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PROCESSES FOR THE PROTECTION OF METALS AND ALLOYS

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It is known that metal surfaces can be treated so as effectively to preserve them from corrosion (as for example anodised aluminium or phosphatised iron). Such treatments are usually carried out in solutions of inorganic or organic compounds, and among these may be cited fatty substances and hydrocarbons such as paraffin. Paraffin, which melts as low as 50°, closes the pores of the protective coating and forms a further protective covering to the surface of the metal. But although this film of paraffin has the appearance of being adherent, in reality it is not so; it detaches itself if the metal is repeatedly immersed in and withdrawn from a solution, and often merely under the action of rain. This is because the paraffin is not chemically but only mechanically attached; it therefore detaches itself easily under mechanical stress, and the metal remains subject to attack by corrosion.

The inventor has already described in Patent U. S. A. 314,349 lodged on 17th January 1940, under the title of "Process for the protection of metallic objects by galvanic treatment" a finishing operation to be applied to a specific protective coating composed principally of manganese oxide, obtained by the galvanic treatment described in the above mentioned patent. This finishing operation consisted in the immersion of the metal object in a bath of paraffin or analogous hydrocarbon at temperatures comprised between 150 and 200° C.

Further researches have permitted the inventor to precise and fix the conditions under which the above treatment must be carried out and also to establish the fact that if the treatment is carried out under the conditions in question, it permits of notably improving the resistance to corrosion of all films having as their basis salts oı oxides, even if these are painted. Moreover such a treatment affords a relative protection even on unprotected metal surfaces.

In putting this new invention into practice, the metal covered by a protective film produced by any desired process (galvanic or chemical treatment, anodic oxidation, etc.), is immersed in paraffin or an analogous hydrocarbon at a temperature above 170° and preferably above 180° C. An evolution of gas results and the treatment must not be stopped before ceases. It is however a wise precaution to continue the treatment three or four minutes longer.

At the temperatures indicated above, the immersion does not give rise to a simple layer of paraffin by mechanical impregnation but causes a veritable dehydration and deoxidation which profoundly modifies the nature of the original protective film. Oxides and salts are dehydrated, and the oxides themselves transformed into lower oxides. Thus for instance Fe_2O_3 is reduced to Fe_3O_4, and CrO_3 to CrO_2.

The inventor has further found that the layer of paraffin resulting from the above described treatment is much more adherent than that which can be formed in any other way, and that it cannot be detached from the subjacent metal even by mechanical deformation.

The following is one preferred means of putting this new invention into effect, but it is given by way of example only and must not be construed in any limitative spirit. A sample of magnesium is coated with a film of Mn_2O_3 by galvanic treatment in a bath of $MnCr_2O_7$. After drying in air, the sample is immersed for 5 minutes in hot paraffin at 195° C. During the immersion water vapour and CO_2 are evolved. After removal, it is found that the brown film of $Mn_2O_3.xH_2O$ has been transformed into anhydrous black Mn_3O_4, which is much more resistant to corrosion than the former.

The inventor has moreover found the surprising result that this treatment in hot paraffin or analogous hydrocarbon tends to make the original protective film more plastic, and has a most markedly beneficial effect even on very dry paints which show only poor adherencc and pliability. The following example, which again is no way limitative, may be cited. A sample of oxidised aluminium was painted and then submitted for one month to a corrosion test in salt spray. At the end of this time, the protective coating, although it had not flaked off, had become stiff and brittle, with the result that it broke off on bending. An identical sample covered with same painted protective coating was first dipped for 5 minutes into hot paraffin at 190° C., and then submitted to an identical corrosion test. In this instance the coating remained perfectly pliable and the paint showed no tendency to break off on bending.

The inventor has found that good results can also be obtained if the present invention is applied to untreated metallic surfaces, for one can even in such instances obtain a firmly adherent coating. This phenomenon is probably due to the deoxidation of the thin film of oxide which adheres to the metal, and which, as for instance in the case of iron, catalytically produces auto-oxidation.

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