

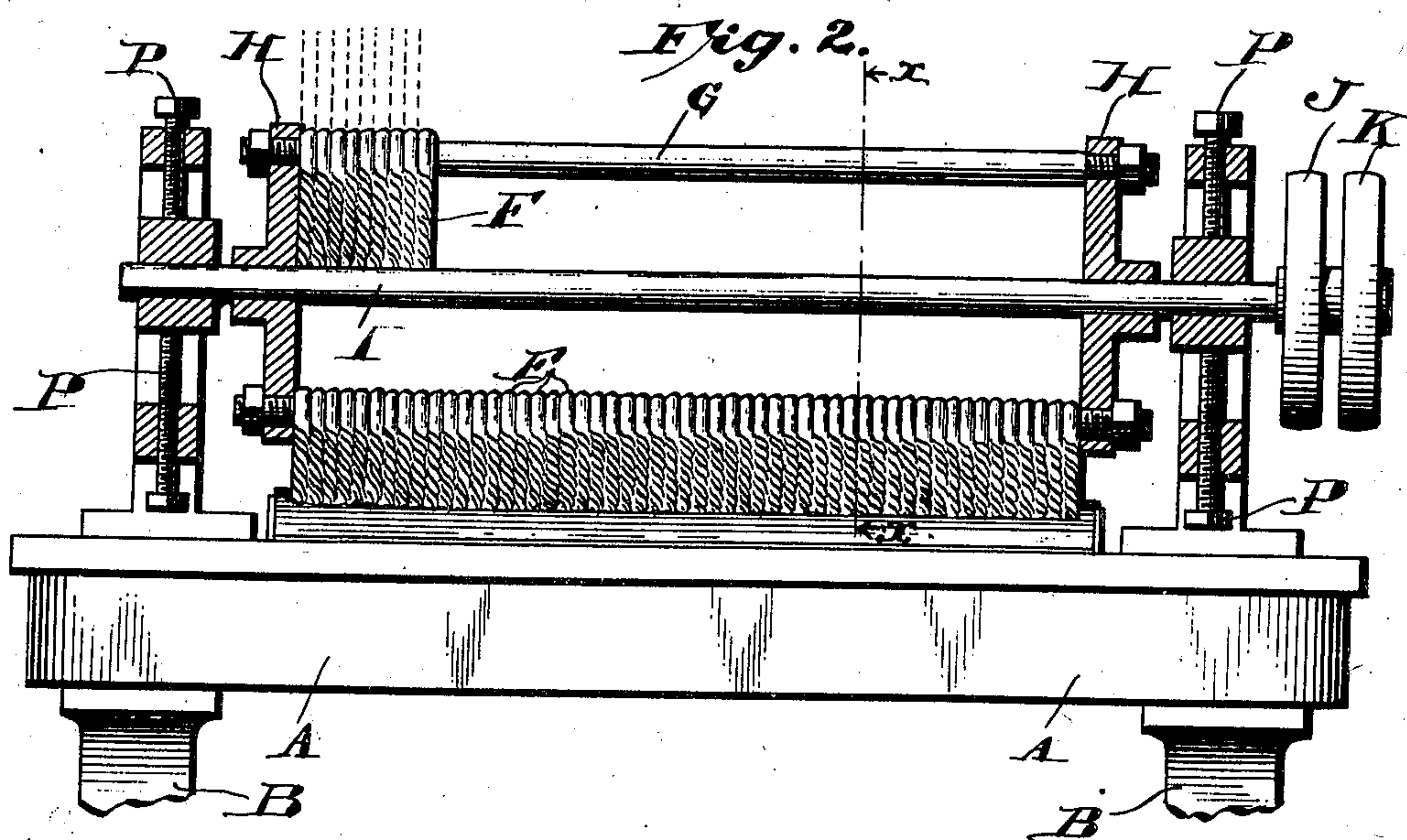
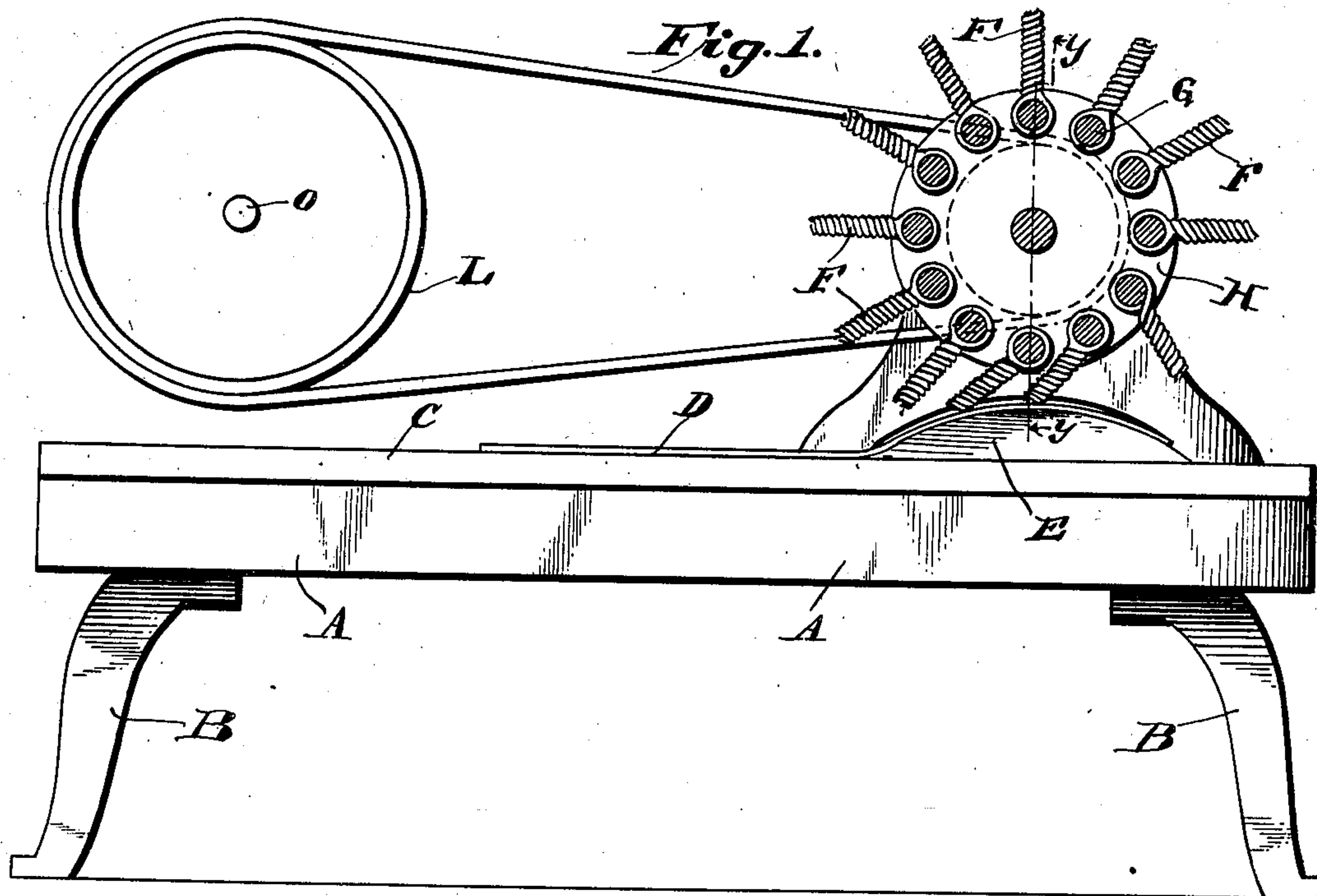
No. 826,628.

