UNITED STATES PATENT OFFICE.

FRANÇOIS SCHMALZ AND JOHN C. FIRMBACH, OF BROOKLYN, NEW YORK, ASSIGNORS TO THE AMERICAN WALTHAM WATCH COMPANY, OF WALTHAM, MASSACHUSETTS.

METHOD OF APPLYING DESIGNS TO WATCH-DIALS.

SPECIFICATION forming part of Letters Patent No. 424,228, dated March 25, 1890.

Application filed February 20, 1886. Serial No. 192,724. (No model.)

To all whom it may concern:

Be it known that we, FRANÇOIS SCHMALZ and JOHN C. FIRMBACH, of Brooklyn, county of Kings and State of New York, have invented certain new and useful Improvements in the Method of Applying Designs, &c., to Watch-Dials, of which the following is a specification.

This invention consists in the improved method, hereinafter described, of applying figures, letters, and lines to watch or clock dials or other surfaces of like nature.

In carrying out our invention we make an ordinary photographic negative from a drawing or print of the characters and lines to be applied to dials, such characters being, for example, the ordinals indicating the hours, the annular lines and spacing-marks as usually made on watch-dials, and, if desired, the maker's name, &c. The dial to be marked is coated on its outer surface with a compound composed of bichromate of ammonia, bichromate of potash, albumen, and water, to which are added a few drops of any suitable blue coloring-matter, such as laundry-bluing. The coating thus applied is sensitive to and capable of being hardened by exposure to light, so that it must be kept from the light while it is being dried on the dial. We then press the coated side of the dial closely against the negative and expose the coating to light, either solar or artificial, passing through the negative. Those portions of the coating which are not protected by the opaque portions of the negative are at once hardened and rendered practically insoluble by the light, the protected portions remaining soft and soluble. After a suitable exposure, the length of which is determined by the character of the light, the dial is removed, and its coated surface is covered with ink or coloring-matter containing powdered enamel. We then wash the dial with water until the soft and soluble portions of the coating and the ink thereon are removed, the hardened portions of the coating and the ink or coloring-matter adhering thereto remaining on the dial and constituting a positive or fac-simile in color of the transparent portions of the negative. The dial is then fired, if enamel-ink has been used, and the process is completed.

When the dial is not to be fired, ordinary printers' ink may be used, in which case we prefer to protect the lines and characters left on the dial by dusting powdered resin, or asphaltum, or dragon's blood over them, and then heating the dial to melt the powdered material and incorporate it into the ink.

Instead of using the original glass negative, we may remove the film of the negative from the glass on which it was originally formed and deposit it on a thin coating of rubber solution applied to another glass plate, said coating being too thin to obstruct light, and at the same time sufficiently yielding to insure perfect contact between the entire coated side of the dial and the negative and compensate for any slight variation from a plane surface in either the dial or the glass plate.

We prefer to treat several dials at once, using a negative having any desired number of duplicate designs. The negative is placed in a frame, for example, like that used by photographers in making photographic prints, and the dials are pressed against the negative by a platen or follower coated with rubber on the side which bears against the dials. We also prefer to interpose annular pieces or washers of leather, rubber, or other yielding material between the back of each dial and the platen, said washers being thicker than the length of the usual pins projecting from the backs of the dials and provided with holes to receive said pins. These washers communicate the pressure from the platen to the dials around the centers thereof and do not bear against the centers of the dials, thus insuring a close contact of all parts of the coated surface of each dial with the negative by exerting pressure on the marginal portion of the dial, which is in some cases slightly crowning or higher in the center than at the margin.

We claim—

The method of applying designs to watch-case dials and analogous articles, the same consisting in covering the face of the dial with a soluble sensitive coating, which be-

comes insoluble on exposure to light, exposing said dial to light under a negative, then applying a liquid enamel or ink over the whole surface, covering both the exposed and unexposed portions, then washing off the portions of the coating remaining soluble, and, finally, firing the dial to set the remaining portions of the enamel coating, substantially as described.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 13th day of February, 1886.

FRANÇOIS SCHMALZ.
JOHN C. FIRMBACH.

Witnesses:
R. E. ROBBINS,
C. F. BROWN.