UNITED STATES PATENT OFFICE.

WILHELM PFANHAUSER, OF LEIPZIG, GERMANY.

MANUFACTURE OF THIN ELECTROLYTIC IRON PLATES OF LARGE AREA.

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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 the Manufacture of Thin Electrolytic Iron Plates of Large Area; 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 has for its object to provide an improved process for the manufacture of thin layers of detachable electrolytic iron deposits on large surfaces.

A process has already been proposed for producing ductile electrolytic iron by the electrolysis of aqueous solutions of iron salts, in which the electrolytes are heated to a temperature exceeding 90 degrees centigrade, and contain moreover hygroscopic salts. Another process has been proposed for producing electrolytic iron by electrolysis of a solution of iron chlorid at a temperature of 70 degrees C., the cathodes being continuously agitated. In the first mentioned process current densities of over 20 amperes per square decimeter are employed, while in the last mentioned process the current densities employed are not higher than 3 to 4 amperes per square decimeter.

When thin iron sheets of from 0.25 to 0.5 millimeters in thickness are produced upon large surfaces such as for instance from 1 to 2 square meters, according to the first mentioned process, it has been found that it is impossible to detach these iron sheets readily from the foundation plate even when the latter is provided with an intermediate layer of arsenic or antimony. This is due to the fact that electrolytic iron deposited by this means is exceedingly soft and consequently is liable to tear and get crumpled in being drawn off with the result that iron sheets of this kind are rendered useless. This is because it is impossible to prevent electrolytic iron which is precipitated from a hot solution of above 90 degrees C. from sticking on the foundation plate in some places notwithstanding the intermediate layer of arsenic or antimony. Equally unfavorable results are obtained when it is attempted to produce detachable iron deposits of from 0.25 to 0.5 millimeters in thickness on surfaces the area of which is from 1 to 2 square meters according to the second of the two above mentioned known methods, since in this case it is found that the edges get detached and therefore the iron rolls up at these places, so that the production of a uniformly thick and flat sheet of iron is frustrated.

Now I have discovered that special elasticity is imparted to electrolytic iron, when the electrolysis of the solution of iron salts is carried out at temperatures between 75 degrees and 85 degrees centigrade, say about 80 degrees centigrade, so that if the work is carried out between these temperatures, an iron is obtained which is not so soft as to become torn or crumpled in being detached in very thin sheets from large surfaces, and of which the edges will not roll up, so that nothing is necessary but to cut off the edges of the foundation plate whereupon the entire sheet may be removed. The electrolysis is effected by currents of high density, *e. g.*, of 10 amperes or more per square decimeter. The ductility of electrolytic iron is however subject to different conditions of temperature of the electrolyte from those which govern the elasticity, which it is intended to give the iron according to the present invention and which is of primary importance for the required purpose. It is impossible to obtain electrolytic iron having this peculiar elasticity even at temperatures of 85 to 86 degrees C.

By the choice of suitable conducting salts, as well as by choosing the current density to suit the temperature within the interval of 75–85 degrees C., it is possible to vary the elasticity of the deposited electrolytic iron to a certain degree, the general rule being that with solutions having good conductivity or with higher current densities, the upper limit of temperature, and with badly conducting solutions or smaller current densities, the lower limit of temperature, will be the best adapted for the production of good electrolytic iron which is neither brittle nor excessively soft.

What I claim is:—

1. The improved process for the manufacture of electrolytic iron deposited by the electrolysis of hot solutions of iron salts, with the use of high current densities, which consists in maintaining the electrolyte at a temperature of from 75 degrees to 85 degrees C. during the electrolysis, for the pur-

pose of obtaining detachable iron deposits of any desired thinness, and of as large a surface as required; substantially as described.

2. The improved process for manufacturing electrolytic iron in the form of thin deposits of large area, which comprises the electrolysis of a solution of iron salts, and the maintenance of the solution, during such electrolysis, at a temperature of approximately 80 degrees C.; substantially as described.

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

WILHELM PFANHAUSER.

Witnesses:

HANS VON SWOBODA-FREYBORN,

RUDOLPH FRICKE.