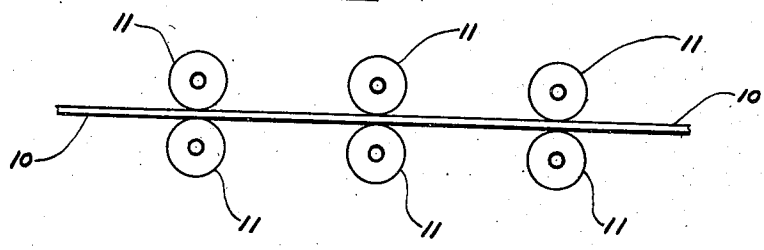
June 17, 1947. E. G. WALTMAN 2,422,323

METHOD OF PRODUCING SHEETS AND THE PRODUCT OBTAINED

Filed Nov. 24, 1944

Fig. 1



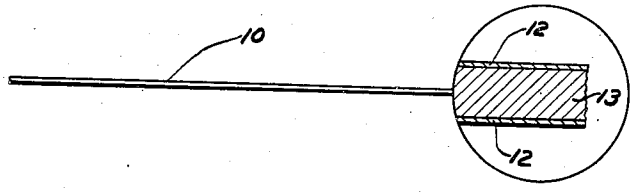




Fig. 2

INVENTOR.
EDWIN G. WALTMAN

BY

James J. Shanley

ATTORNEY.

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## METHOD OF PRODUCING SHEETS AND THE PRODUCTS OBTAINED

Edwin G. Waltman, Steubenville, Ohio, assignor to National Steel Corporation, a corporation of Delaware

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7 Claims. (Cl. 18—47.5)

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This invention relates to a method of producing sheets and foils from bodies of silver chloride and comprises the steps of converting a relatively thin surface layer of the silver chloride to a film of metallic silver and thereafter rolling the body to reduce its thickness. This invention is also concerned with the new product obtained by this process.

Thin sheets and foils of silver chloride have been produced by passing a solid body of silver chloride through a series of pressure rolls but great care has been required in rolling such material into sheets, especially when the final thickness is less than 0.01 inch, for there is a tendency for the foil to buckle excessively and to tear before the rolling operation is complete. These difficulties have limited the thinness to which foils could be rolled commercially. Lubricants have been used to reduce these difficulties without complete success and for some purposes the presence of the lubricant is undesirable.

The object of this invention is to provide an improved method which will eliminate or reduce the tendency of the silver chloride sheets to buckle and/or tear during the rolling operation. It is also an object of this invention to provide an improved method which will enable foils thinner than those heretofore produced to be rolled readily.

It is a further object of this invention to provide a novel silver chloride foil and to provide such a foil which is free of coatings of lubricant in the as-rolled condition.

I have discovered that if a surface layer of silver chloride is converted to a film of metallic silver, the composite sheet of silver chloride can be readily rolled with little or no tendency to tear and with a reduced tendency to buckle. I have also found that foils as thin as 0.0003 inch or less in thickness can be readily formed by my process.

A preferred method of forming the film of metallic silver is to apply a "developer" to the surface of a silver chloride body. Any of the commercial developers which are sold for developing photographic films of silver chloride or silver chloride emulsions and which convert silver chloride to metallic silver can be used. These developers readily convert only a thin surface film of silver chloride to metallic silver. By the term "developer," I intend to include not only the developers commonly sold for developing films and which usually include one or more developing agents, alkaline materials, preservatives and regulators, but any chemical compound such as

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p-methylaminophenol sulfate, p-hydroxyphenol, pyrogallic acid, or the like, or mixtures thereof that will chemically react with the silver chloride to form a smooth homogeneous film of metallic silver. The film of metallic silver may be formed by other means.

After forming the metallic silver film, the body of silver chloride may be passed through a series of pressure rolls or other means, in the usual manner to reduce gradually the thickness to the desired amount.

These and other objects and advantages will become apparent from the following detailed description taken with the accompanying drawings, though my invention is not limited to the following example.

