

# UNITED STATES PATENT OFFICE.

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## METHOD OF PRODUCING THIN ENAMELED DIALS.

994,162.

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No Drawing.

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*To all whom it may concern:*

Be it known that I, EDGAR L. HULL, of Waltham, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Methods of Producing Thin Enameled Dials, of which the following is a specification.

The present invention relates to the art of watch-making and consists in a step by which a thinner watch may be produced.

Developments in the watch-making art have tended, in one direction, toward the production of watches of decreasing thickness with substantially the same diameter, the object being to produce a watch which will be large enough to be accurate as a time keeper and to be easily read, without taking much room in the wearer's pocket. One step in this direction has been to make the dial of metal and secure it flat against the top plate of the watch movement, thereby at one stroke materially diminishing the thickness of the entire watch. There are many respects, however, in which an enameled dial is more desirable than a plain metal dial, but up to the present time it has not been possible to produce a thin enameled dial or to mount such a dial very close to the frame plate of the watch movement.

The purpose of my invention is to provide a watch dial which is enameled on its face and at the same time is approximately as thin as a metal dial and may be secured to the watch movement plate as closely as a metal dial.

The reason for the impossibility which has hitherto existed of securing enameled dials closely to the watch plates is that the enamel with which the back of the plate has been coated is uneven, presenting lumps where an excess of the enamel in its fluid form has gathered, and forming fillets by capillary action around the bases of the pins by which such dials are secured to the movements.

My invention resides in a method of making the dials flat on their back faces and free from such lumps and fillets.

In order to understand my invention it should be known in the first place that enameled dials are made in the first place from thin metal carrying a coating of enamel which is applied in the usual manner in a finely divided condition mixed with a fluid binder or vehicle and afterward fused

by the action of heat. The dials must be enameled on both sides prior to firing, because if coated on only one side, they warp and the enamel is liable to crack in cooling, owing to the unequal coefficient of expansion of the metal and enamel. Hence, before being fired, the metal plate, which forms the foundation of the dial, is first enameled on its under side or back with a layer of the enamel and then on its face with another layer. The back of the dial plate is first coated and the plate is then held horizontal while the face coating is applied. The dial is also held in this position while being fired in order that the face coating may be of even thickness and have a smooth surface. The same position of the dial which insures the even thickness of the face coating, however, causes the coating on the back to be uneven because, owing to its fluid condition, any excess is liable to gather in incipient drops. Also capillary action causes the fluid enamel to rise around the pins by which the dial is attached to the movement plate and to prevent entrance of such pins sufficiently far into the holes made for their reception in the movement plate.

Attempts have been made prior to my invention to produce thin watch dials enameled on their faces, and at the same time capable of being placed closely against the watch plates by applying the enamel in the first instance only to their faces. Such attempts have always been unsuccessful for the reasons heretofore noted, that the dials are liable to warp and the enamel to crack. According to my invention I secure the results so long sought by first coating the dials with enamel in the usual manner on both faces and then after the same has been fused by firing, removing the coat of enamel from the back, leaving the face intact. The removal of the rear coating is effected by dipping the dial into hydrofluoric acid and keeping it immersed therein long enough to effect the desired purpose, the enamel coating of the face being preserved by a covering of wax or other material having equivalent properties as to resisting the action of the acid. Wax is named in this connection as being the material preferably employed, because of the ease with which it may be applied and removed. It is to be understood that in this term I include all substances of a waxy or greasy na-



ture, but I wish it to be also understood that I do not limit myself to such substances. Neither do I limit my invention to the acid treatment for removing the coating of enamel from the back, since other modes of removing this coating may be employed, within the spirit of the invention.

After treatment as hereinbefore described, the dial has the even smooth face coating of enamel and a metal backing from which the attaching pins project free from the obstructing enamel. The dial is perfectly flat, having been preserved in this condition by the back coating while being fired, and in the subsequent cooling, and the face coating is free from cracks. The back of the metal plate is also smooth and the angles between the same and the pins are sharp and free of enamel obstructions, so that the dial may rest flat against the watch plate when the pins are in the sockets.

I claim,—

1. The method of producing thin enameled watch dials which consists in providing both surfaces of a metal plate with coatings of enamel, fusing or firing the coated plate and removing the coating on the back of the plate.

2. The method of producing thin flat watch dials enameled on one side only, which consists in applying a coat of enamel of uniform thickness to the face of a metal

plate which forms the body of the dial, preserving the plate and enamel coating in a flat condition and free from cracks during the steps of firing and cooling, by the application of a coating of enamel to the back of the plate and removing the enamel from the back of the plate.

3. The method of producing flat watch dials enameled on one side only, which consists in applying enamel to both sides of a metal plate, fusing the enamel, and removing the coating on the back of the plate by the action of hydrofluoric acid.

4. The method of producing a watch dial having an enameled face and being smooth and flat on its back, which consists in applying a protecting enamel coat to the back of a metal dial plate, upon the face of which a dial coating has been applied, to protect the plate from warping and cracking the face when being fired and cooled, covering the face of the dial with a substance unaffected by hydrofluoric acid, leaving the back unprotected, and immersing the dial in hydrofluoric acid whereby the coating on the back is removed.

In testimony whereof I have affixed my signature, in presence of two witnesses.

EDGAR L. HULL.

Witnesses:

OLOF OHLSON,  
OSCAR H. BUTLER.