

No. 640,844.

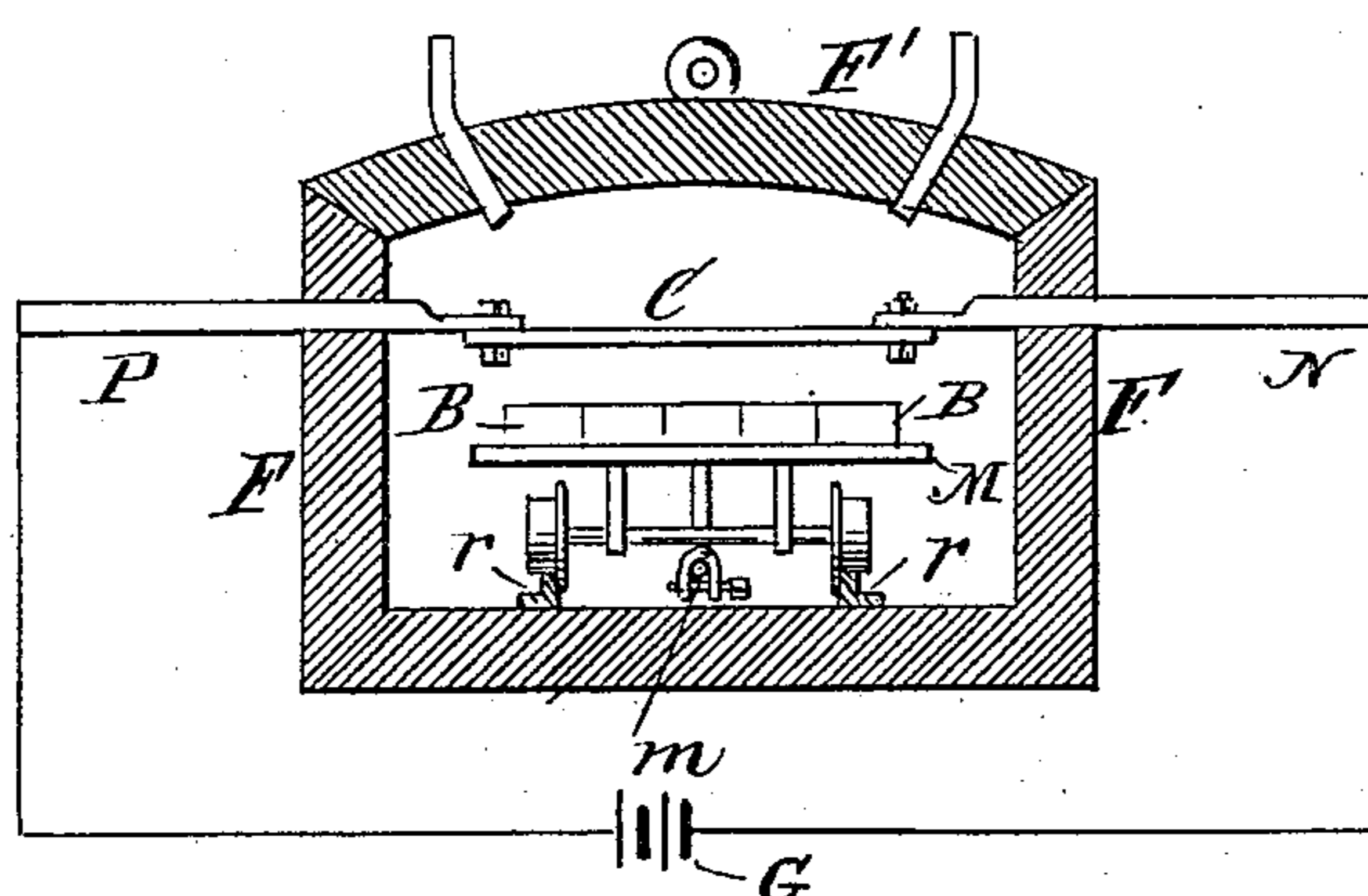
Patented Jan. 9, 1900.

