UNITED STATES PATENT OFFICE.

WILHELM PFANHAUSER, OF LEIPZIG, GERMANY.

PROCESS FOR MANUFACTURE OF METAL BANDS, WIRE, &c., FROM ELECTROLYTIC IRON.

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To all whom it may concern:

Be it known that I, WILHELM PFANHAUSER, electrical chemist, a subject of the Austro-Hungarian Emperor, residing at 13 Schwägrichenstrasse, Leipzig, Germany, have invented certain new and useful Improvements in Processes for the Manufacture of Sheet-Metal Bands, Wire, and the Like from Electrolytic Iron; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to the manufacture of sheet metal, bands, wire and the like from electrolytic iron.

In the manufacture of sheet metal from electrolytic iron it is usual to remove the deposit when it has the required thickness from a correspondingly prepared cathode. Such a process has however the defect that it cannot be applied commercially owing to the numerous manipulations necessary such as taking out the cathode, removing the sheet metal, re-treating the cathode and subsequently re-inserting same in position for a new deposit.

The object of the present invention is a process for manufacturing sheet metal and the like of perfectly soft iron with all the advantages which electrolytic iron offers, such as small coercive force and great permeability, in a manner which is not to be deduced from and in fact contrary to the observations and researches hitherto made in regard to the alteration of the magnetic properties of iron by mechanical treatment.

It has been found that electrolytic iron deteriorates when subjected to mechanical treatment like other kinds of iron known hitherto, but that unlike known kinds of iron all the good properties are again restored thereto by annealing, that is to say, there is no permanent disadvantageous effect on the electrolytic iron by reason of the mechanical treatment. This is probably due to the extraordinary softness of the material, by reason of which internal tension resulting from the previous mechanical treatment disappears completely at a relatively low annealing temperature while at the same time all the good magnetic properties of the material are restored. Consequently it is possible to manufacture sheet metal, bands, wires and the like from electrolytic iron under normal working conditions by making the thickness of the electrolytic deposit as great as possible, or at least greater than the thickness of the final product. That is to say, it is possible to manufacture thick plates by means of an electrolytic deposit, by using thin electrolytic iron sheets as cathodes and thereafter rolling the deposit out at a suitable temperature into thin metal sheets and the like.

That the well known rolling process itself has long been known as disadvantageous for the magnetic properties of other kinds of iron, is illustrated by the following passages from the literature on the subject. In the book, "*The Magnetic Examination of Iron*" by E. Schmidt (published by W. Knapp, Halle a. S. 1900) on page 85 line 10 it is stated, that all mechanical influences are able to essentially change the magnetic condition. On page 86, line 1, it is expressly stated that mechanical influences, which pass beyond the limits of elasticity, magnetically deteriorate a soft material, and in line 20 it states, that annealing only restores the former condition in a limited degree to the kinds of iron known hitherto, that is to say, that every material on annealing reaches a certain limiting stage beyond which it is impossible to improve it. For that reason (compare page 87 main point 1) all mechanical influences which alter the molecular structure of the material, ought to be avoided as far as possible.

In opposition to the misapprehension, that on rolling out electrolytic iron the advantages which are at first gained became more or less illusionary, it has been found on the contrary that the rolling process may very well be applied to electrolytic iron if the rolled products are finally annealed. This new observation upon which the present invention is based, consists in that, as compared with what has been known regarding other kinds of iron the rolling process or similar methods of stretching are employed without hesitation in the case of electrolytic iron. In this way it is possible for instance, to manufacture the electrolytic iron laminæ used in dynamos in a far more economical manner. Moreover, the rolling process may be limited, or only a certain portion of the material subjected thereto, if the plates are so manufactured that the material of the plates is deposited in thin layers and which are consequently readily sepa-

rated from each other, this being effected by making suitable stoppages or reversals of current during the period of deposition. In such a case where the deposit is not made continuously, the separately deposited layers adhere more or less closely to each other, and may be separated after the plate is finished. The rolled out pieces may thereafter just as is done in the English rolling process, be taken apart and separated into their individual layers.

What I claim is:

1. A process for the manufacture of sheet metal, bands, wire and like from electrolytic iron, in which the electrolytically deposited products which are of larger dimensions than the finished size are brought to the correct thickness by rolling or drawing and are thereafter annealed to restore their magnetic properties, substantially as decribed.

2. A process for the manufacture of electrolytic iron objects of good magnetic properties, which consist in electrolytically depositing iron products, then reducing such products by properly working the metal, and finally annealing such products to thereby restore the magnetic properties lost by the aforesaid working of the metal, substantially as described.

3. A process for the manufacture of electrolytic iron objects of good magnetic properties, which consists in depositing by electrolysis iron products having larger dimensions than the finished size, then reducing such products to the ultimate size by suitable mechanical working, and then annealing such products, substantially as described.

In testimony whereof I have affixed my signature, in presence of two witnesses.

WILHELM PFANHAUSER.

Witnesses:
WALTER D. OSING,
SIEGMUND ROSENBERG.