UNITED STATES PATENT OFFICE.

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ELECTRODEPOSITION OF METALS UPON IRON AND ALLOYS OF IRON.

1,417,896. Specification of Letters Patent. Patented May 30, 1922.

No Drawing. Application filed January 17, 1921. Serial No. 437,943.

To all whom it may concern:

Be it known that I, ROBERT JOSEPH FLETCHER, a subject of the King of Great Britain, residing at 3 Penarth Street, Old Kent Road, in the county of London, England, have invented certain new and useful Improvements in or Relating to the Electrodeposition of Metals Upon Iron and Alloys of Iron, of which the following is a specification.

This invention relates to the electrodeposition of nickel, iron, cobalt and other metals upon the surface of iron or alloys of iron, such as ordinary or special steels, and more especially to the method of cleaning the iron so that a firm and coherent coating of the deposited metal can be obtained direct upon the iron surface.

According to this invention the iron or iron alloy on which the metal is to be deposited is subjected to an electrolytic cleansing treatment in an acid bath containing a salt of copper. The electrolytic treatment is such that the iron is left clean without an adhering film of copper, to which metal the iron is electro-positive. A suitable bath for this purpose consists of a solution of, say, 10 to 12 per cent sulphuric acid in water with about 5 to 10 per cent of copper sulphate. The temperature employed may be the normal atmospheric temperature and should not be allowed to exceed 120° F.

The body to be cleansed is suspended in the bath or vat, which may be lead lined or provided with a lead electrode and current of suitable density is supplied. The iron is preferably first made the cathode, and after a suitable time, depending on the thickness of the layer of oxide and other impurities, the current is reversed and the iron becomes the anode. The result of this treatment is that the surface layer is first attacked by nascent hydrogen and is rendered soft and non-coherent, whereupon the reversal of the current completely removes the partly disintegrated layer and leaves the iron surface chemically clean. If the iron surface is not thickly coated the preliminary electrolytic treatment with the iron as cathode may be dispensed with. The current required is usually at a pressure of 8 to 20 volts with a density of from 150 to 500 amperes per square foot of iron surface.

When iron is placed in an electrolyte containing a copper salt, since the iron is electro-positive to the copper, the tendency is for copper to deposit, with or without the action of current in a direction which assists the deposit, that is, with the iron as cathode. Since the iron is covered with an oxide coating the copper forms a loose deposit associated with the oxide, and when the current is passed through the bath with the iron as the anode, the copper is immediately removed, taking with it any oxides or other impurities with which the surface of the iron is coated.

The surface of the work is freed from grease before it is introduced into the bath or vat but after the electrolytic cleansing operation is finished the work is chemically clean and is left untouched until the electro deposition is effected. Deposition may be effected by any of the customary solutions into which the cleansed iron body is placed after removal from the cleansing bath. It is found that iron, nickel and cobalt can be deposited directly upon such a cleansed surface, without the interposition of a copper or other primary coating. Otherwise the depositing process may be of the usual type. The process enables parts of machinery which have been worn to be thickened, at any required point, by a deposited iron layer which becomes homogeneous with the original metal and so allows the worn parts to be utilized again. The deposited layer may be case hardened if desired.

What I claim and desire to secure by Letters Patent of the United States is:—

1. A process for the cleansing of the surface of iron or iron alloy prior to the electrodeposition of metals upon such surface, which consists in subjecting the said surface to an electrolytic cleansing treatment by immersing it in an acid bath containing a salt of copper and passing current through the acid bath and the body to be cleansed the said body forming an anode.

2. A process for the cleansing of the surface of iron or iron alloy prior to the electrodeposition of metals upon such surface,

which consists in subjecting the said surface to an electrolytic cleansing treatment by immersing it in a solution of sulphuric acid containing copper sulphate and passing current through the acid bath and the body to be cleansed the said body forming an anode.

3. A process for the cleansing of the surface of iron or iron alloy prior to the electrodeposition of metals upon such surface, which consists in placing the iron or iron alloy in an acid bath containing copper sulphate passing current through the bath with the body to be cleansed employed as a cathode and then reversing the current so that the body becomes the anode, for the purpose specified.

4. A process for the electrodeposition of metals upon an iron or iron alloy surface, which consists in subjecting the said surface to an electrolytic cleansing treatment in an acid bath containing copper sulphate freeing the surface from the copper solution and thereupon depositing directly upon the said cleansed surface the required metallic coating from an electroplating solution.

ROBERT JOSEPH FLETCHER.