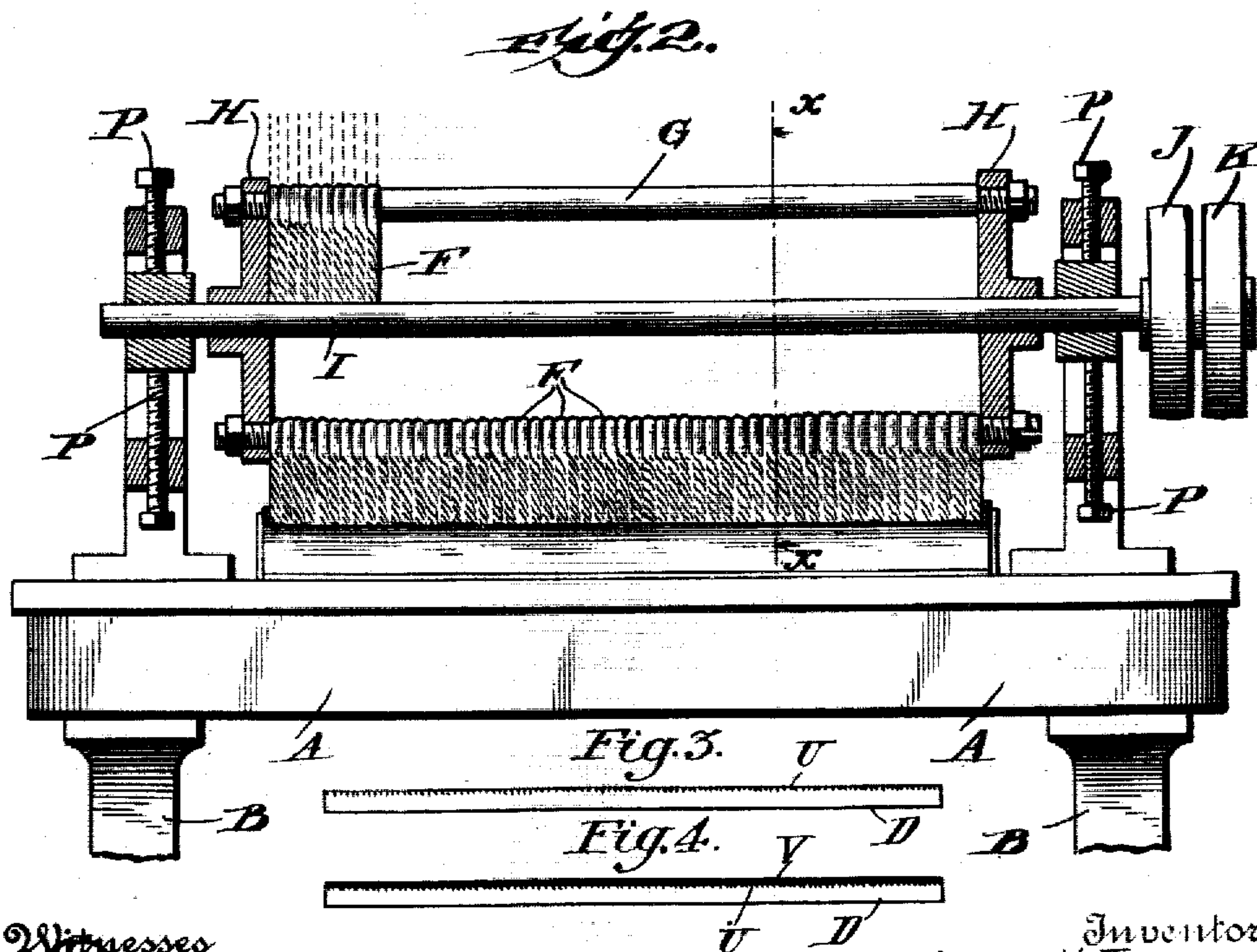
