

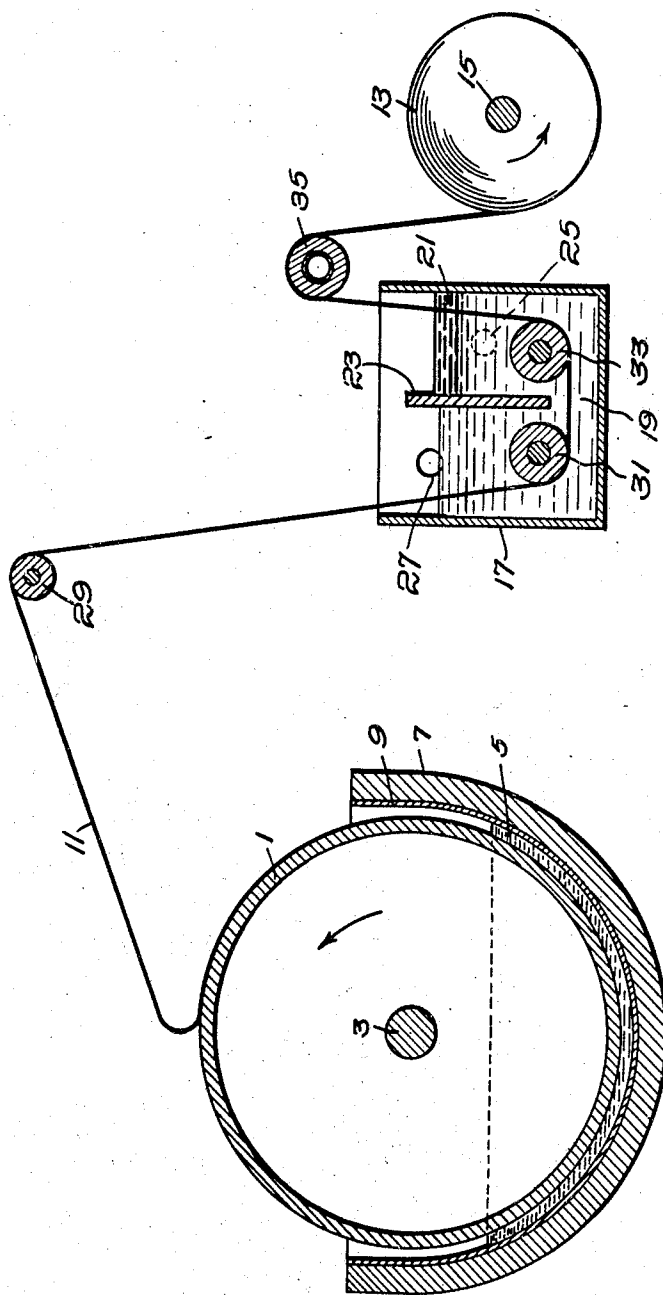
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ELECTROLYTIC METHOD AND APPARATUS

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ELECTROLYTIC METHOD AND APPARATUS

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My invention relates to improvements in electrolytic methods and apparatus, and particularly but not exclusively to those for making sheet material and foil, such as copper sheets and copper foil.

The invention will be best understood from the following description when read in the light of the accompanying drawing, while the scope of the invention will be more particularly pointed out in the appended claims.

The drawing shows a schematic arrangement of apparatus for producing sheet material, such as continuous lengths of sheet copper.

As an example of the electrolytic apparatus, but without limitation thereto, I may employ that disclosed in Merritt Patent 1,601,690 issued September 28, 1926. According to this patent a cylindrical cathode 1 is mounted on a slowly rotating shaft 3, and is partially immersed in a swiftly flowing stream 5 of electrolyte contained in a trough 7, the latter having an insoluble anode 9 opposed to the surface of the cathode. When sheet copper is produced the electrolyte may be an acid solution of copper sulphate and water, and the insoluble anode 9 may be lead.

As the cathode is slowly rotated in the direction of the arrow a sheet 11 of copper, say about 0.004 inch thick, is formed thereon, and is stripped therefrom by causing the sheet to be wound as at 13 on the slowly rotating mandrel 15.

It has been found that a copper cathode, the surface of which is coated with a minute film of copper selenite, may satisfactorily be used as a cathode from which the deposited copper sheet may be readily stripped. Conveniently, this film may be formed by treating the surface of the copper with selenious acid (SeO_2), after polishing and burnishing said surface. As a satisfactory method of applying the acid a solution of the same may be spread over the copper surface with a sponge, brush, or cloth wet with the solution. Water solutions of the acid, it has been found, do not give satisfactory results, probably because of the high surface tension of water as compared to copper the solution does not "wet" the copper, which acts to prevent the solution being uniformly spread over the copper, leaving more or less minute areas untouched by the solution as the latter dries in spite of the fact the solution may be "rubbed into" said surface when applying it thereto. It has been found, in respect to securing this necessary uniformity, that if a substance having a low surface tension compared to copper is mixed with the selenious acid or is employed as a selenious acid solvent, satisfactory

results will be secured. As examples of this substance, but without limitation thereto, ethyl alcohol or glacial acetic acid may be employed, a satisfactory composition being 2.0 grams of selenious acid dissolved in 1000 c. c. commercial U. S. P. ethyl alcohol.