C. H. WATERMAN.  
PROCESS OF ENAMELING.

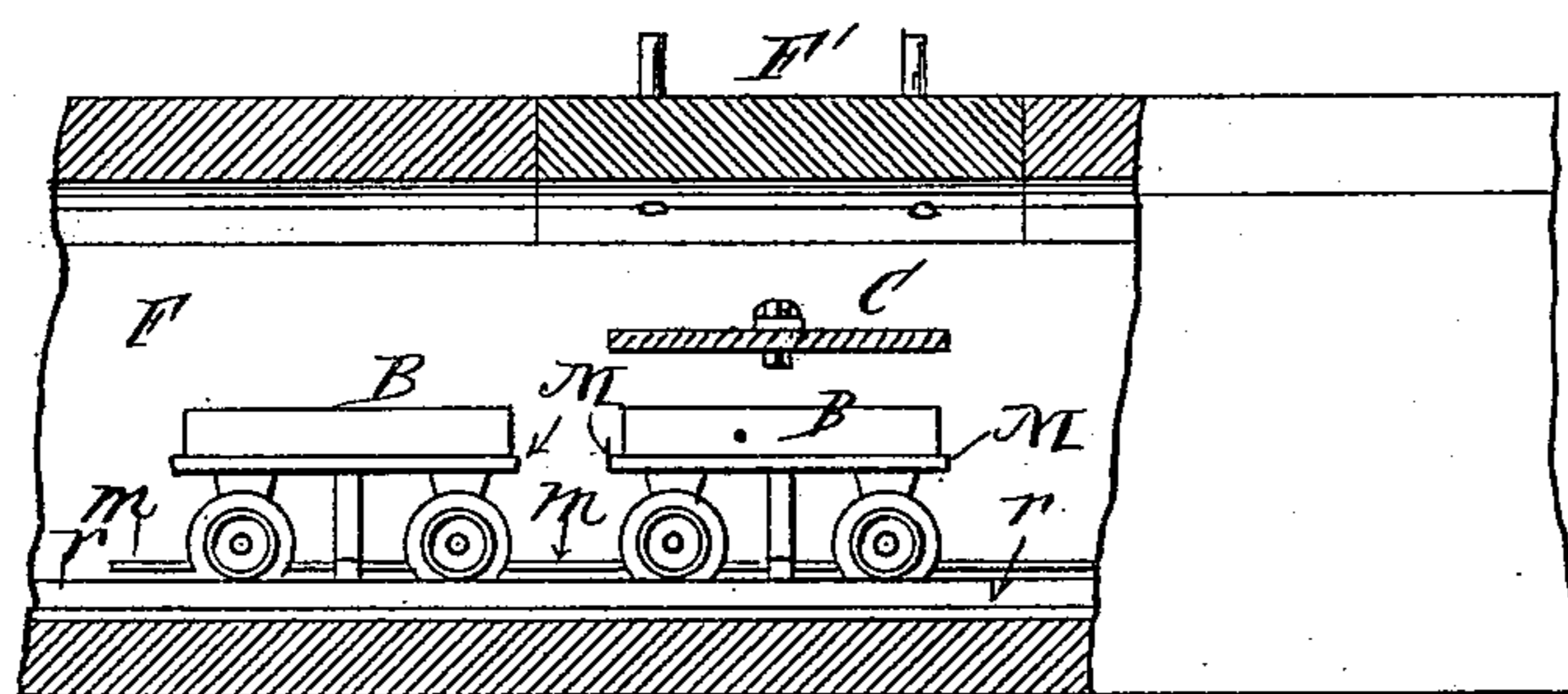
(Application filed June 16, 1899.)

(No Model.)