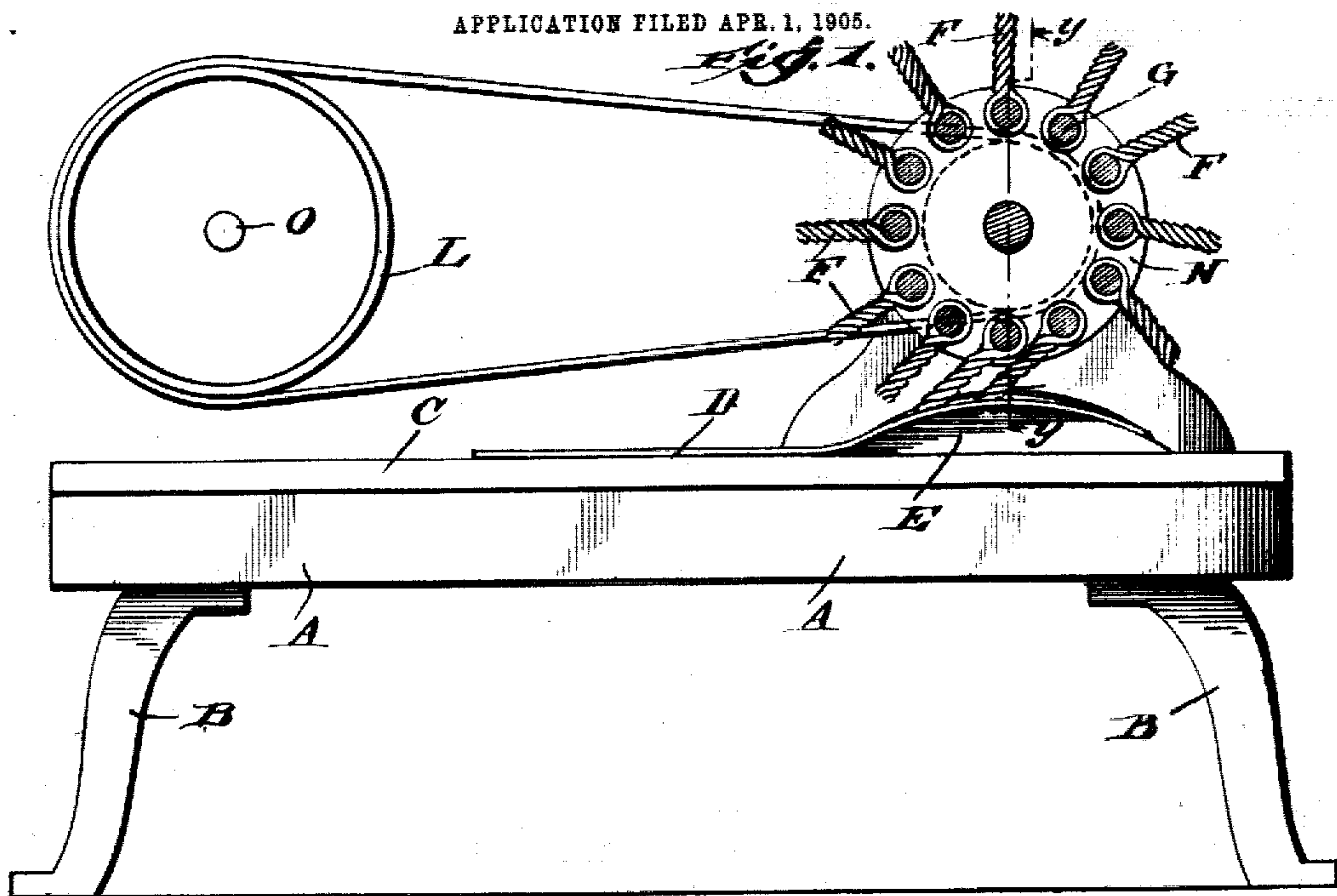


