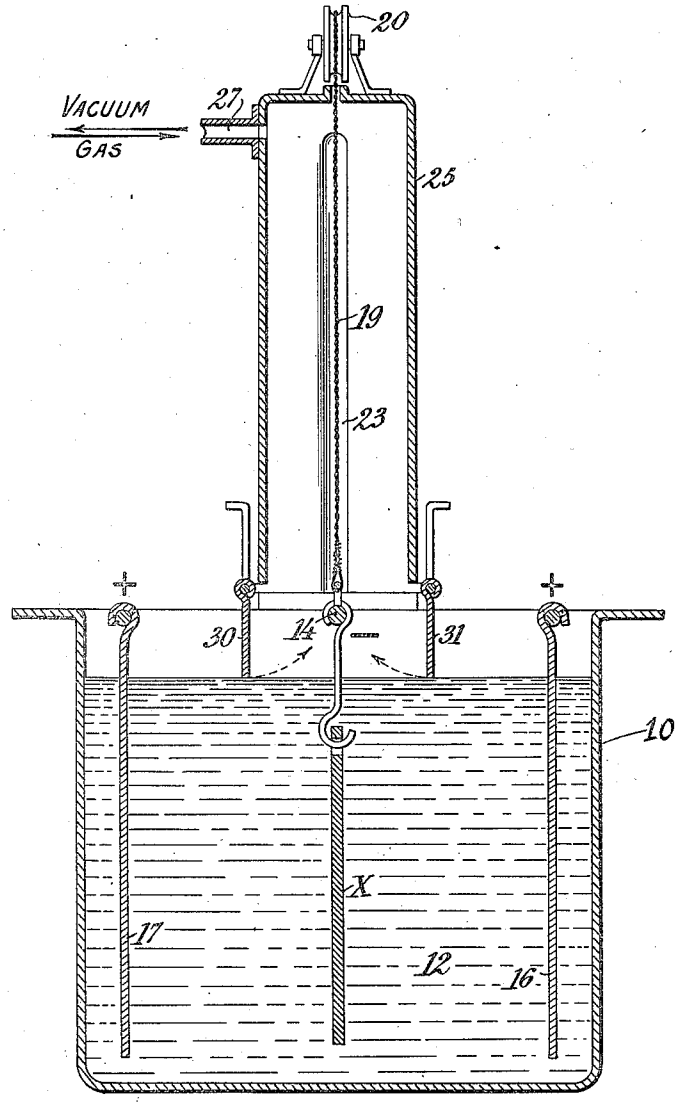
Dec. 29, 1931. C. G. FINK ET AL 1,838,666

ELECTROPLATING APPARATUS

Original Filed Aug. 12, 1925



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Patented Dec. 29, 1931

1,838,666

UNITED STATES PATENT OFFICE

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ELECTROPLATING APPARATUS

Original application filed August 12, 1925, Serial No. 49,751. Patent No. 1,786,398, dated May 6, 1930. Divided and this application filed November 12, 1927. Serial No. 232,737.

This invention relates to electroplating apparatus, and particularly to an apparatus adapted for use in the process described in our application for patent, filed August 12, 1925, Serial No. 49,751, now Patent No. 1,786,398, of which application the present is a division.

According to said process invention, metal (or alloy) articles (steel, for example) are plated with a protective and resistant metal, such as above set forth, according to any suitable method of plating, and then treated to eliminate or heal the "pin-holes" therein, by a method involving the intermittent exposure to air or other gas, or even to sub-atmospheric pressures down to the pressure ordinarily referred to as a vacuum.

During the process of electroplating, hydrogen is nearly always, if not always, co-deposited with metal in depositing metals from aqueous solutions: and in depositing certain metals, such as chromium, the metal does not begin to deposit until after hydrogen is electrolyzed from the solution.

It is believed that the so-called "pin-hole" defects observable in plates, and particularly in thin plates of electrolytically deposited metal, are almost always due to the presence of molecules, or groups of molecules, of gas hydrogen.

It has been found that if these plates of metal are exposed to air at atmospheric or reduced pressure, or to oxygen, or to a number of other gases, especially in the early stages of electrodeposition, these pin-hole defects running entirely through the entire coating may be avoided, and a continuous or imperforate, protective and resistant coating obtained.