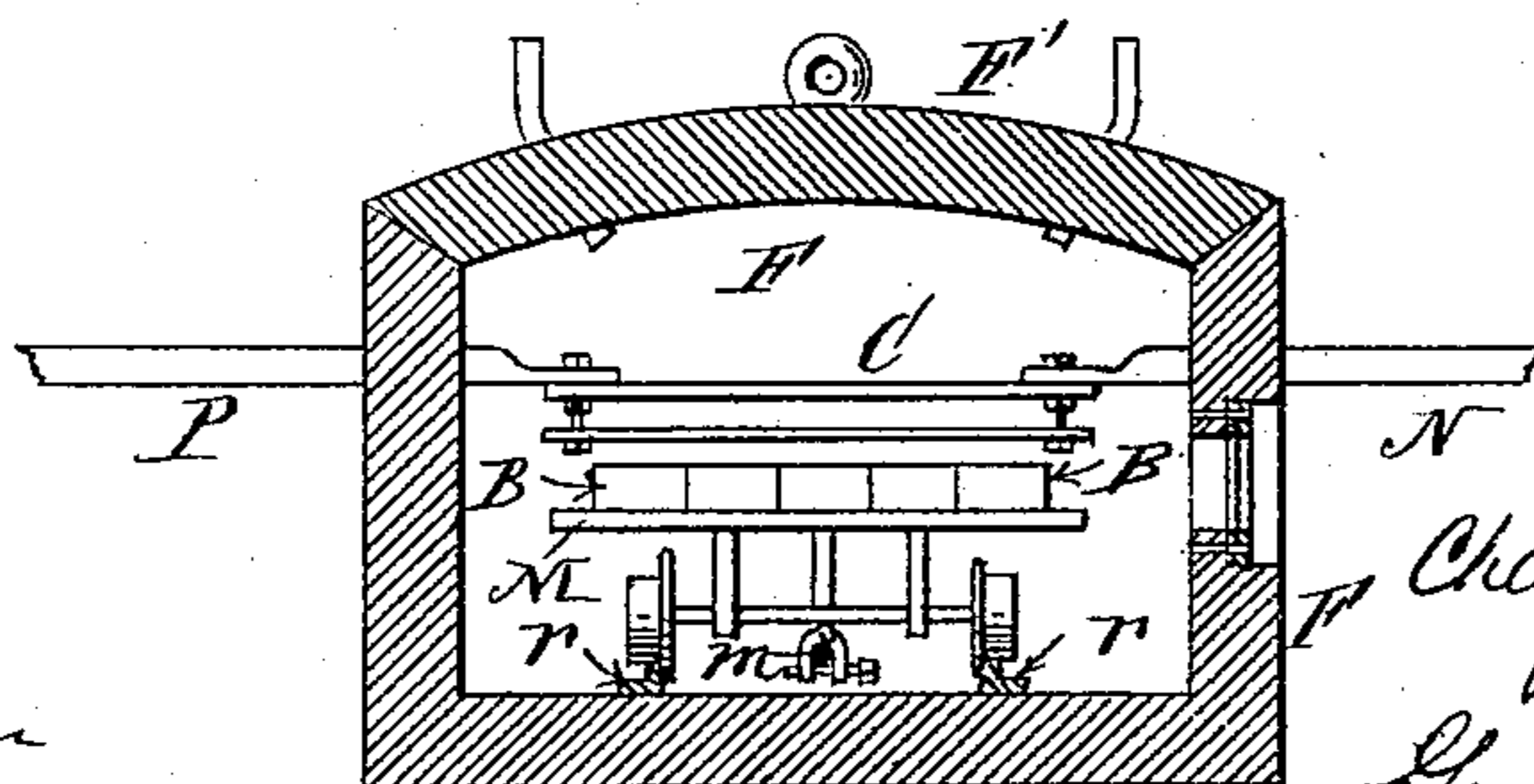
*Fig. 1.*



*Fig. 2.*



*Fig. 3.*



Witnesses:

R. W. Gardner  
F. L. Freeman

Inventor:  
Charles H. Waterman  
By his Attorney  
George William Math

# UNITED STATES PATENT OFFICE.

CHARLES H. WATERMAN, OF POMPTON PLAINS, NEW JERSEY.

## PROCESS OF ENAMELING.

SPECIFICATION forming part of Letters Patent No. 640,844, dated January 9, 1900.

Application filed June 16, 1899. Serial No. 720,815. (No specimens.)

*To all whom it may concern:*

Be it known that I, CHARLES H. WATERMAN, a citizen of the United States, and a resident of Pompton Plains, in Morris county, and State of New Jersey, have invented certain new and useful Improvements in Processes of Enameling, of which the following is a specification sufficient to enable others skilled in the art to which the invention appertains to make and use the same.

My invention relates to the art of enameling the surfaces of materials which are, relatively speaking, non-conductors of heat and electricity, such as those containing silicate of aluminium, as distinguished from articles composed of metal or other material of comparatively high conductivity.

My process is especially adapted to the enameling of the faces of bricks, tiles, and other articles of clay.

The main object of my invention is to effect the fusion of the enameling material onto the surface to which it is applied while the body of the article is relatively cool, so as to avoid the "crazing" of the enamel that would otherwise result from the difference in contractibility between the enamel and the body of the article and incidentally to avoid the loss from distortion or fracture heretofore involved in the enameling process by reason of the refiring or reheating of the body of the article to the temperature required to fuse the enamel, as well as the deleterious effects upon the enamel of the presence of products of combustion, such as discoloration, impaired surface, &c.