A cake of silver chloride, weighing about 45 pounds and about 14 inches x 11 inches x 1 inch, was formed by casting and then rolled into a sheet 10 having a thickness of 0.01 inch by passing the cake between a series of pressure rolls 11 at a temperature of about 680° F. and as schematically shown in Figure 1 of the drawings. An aqueous solution of a developer, obtainable on the market under the designation of "D–72" and sold by Eastman Kodak Co. was applied to the surfaces of the sheet. The developer may be applied by any suitable means. The "D–72" developer contains 3.1 parts of p-methylaminophenol sulfate, 45 parts of sodium sulphite, 12 parts of p-hydroxyphenol, 67.5 parts of sodium carbonate and 1.9 parts of potassium bromide. The developer reacted with the silver chloride and quickly formed a smooth, even surface film 12 of metallic silver as schematically shown in Figure 2. The surface film 12 apparently prevented further reaction between the developer and the main body 13 of silver chloride. The silver chloride sheet coated with a thin film of metallic silver was passed between a second series of similar pressure rolls and gradually reduced in thickness to 0.007 inch, then to a foil of 0.003 inch and finally to 0.000 inch. Foils of from 0.003 to 0.0003 inch, and less, can be produced by my process.

The sheet of silver chloride coated with metallic silver was more easily handled during the rolling operation and did not tear as readily as when sheets of silver chloride not coated with metallic silver were rolled, even though these sheets were coated with a lubricant. A film of lubricating mineral oil was found not to be necessary when the surface film of metallic silver was present, though lubricating oil may be used if desirable. Eliminating the necessity for this film of lubricating oil from the foil in the as-rolled condition

is highly desirable as the oil film must be removed before the foil can be used for at least some purposes.

While I prefer to roll the cast cake of silver chloride at an elevated temperature, such as about 680° F., other elevated temperatures may be used or the cake may be rolled at room temperature. Further, the film of metallic silver may be developed at any time during the rolling process, though the advantage of the metallic silver film is more pronounced when rolling sheets less than 0.06 inch and is especially pronounced when rolling sheets less than 0.01 inch thick. If desirable, the developer may be applied repeatedly between the rolling steps or to the original body.

These foils are, for example, suitable for use for hermetic sealing of merchandise, and as a backing for mirrors. In thicker gauges, these foils are useful as a decorative inlay or surface, especially as it takes a high polish with buffing. These foils are not limited to such uses and may be used for other purposes.

I claim:

1. The method of producing relatively thin sheets from a relatively thick, solid body of silver chloride comprising the steps of converting a surface layer of silver chloride to a film of metallic silver; and thereafter reducing the thickness of said body to form such a sheet.

2. The method of producing foil from a cast body of silver chloride having a thickness greater than 0.01 inch, said method comprising the steps of heating and rolling the cast body of silver chloride at an elevated temperature and reducing its thickness to about 0.01 inch; applying a developer to the surface of the rolled silver chloride body and forming a thin surface film of metallic silver; and thereafter rolling the silver chloride body and reducing its thickness.



3. The method of producing sheets of silver-silver chloride foil from solid bodies of silver chloride comprising the steps of applying a developer to such a body and converting only the surface portion of said body to metallic silver; and thereafter rolling and reducing the thickness of said body.

4. A silver chloride foil comprising an outer film of metallic silver and a solid body portion of silver chloride, the overall thickness of said foil being not more than 0.003 inch.

5. A composite rolled foil comprising two outer films of metallic silver and a solid body portion of silver chloride between said films, said foil being free of lubricating mineral oil in the as-rolled condition and having an overall thickness of less than 0.01 inch.

6. A sheet comprising a solid body portion of silver chloride and a surface film of metallic silver on the body portion.

7. A composite, rolled foil having a thickness of less than 0.01 inch and comprising a solid body portion of silver chloride anl a surface film of converted metallic silver.

EDWIN G. WALTMAN.


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