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PROCESS FOR THE ELECTROLYTIC DEPOSITION OF METALLIC CHROMIUM.

No Drawing.

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To all whom it may concern:

Be it known that I, RICHARD GRAH, of Sheffield, England, a citizen of Germany, have invented a certain new and useful Improved Process for the Electrolytic Deposition of Metallic Chromium, of which the following is a specification.

This invention relates to an improved process of electrolytically depositing metallic chromium from chromium compounds, and more especially to a type of process of electrolytic deposition of chromium by means of a bath which contains a mixture of chromic oxide and an acid and used in the proportions by weight of acid and oxide of chromium approximately equal or a smaller quantity of chromium oxide but not less than half the weight of the acid, the relative proportion being as far as possible maintained constant during the operation, and to which acid is added and the temperature kept constant.

It has previously been proposed to deposit chromium from a solution of chromic sulphate, chromic anhydride and boric acid also being present in the solution, and also from a solution of chromic and boric or tartaric acid with an average current density of 0.20 amperes per square centimetre at a pressure of 20 volts. Chromium has previously been deposited from a solution of the sulphates but in this process a very high current density is required, say of between 2 and 5 amps. per sq. cm. at a pressure of 3 to 6 volts but the deposit resulting is brittle and easily flakes off.

A process of the type described according to this invention is characterized in that the acid added to the chromium oxide is hydrochloric acid or acetic acid, with the addition of a suitable conducting acid or salt, for example, boric acid, tartaric acid, citric acid, or sulphuric acid, which produces a non-colloidal solution.

In the above process, in the preferred form, the proportion by weight of hydrochloric acid or acetic acid to chromium oxide of approximately 2 to 1 has been found to give a good result. This strength of the solution requires to be maintained during the working of the solution, and one way of doing this is to add fresh materials to the solution, while working with suitable anodes. The additional subsidiary conducting acids, such as boric acid, tartaric acid,

citric acid, or sulphuric acid are used in small quantities.

While a proportion of 2 to 1 is maintained, an increase in current density employed has no appreciable effect on the amount of metal deposited in a given time. If, however, the proportion employed is 4 to 3 or still higher, i. e., if the proportion of chromium oxide present in the solution is increased, better results are obtained. The solution is worked at a temperature of 18° to 20° centigrade, using a current density of 2 to 3 amperes per square decimetre and a voltage of 2 to 4. Working the solution as described above, a coating can be deposited on many metals commonly used for commercial purposes, any desired thickness being obtainable.

This process enables chromium to be deposited in such a condition that it can be highly polished.

What I claim and desire to secure by Letters Patent is:—

1. A process of electrolytically depositing metallic chromium consisting in providing a bath containing a mixture of chromic oxide and a non-oxidizing acid in the proportions by weight of oxide of chromium more than half the weight of the acid, maintaining the relative proportions substantially constant during the operation, adding a suitable conducting acid which produces a non-colloidal solution, and maintaining the temperature constant.

2. A process of electrolytically depositing metallic chromium consisting in providing a bath containing a mixture of chromic oxide and a non-oxidizing acid and used in the proportions by weight of oxide of chromium more than half the weight of the acid, maintaining the relative proportions substantially constant during the operation, adding a suitable conducting acid which produces a non-colloidal solution, maintaining the temperature constant, and supplying current density of about 2 to 3 amperes per square decimetre at a constant temperature of about 18 degrees centigrade and a voltage of not less than 2 and not more than 4.

3. A process of electrolytically depositing metallic chromium consisting in providing a bath containing a mixture of chromic oxide and a non-oxidizing acid and used in the proportions by weight of acid and oxide of chromium approximately 4 to 3, maintaining the relative proportions substan-

tially constant during the operation, adding a suitable conducting acid which produces a non-colloidal solution and maintaining the temperature constant.

5 4. A process of electrolytically depositing metallic chromium consisting in providing a bath containing a mixture of chromic oxide and a non-oxidizing acid and used in the proportions by weight of oxide of chromium
10 more than half the weight of the acid, maintaining the relative proportions substantially constant during the operation, adding boric acid, and maintaining the temperature constant.

15 5. A process for electrolytically depositing metallic chromium consisting in providing a bath containing a mixture of chromic oxide and acetic acid used in the proportions by weight of oxide of chromium more

than half the weight of the acid, maintaining the relative proportions substantially constant during the operation, adding a suitable conducting acid which produces a non-colloidal solution, and maintaining the temperature constant.

25 6. A process for electrolytically depositing metallic chromium consisting in providing a bath containing a mixture of chromic oxide and acetic acid used in the proportions by weight of oxide of chromium
30 more than half the weight of the acid, maintaining the relative proportions substantially constant during the operation, adding boric acid and maintaining the temperature constant.

35 In testimony whereof, I affix my signature.

RICHARD GRAH.