My invention consists, essentially, in "flashing" or quickly fusing the enameling material onto the surface of an article of clay or other material of comparatively low conductivity, both as regards heat and electricity, by exposing the said surface, with the enameling material applied thereto, in proximity to but without contact with an electric converter heated by an electric current to a sufficiently high temperature to flash the enamel, the heat being applied directly only to the enameling material in a plane parallel thereto in such manner as to penetrate through said enameling material before reaching the surface to which it is to be fused, whereby I am enabled to "flash" or effect the

fusion and union of the enamel over the entire underlying surface while the body of the article is comparatively cool, and then effect the removal of the article before the mass of material of which it is composed becomes unduly, unnecessarily, or dangerously heated, and while practically and relatively cold. As a result, the integrity of the object, both in form and structure, is retained unimpaired, and the enamel after it has set is not distorted, cracked, or crazed by the subsequent shrinkage of the article, neither is it contaminated by the presence of products of combustion. By the use of electricity as a heat medium I am enabled to quickly attain a comparative high degree of uniform heat in the converter over a sufficient surface, which is under perfect control, the heat being transmitted directly to the enamel and the underlying surface without exposing the other surfaces of the article to direct radiation or to the action of products of combustion.

It will thus be seen that I evade harmful effects heretofore resulting from the difference in contractibility between the enamel and the mass of material to the surface of which it is applied, and this is the distinguishing feature of my invention.

In the accompanying drawings, Figure 1 is a transverse section of an electrical furnace adapted to the enameling of tiles, bricks, and like articles. Fig. 2 is a longitudinal section of the same. Fig. 3 is a view similar to Fig. 1, showing a non-oxidizable shield interposed between the converter and the articles under treatment.

In the drawings, which are mainly symbolic, I show the converter C as consisting of a plate—say of carbon or any suitable material affording the required degree of electrical resistance—interposed between and connected to the terminals P and N of an electric circuit connected with a suitable source of electricity G.

The furnace F is preferably extended in either direction considerably beyond the position of the converter C, where the actual fusion of the enameling material takes place. The articles B to be enameled are presented successively to the action of the converter C by any appropriate mechanical expedient, as by means of movable platforms M. Thus the

platforms may consist of a series of cars or trucks run upon the longitudinal rails  $r\ r$ , the trucks being coupled together or to a cable  $m$ , or an endless belt or chain platform of refractory non-combustible material may be substituted, if desired. The top of the furnace  $F$  is preferably made with one or more movable sections  $F'$  for convenience of access, and the furnace or walls of refractory material preferably extend beyond the converter  $C$  a sufficient distance to effect the gradual cooling or annealing of the articles treated before being removed.

The enameling material is applied to the surfaces to be enameled prior to the introduction of the articles into the electrical furnace in any suitable or well-known manner, and the articles are presented to the converter  $C$  either continuously or intermittently, as may be desired. Practically, even when the feed is intermittent, the fusion of the enameling material is accomplished so rapidly by the converter  $C$  that the process may be designated as "continuous," a few seconds of exposure to the heat generated in the converter  $C$  being sufficient to accomplish the result desired.

My process is not only practically instantaneous, but it may be carried on continuously for any desired length of time. Furthermore, especially when applied to the enameling of

bricks, tiles and the ceramics generally, my process avoids the delay heretofore involved in "firing" or heating the articles bodily, the discoloration resulting to the enameling material from contact with products of combustion, loss by breakage from lack of control or uniformity of temperature, and the crazing of the enamel.

In my concurrent application for patent, Serial No. 714,379, filed April 25, 1899, I describe and claim means essential in carrying out practically my improvements in the art of enameling. In the present case I confine myself exclusively to the method involved.

What I claim as my invention, and desire to secure by Letters Patent, is—

The process herein set forth of flashing enamel onto surfaces of a refractory material, which consists in applying the enameling material to the desired surface and subjecting such surface to the action of uniform electric heat delivered at once on and over the entire coated surface in a plane parallel thereto, whereby all the enameling material is instantaneously and simultaneously fused over the whole surface to which it is applied while the body of the article is left relatively cool.

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Witnesses:

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