

No. 676,357.

Patented June 11, 1901.

C. ENDRUWEIT.

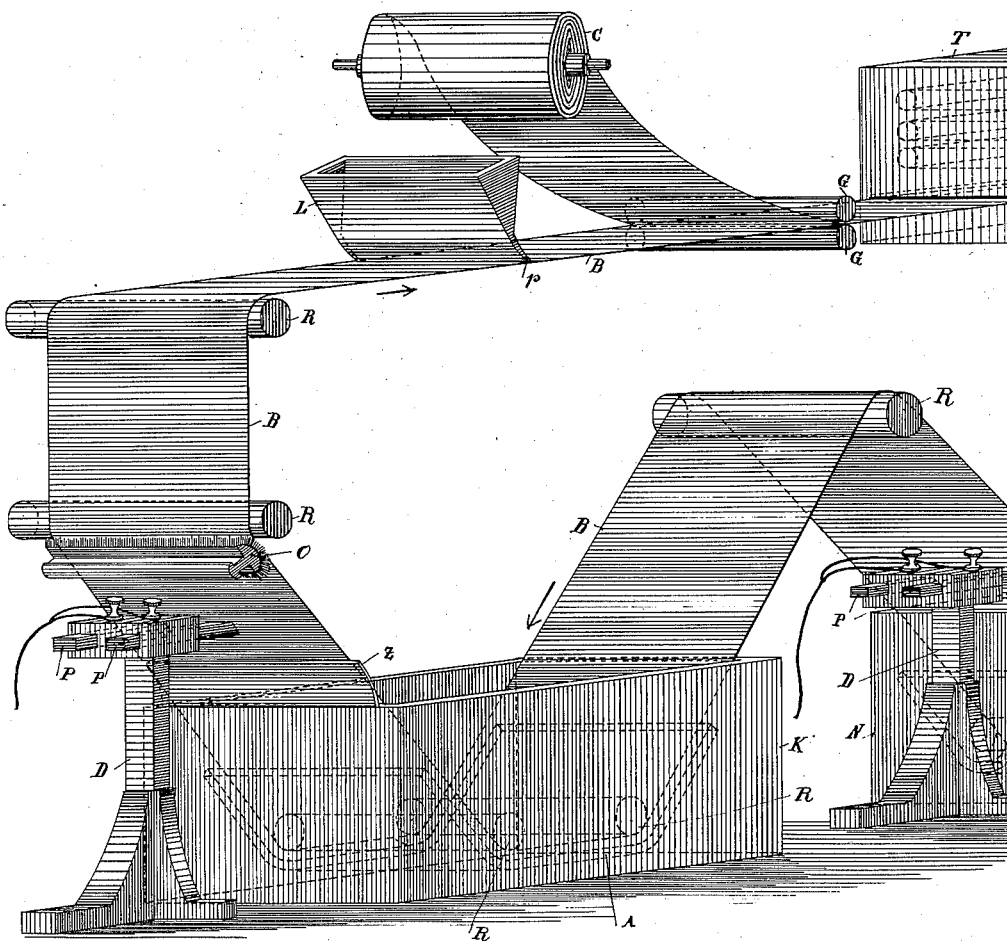
PROCESS OF MAKING METAL PAPER IN ENDLESS STRIPS.

(No Model.)

(Application filed Dec. 31, 1897.)

2 Sheets—Sheet 1.

Fig. 1.