PATENTED JULY 24, 1906.

S. H. THURSTON.

PROCESS OF ENAMELING METAL AND THE RESULTING PRODUCT.

APPLICATION FILED MAY 25, 1905.



Attest:

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UNITED STATES PATENT OFFICE.

SAMUEL H. THURSTON, OF LONG BRANCH, NEW JERSEY.

PROCESS OF ENAMELING METAL AND THE RESULTING PRODUCT.

No. 826,628.

Specification of Letters Patent.

Patented July 24, 1906.

Application filed May 25, 1905. Serial No. 262,137.

To all whom it may concern:

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

This invention relates to a process of enameling metal, and the resulting product; and the object of the invention is to obtain an enamel or coating which will not peel from the surface of the metal upon which the coating is enameled, but which adheres firmly thereto.

The invention consists of the process and product for carrying out the above object, and suitable apparatus for carrying out the 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 $y y$ of Fig. 1.

The apparatus illustrated in the drawings is substantially like that disclosed in the patent granted to me November 13, 1900, No. 661,650, and in accordance with the present invention the metal to be enameled is first treated in the manner described in said patent. In accordance with this invention, therefore, the metal to be enameled is first given an inherent, adherent, coherent, and permanent coating of any desired metal. In the production of said coating the particles of the coating metal are driven into and 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 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 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 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. The next step in the process consists in impacting the coating metal into the surfaces to be coated by systematically beating the coating metal against the metal being coated, which is firmly held to receive the impacting blows of the beaters.

Any suitable apparatus may be provided 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. 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 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, 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 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 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 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. Then the particles from said beating-rods or beaters are hammered, driven, and projected 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. The next step in this present process is to place a coating of the desired glaze or enamel of any suitable kind upon the inherent, adherent, coherent, and per-

manent coating which has been applied to the surface of the metal by the means described. One suitable mixture which is suitable for this process is that given in the patent of Niedringhaus of July 3, 1877, reissue No. 7,779. 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 enameled coating. The beating in and rubbing on of the metallic coating forms a surface that is receptive to the enamel. 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 coating of enamel 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.

According to this invention the enamel may be placed on copper, nickel, silver, gold, aluminium, or any desired metal. 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 into and 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 the aluminium or nickel and then enameled to form the outer coating. In any of these cases the final enamel coating forms practically a part of the plate itself.

A great many different combinations of metal and enamel can be obtained, and I have referred only to a few as examples. Heretofore it has not been possible to coat aluminium upon iron or steel practically or to coat aluminium with enamel; but according to this invention any one of these desired objects may be carried out. The outer enamel coating is incorporated with the surface of the plate treated. If desired, the sheets may be rolled after the first coating has been beaten into and upon them. This rolling makes a smoother surface, and then the electrodeposit may be made upon said smooth-rolled surface. If desired, an electrodeposit of any desired metal may first be

made upon the coating which has been beaten into and upon the metal and then the enamel placed upon the electrodeposited coating. The first metal coating forms an anchorage for the electrodeposit, which in turn forms an anchorage for the enamel layer. The two intermediate binding layers of metal may be the same kind or different kinds of metal.

I do not herein claim the process disclosed and claimed in my copending application, Serial No. 253,260, filed April 1, 1905. In said application I have claimed a process and product in which there is an outer electrodeposited 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 enameling metal, 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 a coating of enamel upon said coating.

2. 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 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 upon the other, and said product being provided with an outer coating of enamel which is incorporated with the said inherent, adherent, and coherent coating.

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

SAMUEL H. THURSTON.

Witnesses:

CHARLES D. FULLER,
PENDLETON R. FULLER.