No. 822,873.

PATENTED JUNE 5, 1906.

S. H. THURSTON.  
PROCESS OF COATING ONE METAL WITH ANOTHER AND THE RESULTING  
PRODUCT.

APPLICATION FILED APR. 1, 1905.



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# UNITED STATES PATENT OFFICE.

SAMUEL H. THURSTON, OF NEWARK, NEW JERSEY.

PROCESS OF COATING ONE METAL WITH ANOTHER AND THE RESULTING PRODUCT.

No. 822,873.

Specification of Letters Patent.

Patented June 5, 1906.

Application filed April 1, 1905. Serial No. 253,260.

*To all whom it may concern:*

Be it known that I, SAMUEL H. THURSTON, a citizen of the United States, and a resident of Newark, New Jersey, have invented certain new and useful Improvements in Processes of Coating One Metal with Another and the Resulting Product, of which the following is a specification accompanied by drawings.

10 This invention relates to a process of coating one metal with another and the resulting product; and the objects of the invention are to obtain an electrodeposit or coating which will not peel from the surface of the metal  
15 upon which the coating is made, but which adheres firmly thereto.

The invention consists of the process and product for carrying out the above objects, and suitable apparatus for carrying out the  
20 first steps of the process is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal sectional elevation on the line *x x* of Fig. 2, and Fig. 2 is a transverse sectional elevation on the line *y y*  
25 of Fig. 1. Fig. 3 is an edge view of a plate, illustrating graphically the beaten layer of metal produced in the machine illustrated in Figs. 1 and 2. Fig. 4 is an edge view of the same plate, illustrating graphically the completed  
30 product after the electrodeposited coating has been applied to the beaten coating.

The apparatus illustrated in the drawings is substantially like that disclosed in the patent granted to me November 13, 1900, No.  
35 661,650, and in accordance with the present invention the metal to be coated is first treated in the manner described in said patent.

In accordance with this invention, therefore, the metal to be coated is first given  
40 an amorphous, inherent, adherent, coherent, and permanent coating of the desired metal. In the production of said coating the particles of the coating metal are driven into and  
45 incorporated with the metal being coated by beating them into and beneath the surface thereof by means of the apparatus shown in the drawings.

The first step of this invention consists in  
50 cleaning the metal to be coated, so that substantially nothing remains upon its surface which is not homogeneous with the metal itself. Acids, alkalies, or oxids, grease, and anything which prevents the coating metal  
55 from coming in absolute contact with the molecules of the metal to be united injures

the resulting product. The surface should be free from moisture, and preferably for the most perfect and permanent result the surfaces should be dried by heat. No air can  
60 remain between the particles of the coating and the coated metal, and upon this depends the efficiency of the result. This is especially important when the metal to be coated is an easily-oxidizable one, such as iron, steel, &c. 65

The next step in the process consists in impacting the coating metal into and upon the surfaces to be coated by systematically beating the coating metal against the metal being coated, which is firmly held to receive the  
70 impacting blows of the beaters. Any suitable apparatus may be used for this purpose, that illustrated in the drawings having been satisfactory.

Any suitable apparatus may be provided  
75 for beating the coating metal into and against the metal being coated.

As shown in the drawings, A represents the bed of the machine, B the legs, and C the table on which the plate D to be coated rests.  
80 The table C is to be moved backward and forward either by hand or by the usual reciprocatory table movement, as in planing-machines, in which case the plate is fastened to the table. The table is provided with a  
85 raised portion E, arranged beneath the revolving vibrating beaters F. The vibrating beaters F are formed of wires, as shown in this instance, twisted about the rods G, carried by the disks H, connected to the shaft I,  
90 which in turn is provided with the pulleys J and K, connected to be driven from the driving-pulley L, carried upon the shaft O.

The plate D is placed upon the curved raised portion of the table, and the revolution  
95 of the beating apparatus causes the wire beaters F to strike with force upon the surface of the plate. The degree of force varies as the distance from the surface of the plate is less or greater. This distance is regulated  
100 by turning the adjusting-screws P to raise or lower the bearings for the shaft I.

When the iron or steel plate D is being coated with copper, for instance, the wire  
105 beaters F are of copper in whole or in part. Of course the ends which beat upon the iron plate must be of copper.

In the action of the apparatus described the metallic beaters, or beating-rods, first serve to mechanically clean the surface.  
110 Then the particles from said beating-rods or beaters are hammered, driven, and pro-



jected into and onto the said plate and incorporated with its surface and form a coating of metal on the surface, which is adherent thereto. This coating is practically incorporated with the particles or molecules of the plate, and the adherence is such that the coating cannot be removed from said plate mechanically without removing the particles of the plate also.