It has been found that improved results may be secured by treating the surface of the cathode to fill the minute pits and pores in its surface, which I have found may be done by treating the surface with a conductive grease. As suitable for this purpose, but without limitation thereto, I may employ a conductive animal fat such as refined wool grease (lanum) mixed with fine flake graphite to improve its conductivity. Preferably I dissolve the animal fat in carbon tetrachloride and mix into the solution flake graphite, which latter will be in suspension in the solution. The solution may be applied to the cathode surface by means of a cloth, and the cathode then rubbed dry. This will fill the pits and pores of the cathode surface, after which the surface may be treated with selenious acid, as above described.

As an example of the proportions of the above mentioned conductive grease I may dissolve 1.0 gram of lanum in 250 c. c. commercial carbon tetrachloride, and stir into the solution 0.25 grams of fine flake graphite, the latter of which under some conditions may be omitted, but ordinarily its use will give improved results. As substitutes for carbon tetrachloride I may employ ethyl alcohol, carbonbisulphide, turpentine, or acetone.

It will be understood that the treatment of the cathode surface with conductive grease is applicable to cathodes formed of materials other than copper, as for example, silver cathodes, and likewise the treatment with selenious acid is applicable to cathodes or other material having a high surface tension with respect to water, as for example, silver cathodes.

For preventing corrosion of the sheet after it leaves the bath the sheet is preferably washed and coated with a film of oil. Conveniently this may be done by causing the portion of the sheet between the cathode and the roll on the mandrel to pass through a receptacle 17 containing a body of water on which floats a layer 21 of oil. As shown, the receptacle is divided by a partition 23, the oil layer being confined to the right hand compartment so formed. Herein water may be supplied to the receptacle through an inlet 25 and discharged through an overflow 27. Practically any hydrocarbon oil, especially those having a paraffin base, will be suitable for this purpose,

such as the light or medium body oils of this nature commonly employed for lubricating machinery, known to the arts as "light" or "medium" machine oil. Preferably the oil is mixed with an equal volume of kerosene, gasoline, or other light volatile oil solvent which acts to insure spreading of the oil in a thin film. For this purpose it is also possible to use an emulsion of whale oil soap. Where the electro-deposited sheet is to be employed for purposes involving soldering, conveniently the oil employed is lard oil which does not interfere with soldering.

As shown, the sheet is caused to pass through the receptacle 17 by use of suitable guide rollers 29, 31, 33, 35. Preferably the roller 35 is heated by passing steam through it, the heated roller acting to dry the sheet after it leaves the receptacle 17 and to render the oil somewhat gummy. For usual conditions a temperature of 30 degrees C. for the roller will give satisfactory results.

It will be understood that the invention is not limited to the apparatus, materials, or particular steps of the method herein described, but that within the scope and spirit of the invention wide deviations may be made from these.

I claim:

1. The method of producing articles by electro-deposition which comprises depositing the article on a cathode of conductive material and stripping the deposited article therefrom; and facilitating the stripping operation by wetting the cathode surface, prior to depositing thereon, with a film of selenious acid dissolved in a substance having a low surface tension as compared to water with respect to the material of said cathode.

2. The method of producing articles by electro-deposition which comprises depositing the article on a cathode of conductive material and stripping the deposited article therefrom; and facilitating the stripping operation by wetting the cathode surface, prior to depositing thereon, with a film of selenious acid dissolved in alcohol.

3. The method of producing articles by electro-

deposition which comprises depositing the article on a cathode of metal of the group comprising copper and silver and stripping the deposited article therefrom; and facilitating the stripping operation by wetting the cathode surface, prior to depositing thereon, with a film of selenious acid dissolved in a substance having a low surface tension as compared to water with respect to the material of said cathode.

4. The method of producing articles by electro-deposition which comprises depositing the article on a cathode of copper and stripping the deposited article therefrom; and facilitating the stripping operation by wetting the cathode surface, prior to depositing thereon, with a film of selenious acid dissolved in a substance having a low surface tension as compared to water with respect to copper.

5. The method of producing articles by electro-deposition which comprises depositing the article on a cathode of metal of the group comprising copper and silver and stripping the deposited article therefrom; and facilitating the stripping operation by wetting the cathode surface, prior to depositing thereon, with a film of selenious acid dissolved in alcohol.

6. The method of producing articles by electro-deposition which comprises depositing the article on a cathode of copper and stripping the deposited article therefrom; and facilitating the stripping operation by wetting the cathode surface, prior to depositing thereon, with a film of selenious acid dissolved in alcohol.

7. The method of producing articles by electro-deposition which comprises depositing the article on a cathode treated with conductive grease and graphite, and stripping the article from said cathode, the stripping being facilitated by treating the cathode, prior to depositing thereon, with selenious acid dissolved in a volatile substance having a low surface tension as compared to water with respect to the cathode surface.

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