Witnesses  
S. Brashers  
M. C. Lyddane

Inventor  
C. Endruweit  
per J. Littmar,  
Attorney

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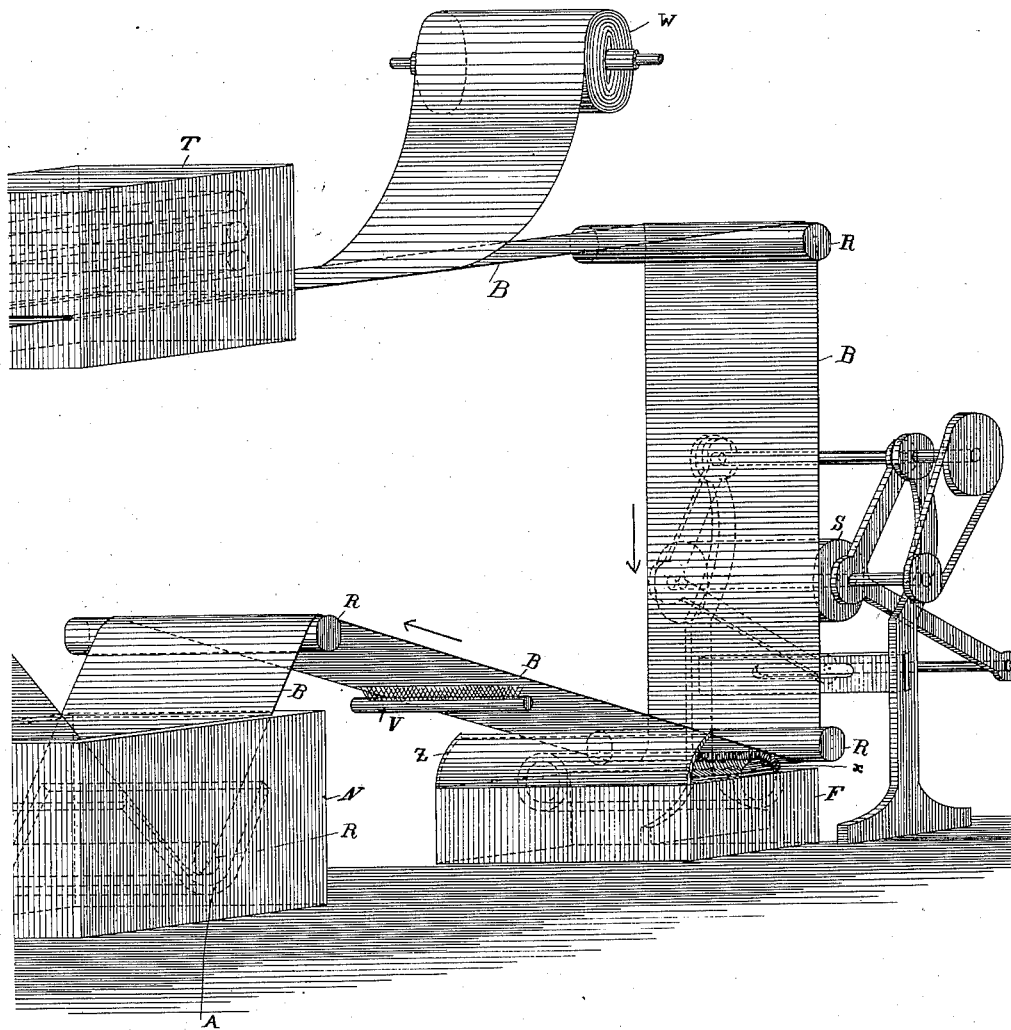
PROCESS OF MAKING METAL PAPER IN ENDLESS STRIPS.

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(No Model.)

2 Sheets—Sheet 2.

Fig. 2.



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# UNITED STATES PATENT OFFICE.

CARL ENDRUWEIT, OF BERLIN, GERMANY.

## PROCESS OF MAKING METAL PAPER IN ENDLESS STRIPS.

SPECIFICATION forming part of Letters Patent No. 676,357, dated June 11, 1901.

Application filed December 31, 1897. Serial No. 665,260. (No model.)

*To all whom it may concern:*

Be it known that I, CARL ENDRUWEIT, a subject of the Emperor of Germany, residing at Berlin, Germany, have invented certain new and useful Improvements in Galvanic Processes for Making Metal Paper in Endless Strips; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a process for producing metallic deposits upon paper. This "metal paper," as it is called, has heretofore been made only in single sheets of certain sizes—as, for instance, described in United States Patent No. 510,013—and consequently its production has been small and its use confined to certain limits.

The object of the present invention is to provide a method and means for producing metal paper in endless rolls or strips of any desired dimensions or designs.

In order to carry my invention into practice, I employ a simple apparatus, which is illustrated in its preferred form in the accompanying drawings, wherein—

Figure 1 is a perspective view of one end of the apparatus, showing the component parts thereof; and Fig. 1<sup>a</sup> is a similar view of the opposite end.

The ordinary plates used heretofore in the production of metal paper are here dispensed with, an endless metal band B being substituted therefor, which is guided over a number of insulated rolls R, suitably arranged in a frame. The width of said metal band corresponds to the width of the metal paper to be produced. The outer surface of said metal band B may be smooth or may contain any suitable and appropriate design to be transferred upon the paper, or it may be provided with a high polish and may be burnished or lightly engraved or impressed to present designs of all kinds. A continuous revolving motion is imparted to the rolls R from any suitable source, whereby the metal band B is moved in the direction indicated by the arrow. This motion may be accelerated at will by increasing the speed of the guide-rollers R more or less, according to the metallic deposits intended for the paper. During the travel of the