An apparatus useful in carrying out said process is illustrated in the accompanying drawing. This drawing is a diagrammatic representation of the apparatus.

The process may be carried out by placing the article X, shown on the drawing as a sheet of metal, in a tank 10 of any suitable kind containing an electrolytic solution 12. The article X is as usual made the cathode and connected for example to the cathode bus-bar 14, between anodes 16, 17 of any suitable kind.

The current is allowed to pass to deposit the metal, and after an initial increment has been deposited on the article, a small fraction of a mil, for example, the article is exposed to air for a time, as by lifting the article X out of the solution 12, and then returned to the solution and the electroplating resumed. It will generally be sufficient to expose the plate, for a minute more or less.

For lifting the article X out of the solution, a cord and pulley 19, 20, is shown, the cord being conveniently attached to the bus-bar 14, and the ends of the bus-bar conveniently guided in grooves 23. Any other suitable means could be used.

A hood 25 may be provided above the bus-bar 14 into which the article X carried by the bus-bar 14 may be lifted when raised by the cords 19.

A suitable gas, as oxygen for example may be contained in the hood, and a conduit 27 may serve for conducting the gas to the hood.

The molecular hydrogen adhering to the plate on the article X disappears, presumably by diffusing into the oxygen, in the air, or the gas itself.

The pressure of the gas in the hood 25 may be reduced below that of the atmosphere, to a greater or less extent. A so-called vacuum may be produced in the hood corresponding to a few inches of mercury, such as can be obtained by ordinary rotary quick-acting vacuum pumps. The gas which is adherent to the plate on article X detaches itself from the plate when subject to sub-atmospheric pressures, as described.

In order that a sub-atmospheric pressure may be produced in the hood 25, doors 30, 31, adapted to be closed after the article X is lifted into the hood, are provided, and the evacuation may be effected through the conduit 27.

Chromium is a metal having a number of remarkable properties rendering it very useful as a protective, a protective and resistant, and an ornamental, non-tarnishing coating for articles, of both the useful and fine arts, composed of less resistant foundation metals, such

as iron, steel, brass, etc. Chromium is hard, wear-resisting, acid-resisting as regards most acids, may be deposited with a bright surface, and keeps its finish.

The present invention is of special advantage in the production of resistant and protective coats of chromium and similar metals.

A specific mode of procedure in producing resistant electrodeposited coatings of chromium, in which pin-hole defects do not extend through the entire coating to the underlying foundation metal, will be given by way of example.

A steel article, say a sheet X of steel, is made the cathode and placed in a bath 12 of chromic acid or other suitable chromium electroplating solution, and a thin coat of chromium deposited thereon. The process described in Fink Patent No. 1,581,188, dated April 20, 1926, and others, may be employed.

After a small fraction of a mil of plate has been deposited, the article X is removed from the bath and exposed to air (or to a reduced pressure) by raising it for example by cords 19, or any other suitable means, into a position above the tank, and into the hood 25 where it is desired to expose the plate to an atmospheric or sub-atmospheric pressure or to a gas other than air.

The exposure to the atmosphere may be for about one-half a minute. This may be lengthened or shortened depending on the metal deposited. Thereafter the article X is again lowered into the electrolytic solution 12 and the plating resumed. In building a plate of five-tenths mil thickness an exposure may be made after each gain of a tenth mil in the thickness of the deposit. More or less frequent exposures could be made according to the results obtained with any particular article, the solution employed, etc.

The invention may be carried out by other apparatus and by other modes of procedure than those herein specifically described.

What is claimed is:—

An apparatus for electroplating comprising an electrolytic tank for electrodepositing metal on an article immersed in the electroplating solution therein, a hood or container for gas mounted above said tank, said hood having a height greater than the height of the article being electroplated in said tank, closure means adapted to close the bottom of said hood, means for transferring the article undergoing electroplating from said solution to said gas container and back again to the solution, and means for reducing the pressure in said hood or container after the article is transferred into said hood and after the aforesaid closure means are closed on the bottom of said hood.

In witness whereof, we have hereunto signed our names.

COLIN G. FINK.
CHARLES H. ELDRIDGE.