

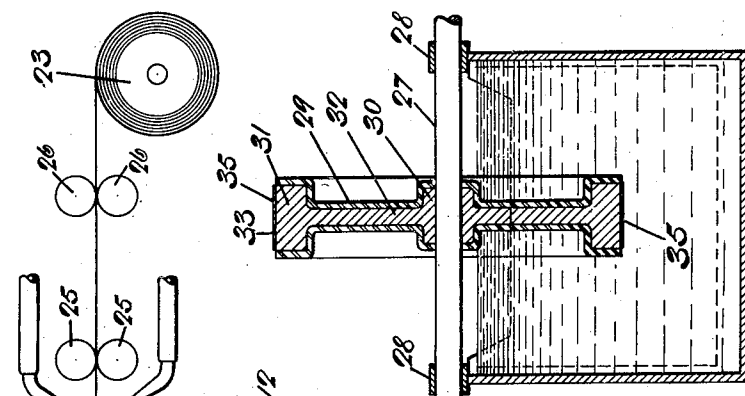
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PROCESS OF PRODUCING METAL SHEETS BY ELECTRODEPOSITION

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PROCESS OF PRODUCING METAL SHEETS BY ELECTRODEPOSITION

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The invention relates to the production of metals in sheet form, particularly by the use of an electrolytic process.

Its objects are to produce strips or sheets of metal of indefinite length; to produce such strips or sheets in a continuous process; to utilize, as raw materials, scrap metal or more or less crude or impure metal.

In carrying out the process, use may be made of apparatus such as is illustrated diagrammatically in the accompanying drawing in which:

Fig. 1 illustrates a complete apparatus in side elevation but showing a container in longitudinal section, and Fig. 2 a transverse vertical section through said container in an axial plane of a drum serving as an electrode.

The process involves an electroplating step which consists, generically, in plating with metal upon a metallic chromium or chromium containing surface from which the plating may be afterwards stripped. The chromium or chromium containing surface may be on the periphery of a drum mounted to rotate, partially submerged, in an electrolyte. By establishing an electric circuit through the chromium bearing surface of said drum, which thus serves as one electrode, and submerging in the electrolyte other electrodes formed of or containing the metal of which the desired strip or shell is composed, a deposit of the metal of the latter electrodes will collect on the metallic periphery of the drum. The layer of metal deposited on the periphery of the drum may be readily peeled or stripped therefrom. The material of the electrodes composed of metal of which the sheet is to be formed will be continuously transferred to that portion of the periphery of the drum that is submerged in the electrolyte, and may be continuously stripped from that portion of the drum that is above the electrolyte. The strip so being separated from the drum may be passed through a cleaning solution, then subjected to the action of a drying device, then have its edges sheared or trimmed by drawing between rolls having shearing disks and then smoothed, compacted and drawn from the drum by pres-

sure rolls, whence it may pass to a winding reel or spool.

In the drawings, 10 indicates a container for an electrolyte 11 and 12 a container for a cleansing liquid 13. In the illustrated embodiment these containers are combined in one tank divided into two chambers by a transverse partition 14. A rotary electrode in the form of a drum 15 is mounted so that its lower portion may dip into the electrolyte 11. Other electrodes 16, containing a metal to be plated upon the drum 15, are suspended in the electrolyte. Leads 17 connect electrodes 16 with a source of electrical energy and a lead 18 connects the drum 15 therewith. Electrodes 16 are anodes and drum electrode 15 is a cathode in the equipment shown. A guide, preferably a roller 19, is disposed above one end of the chamber containing the cleansing liquid 13 and a guide, such as roller 20, above the opposite end. A stripper, such as a roller 21, is disposed adjacent the drum. Submerged in the cleansing liquid are other guides, such as rollers 22. A reel or winding spool 23 is located some distance from the guide 20 and between said reel or spool and said guide 20 are drying means, such as air nozzles 24, trimming devices 25, and one or more pairs of pressure rolls 26. The drying means are preferably between the guide 20 and the trimming means 25; the pressure rolls between the trimming means and the reel or winding spool. The drum, stripper, guides, drying means, trimming means, pressure rolls and winding spool are arranged in series order, in such position that a strip drawn by the pressure rolls and winding spool from the drum 15 will move between parallel planes as directly as practicable from the drum to the spool. The active surface of the stripper 21 is disposed on that side of a plane, tangent to the active surface of guide 19 and unsubmerged perimenter of drum 15, that is away from the drum or, in the illustrative equipment, above that plane.