metal band B it passes at first in front of a suitable polishing or grinding device S, which removes any unevenness or stains. Then the band passes around the guide-roller R and over tank F, containing a solution of double sulfid of alkali—for instance, five parts of alkali-metal trisulfid and one hundred parts of water. In said tank a brush-cylinder X, lined with tufts of long and soft hair, is so arranged that it is immersed as it rotates in the liquid and moistens the under side of the metal band B with the solution continually. The object of moistening the band with this solution is to obtain a sulfid layer upon the polished band not perceptible to the eye, said layer acting as a conducting medium. The band next passes over a wiper Z, of rubber or other suitable material, which removes any excess of moisture. The band is then carefully rinsed by passing over a suitable rinsing device V, the wiper serving as a guard to prevent the water from running into the tank F. Thereupon the band in passing over suitably-arranged rollers R is immersed in a nickel-bath N, where the band receives a very thin layer of nickel. The band is next immersed in a copper-bath K. As the vat containing the copper-bath is longer than that of the nickel-bath mentioned, the copper layer deposited is relatively thicker than the nickel layer. This copper layer serves as a reinforcement for the thin nickel layer. The anode-plates A in these baths are shaped corresponding to the manner in which the band is guided and are directly connected with a battery or other source of current. When the metal band is past the last of the baths, it is thoroughly scraped or cleaned by means of a brush O. Here also is seen a second wiper Z, which leads back any excess of liquid into the tank K. It also prevents the water used in the washing from entering said tank. After its second washing the band passes beneath a glue-boiler L, which is heated by steam in any suitable manner, and is provided with any suitable means, as brush P, for applying the agglutinant. I preferably add to the latter a solution of hydrosulfid of ammonia, mercaptan, or allyl sulfid. This is valuable, as either of these solutions has a peculiar affinity for metal and causes the metal deposit to rigidly adhere to the paper. The agglutinant

employed is usually animal glue, and this alone is hardly adequate for forming a permanent adhesive for the metal deposit and paper. The paper is then fed from web C between two rubber pressing-rolls G, together with the band B, and adheres to the latter. The band here passes through a drier T, where the pasting material is dried. On issuing therefrom the paper detaches itself from the band and is wound upon roll W.

Having now fully described my said invention, what I claim by Letters Patent is—

1. An improved method of making metal paper by electrodepositing a film of metal upon a continuously-moving metal surface or endless metal belt, which consists in first treating said belt with a solution of alkali-metal trisulfid and water, then exposing it to the action of an electric current in a galvanic metal-depositing bath, applying an agglutinant to the electrodeposited metal and transferring said electrodeposited metal upon a paper web by winding said paper upon the belt and then stripping metal and paper from the belt, substantially as described.

2. An improved method of making metal paper by electrodepositing a film of metal upon a continuously-moving metal surface or endless metal belt, which consists in first polishing the surface of the belt and washing the same, then passing it through a solution of alkali-metal trisulfid and water, removing any excess of moisture from the belt, then exposing it to the action of an electric current in a galvanic metal-depositing bath, applying an agglutinant to the electrodeposited metal and transferring said electrodeposited metal upon a paper web by winding said paper upon the deposit under pressure and then stripping paper and deposit therefrom, substantially as described.

3. An improved method of making metal pa-

per by electrodepositing a film of metal upon a continuously-moving metal surface or endless metal belt, which consists in first preparing said belt by polishing and washing the same, then passing it through a solution of alkali-metal trisulfid and water, removing any excess of moisture from the belt, then passing it through an electrolytic bath of nickel, next through a bath of copper and subsequently washing the belt, applying an agglutinant to the electrodeposited metal, transferring said electrodeposited metal upon a paper web by causing the paper to wind itself upon the belt under pressure and thereafter drying the belt and stripping the metal paper therefrom, substantially as described.

4. An improved method of making metal paper by electrodepositing a film of metal upon a continuously-moving metal surface or endless metal belt having ornamental figures or designs engraved thereon, which consists in first preparing said belt by polishing and washing the same, then passing it through a solution of alkali-metal trisulfid and water, removing any excess of moisture from the belt, then passing it through an electrolytic bath of nickel, next through a bath of copper, so timing the treatment as to obtain a relatively thicker layer of copper, washing the belt, applying an agglutinant to the electrodeposited metal, transferring said electrodeposited metal upon a paper web by causing the paper to wind itself upon the belt under pressure and thereafter drying the belt and stripping the metal paper therefrom, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

CARL ENDRUWEIT.

Witnesses:

ALFRED BORN,  
EMIL SCHÜTZE.