10 The next step in this present process is to suitably electrodeposit a coating of the desired metal upon the inherent, adherent, coherent, and permanent coating which has been applied to the surface of the metal by the means described. The treatment of the metal surface and application of the coating by beating one metal into and upon another produces what may be termed an "anchorage" for the electrodeposited coating. The beating in and rubbing on of the metallic coating forms a surface that is receptive to the electrodeposit. In Fig. 3, D represents the plate, and U represents the beaten coating. In Fig. 4 the electrodeposited layer V is shown on top of the beaten coating U. If, for instance, copper is the metal which has been beaten into and upon the surface, it will be found to stick firmly, and an additional copper coating electrodeposited also adheres firmly. In the operation of beating one metal into and upon the other the beating-arms, or beaters, not only beat in the metal, but, as will be seen from the drawings, they drag across the plate and rub the surface, thus depositing more of the metallic coating upon the surface and making the surface more homogeneous. A grain is thus first formed on the surface, and then the particles are united and smoothed down.

40 According to this invention copper may be electrodeposited on copper, nickel may be electrodeposited on copper, nickel may be electrodeposited on nickel, silver may be electrodeposited on gold, and gold may be electrodeposited on silver. Iron may be given a coating of gold or silver, and in any of the processes described the base or plate upon which the coating is deposited may be steel or iron. The sheet-metal base or metal upon which the coating is deposited may also be any other suitable metal—as, for instance, aluminium or nickel. The copper may be beaten into and upon the aluminium or nickel and then nickel or copper may be electrodeposited to form the outer coating. In any of these cases the final coating electrodeposited forms practically a part of the plate itself and cannot be removed therefrom without removing a portion of the body of the plate.

A great many different combinations of metals can be obtained, and I have only referred to a few as examples. Heretofore it has not been possible to coat aluminium upon iron or steel practically or to coat alu-

minium with another metal—as, for instance, to provide a coating of copper or nickel upon aluminium. No satisfactory economical process is known, but according to this invention any one of these desired objects may be carried out.

According to this invention the electrodeposit may be formed upon more of the same metal or different metal and homogeneously united with the anchorage coating. Therefore the outer electrodeposit is incorporated with the surface of the plate treated. If desired, the sheets may be rolled after the first coating has been beaten upon them. This rolling makes a smooth surface, and then the electrodeposit may be made upon said smooth-rolled surface.

All electrodeposits of iron and steel scale or flake off on bending or pressing the coated sheets; but in accordance with this invention the sheet of metal provided with an electrodeposited coating may be twisted, bent, or compressed and shaped in any desired form or manner without cracking or scaling or flaking the outer coating of metal.

After one coat of metal, as copper, has been beaten upon the plate and a coating of metal electro-deposited thereon another coating of a different kind of metal from the last may be beaten upon the electrodeposited coating and a second electrodeposit made upon that, and so on indefinitely, one coat superimposed upon another, always starting with the anchorage coating.

Obviously this invention may be carried out in many different kinds of apparatus, and the steps of the process may be varied without departing from the spirit of the invention.

Without enumerating equivalents, therefore, I claim, and desire to obtain by Letters Patent, the following:

1. The process substantially as herein described of coating one metal with another, which consists in first forcibly beating one metal into and upon the other systematically and continuously until the particles, or molecules, of the coating metal are driven into the metal being coated and incorporated with the particles at and beneath the surface of the same, thereby forming an adherent and coherent permanent coating irremovably united with the metal being coated, and then forming an electrodeposit of metal upon said coating.

2. The process substantially as herein described of coating one metal with another, which consists in first producing an anchorage coating upon the surface of the metal to be coated, by beating and rubbing the plate, and then forming an electrodeposit of metal upon said anchorage coating.

3. The process substantially as herein described, of coating one metal with another, which consists in first forming upon the plate



to be coated, a surface which is receptive to an electrodeposit of metal, and then forming an electrodeposit of the desired metal upon said receptive surface, whereby the  
5 electrodeposited coating is incorporated with the surface of the plate treated.

4. The herein-described product consisting of a sheet, or plate, of one metal whose surface particles are commingled with particles of another coating metal, the coating  
10 metal being driven into the body metal, and the two metals being incorporated together at on and beneath the surface of the body metal, and forming a union the one with the

other, of a permanent nature, the one forming an inherent, adherent, and coherent coating for the other, and said product being provided with an outer electrodeposited coating of metal which is incorporated with the said inherent adherent, and coherent  
20 coating.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

SAMUEL H. THURSTON.

Witnesses:

HELEN L. OBERTEUFFER

A. L. O'BRIEN.