

UNITED STATES PATENT OFFICE.

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LEAD-COATING PROCESS.

1,371,445.

Specification of Letters Patent. Patented Mar. 15, 1921.

No Drawing.

Application filed December 11, 1920. Serial No. 429,889.

To all whom it may concern:

Be it known that I, ROBERT J. SHOEMAKER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Lead-Coating Processes, of which the following is a specification.

My invention relates to the lead coating of iron or steel articles, and its object is to provide a method by which this operation may be accomplished more conveniently, expeditiously and economically than with methods heretofore used. A more specific object of the invention is to improve upon the process of manufacturing cold drawn steel tubes by coating the billets from which the tubes are drawn with lead in the novel manner, to be hereinafter described, for the purpose, in the first place, of lubricating the billets for the drawing operation and, in the second place, giving the finished tubes a highly polished rustproof surface. By utilizing the coating process in this connection the necessity for lubricating or "doping" the billets before drawing is obviated (where the billets are not subjected to a large number of passes at least); the percentage of "breakers" is greatly decreased; the number of passes to obtain a given reduction of the billet may be diminished; the danger of scratching the tubes is minimized; wear and tear on the dies and mandrels lessened, thereby increasing the life of these parts; and the possible speed of the billets through the draw bench is considerably increased; all of which results in increased output with a given equipment and in a given time, and decrease in the manufacturing cost of the tubes. In addition the surfaces of the tubes are made highly polished and rustproof.

The coating method, to be hereinafter described, may, however, be used in other connections, for example, coating blanks or bodies to be employed in stamping operations or, in fact, the method may be utilized in the manufacture of any iron or steel articles where the coating of the articles with a thin, even, dense covering of lead is required or desirable. With this understanding, the improved method will be described as utilized for treatment of billets for cold drawing steel tubes, and is as follows:

The billets are first cleaned in the usual

way by means of a suitable acid, it being of particular importance to remove all traces of grease. They are then immersed in a concentrated water solution of lead acetate and acetic acid. The solution should contain at least thirty-five per cent., by weight, of lead acetate, although to get the best results the lead acetate content should be from forty to fifty per cent. The acetic acid should not be less than five per cent. A somewhat larger quantity may be used. The solution is heated, otherwise the action will be extremely slow. Preferably it is maintained at a temperature from 160° to 180° Fahrenheit, which is sufficient to disassociate the acetate without producing excessive volatilization of the acetic acid. If the billets be allowed to remain for approximately fifteen minutes in the solution at this temperature they will be covered with an extremely thin but smooth and very dense coating of lead which adheres to the steel with great tenacity. Apparently the chemical action is one of substitution, the lead acetate disassociating and the lead being deposited on the billet and iron from the billet combining with the radical $(C_2H_3O_2)_2$ to form iron acetate. In time this iron acetate will decompose into iron hydrate and acetic acid and the iron hydrate settling to the bottom of the tank, may be drawn off at suitable intervals. The solution will become impoverished during the process and may be built up by adding lead acetate crystals, water and acetic acid. The acetic acid apparently does not enter into the reaction but keeps the solution from becoming basic, due to the presence of the iron, and has a cleansing effect upon the billets.

After the process has been carried on for a time, the solution will necessarily contain a certain amount of iron acetate and while this does not interfere with the contemplated chemical action the adherence of this iron acetate to the billets will result in the formation of rust on the plated surface, through oxidation, so that it is desirable that the billets, when taken from the solution, be washed to remove the iron acetate, or otherwise treated to prevent the rusting from taking place. Ordinarily it will be sufficient to wash the billets thoroughly in clean water.

The billets thus treated may be drawn in the usual manner through dies and over

mandrels. The lead coating makes it unnecessary to cover the billets with any of the usual lubricants or "dope" either before the first pass or between passes unless the billet is given a considerable number of passes, say four or more. The usual annealing and pickling between passes is consequently obviated.

Commercial operation of the process has shown that the billets when treated as above described may be drawn with less breakage than when dope according to methods heretofore used. I have found that the number of "breakers" is ordinarily reduced from the usual ten per cent. to about three per cent. In some operations it is possible to accomplish the desired reduction by a fewer number of passes than heretofore. The speed of the billets through the draw bench may be increased, thereby making possible an enlarged production with a given equipment and in a given time. Fewer of the tubes are scratched. Wear and tear on the mandrels and dies is diminished, increasing the life of these parts several fold. The billets are more conveniently handled than those covered with the greasy dope ordinarily used. Finally, the finished tubes are given, within and without, highly polished surfaces which will not rust. If the tubes are annealed it will be found that they can be flanged, flattened or similarly manipulated just as well as the seamless tubes made by the old processes.

This application is a continuation in part of my co-pending application Serial No. 374,089, filed April 15, 1920, for lead coating process.

I claim:

1. Method of lead coating an iron or steel

article which consists in bringing the same into contact with a solution of lead acetate sufficiently concentrated to coat the surface of the article with a dense, thin, smooth, permanently adherent film of lead.

2. Method of lead coating an iron or steel article which consists in bringing the same into contact with a solution of lead acetate sufficiently concentrated to coat the surface of the article with a dense, thin, smooth, permanently adherent film of lead and washing the coated surface to remove iron acetate therefrom.

3. Method of lead coating iron or steel articles which consists in immersing the same in a solution of lead acetate of sufficient concentration to cover the surfaces thereof with a dense, thin, smooth, permanently adherent film of lead which is substantially non-oxidizable when exposed to the atmosphere.

4. Method of lead coating iron or steel articles which consists in immersing the same in a solution containing not less than thirty-five per cent. by weight of lead acetate.

5. Method of lead coating iron or steel articles which consists in immersing the same in a solution containing not less than thirty-five per cent., by weight, of lead acetate and thereafter washing the articles to remove traces of iron acetate.

6. Method of lead coating iron or steel articles which consists in immersing the same in a water solution containing approximately forty to fifty per cent., by weight, of lead acetate, and five per cent. or more of acetic acid maintained at a temperature of between 160° and 180° Fahrenheit.

ROBERT JAY SHOEMAKER.