Drum 15 may be mounted on a shaft 27 rotatable in bearings 28 mounted on the sides of container 10 with its axis parallel with the axis of the winding spool 23 and the sev-

eral guides referred to. Drum 15 has a periphery of chromium or chromium containing metal. It may be made entirely of chromium or chromium containing metal, and in any event all exposed parts that dip below the surface of the electrolyte except the periphery should have a surface that cannot be plated. Drums made entirely of metal are intended to be covered with a substance that prevents the electrodeposition of metal except upon the exposed periphery. In the drawing the entire drum except the perimeter is shown protected by an insulating coating 29 such as a heavy coating of vitreous material, bakelite or other substance suitable for the purpose; and the drum is shown as composed entirely, except for the coating, of one piece of material. It may have a distinct hub 30 and a distinct rim portion 31 of considerable thickness measured parallel with the axis, and a thinner web 32 connecting the hub and rim. The plating, or receiving surface for the deposited metal, is the smooth surface of revolution 33 not covered by the coating 29.

The plating surface 33 may be formed on a body of pure metallic chromium, as by casting a drum of chromium and machining the perimeter; or the central and main body of the drum may be formed of other metal, or other suitable material, and a thin layer of chromium plated or otherwise formed upon the periphery.

A pure metallic chromium surface is not essential. It has been found by extensive experiments that plating surfaces of ferrous alloys containing substantial proportions of the chromium are effective. Plating surfaces on ferrous alloys having as low as 10% chromium have afforded good results, and plating surfaces formed on ferrous alloys containing any proportion of chromium from 10% upward can be used. In making thin strips of copper, for example, by this process, a plating surface on a ferrous alloy containing 20% chromium collects satisfactorily a plating of copper which can be stripped with facility, and the sheets of copper so formed have possessed excellent physical properties. Extensive experiments have led to the conclusion that any of the metals may be formed into thin sheets by this process. Sheets of copper, nickel, zinc, brass and others of the more common metals have been made in this manner.

In practising this process by the aid of the apparatus conventionally illustrated the procedure is as follows:

Electrodes 16 composed substantially of the metal to be formed into sheets or strips are suspended in a suitable electrolyte 11 in the container 12. Electric current is then discharged from the electrodes 16 to the exposed plating surface 33 of the drum 15, while the latter is being rotated in the di-

rection indicated by the arrow in Fig. 1. When the drum has rotated far enough to bring the coating 35 of plating metal deposited thereon to the top this coating may be lifted from the drum, as by the aid of any thin edged instrument and peeled and stripped partially from the plating surface. The so stripped metallic ribbon or sheet 35^a may then be led over the stripper 21, over guide 19, under guides 22, over guide 20, between drying nozzles 24, trimming means 25, pressing rolls 26, and attached to spool 23 in such manner that rotation of the spool will tension the sheet and wind it thereon as the sheet is stripped from the drum, washed in the container 12, dried by an air blast issuing from nozzles 24, edge trimmed by the trimming means 25 and drawn, flattened, reduced or compacted by the pressure rolls 26, all in one continuing operation. It will be apparent that, with an apparatus of the kind illustrated, the operation may proceed indefinitely and strips of indefinite length be produced, as it is an easy matter to insert new electrodes 16 at any time when one or more is nearly or partly consumed.

What is claimed is as follows:

1. The process of producing sheets of metal which comprises electrodepositing the metal directly upon a chromium containing metallic surface and stripping the sheet so formed from said surface.

2. The process of producing sheets of copper which comprises electrodepositing the copper directly upon a chromium containing metallic surface and stripping the sheet so formed from said surface.

In testimony whereof we hereto affix our signatures.

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