

UNITED STATES PATENT OFFICE.

FRANÇOIS SCHMALZ, OF NEW YORK, N. Y., ASSIGNOR TO THE AMERICAN
WALTHAM WATCH COMPANY, OF WALTHAM, MASSACHUSETTS.

METHOD OF APPLYING CHARACTERS AND LINES TO WATCH-DIALS.

SPECIFICATION forming part of Letters Patent No. 416,015, dated November 26, 1889.

Application filed April 2, 1888. Serial No. 269,324. (No model.)

To all whom it may concern:

Be it known that I, FRANÇOIS SCHMALZ, of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in the Method of Applying Characters and Lines to Dials, of which the following is a specification.

This invention has for its object to enable the enamel characters, lines, &c., usually formed on watch-dials to be applied cheaply and quickly; and it consists in the improved process hereinafter described and claimed.

In carrying out my invention the plain enameled surface of a dial is first coated with a sensitized solution composed of bichromate of ammonia, bichromate of potassium, and albumen. This is applied in a liquid form and allowed to dry, forming a coating that is readily soluble until exposed to a strong light and becomes hard and insoluble on exposure to such light. A photographic negative is then made on glass by the usual photographic process from a drawing which is an enlarged fac-simile of the characters and lines to be applied to the dial, the negative being reduced to the size required for the dial. A thin film or coating of rubber solution is poured upon the negative, and when this has sufficiently hardened a film of collodion is poured upon the rubber coating. The aggregate thickness of these two films is such that they will not intercept light to any injurious extent, and they constitute a flexible transparent coating or backing adhering closely to the negative and strengthening it and rendering it so elastic that it can be curved to some extent without breaking to conform to the crowning or convex surfaces of watch-dials when stripped from the glass on which it is made. The glass with the coated negative adhering to it is next immersed in a bath of acetic acid, which acts on the negative in such manner as to loosen it from the glass. The negative coated on one side, as described, is next stripped from the glass and secured by gum-arabic or other suitable transparent cement to a sheet of oiled silk, the latter being stretched and held smooth meanwhile by being clamped in a frame after the manner of a drum-head. The

uncoated side of the negative is the one which is placed in contact with and secured to the oiled silk. The negative is thus protected on both sides, the one side by the oiled silk and on the other side by the rubber-collodion film, the two constituting a tough and transparent pellicle which is of a limp or elastic yielding nature, so that it will sink with the negative into any slight depressions or undulations in the face of the dial and conform closely to whatever shape said face may possess. The opaque portions of the negative are prevented from cracking by the said pellicle. I do not limit myself, however, to the precise manner of protecting the negative film above described. If preferred, the negative may be cemented directly to the oiled silk and left uncovered at its opposite side; or, instead of the oiled silk at one side of the negative and the collodio-rubber film at the other side each side of the negative may be protected by a film of rubber and collodion, the only essential being that it be limp and elastic enough to conform to the irregularities or crowning or convex dial-surface.

The negative protected as described is placed on the sensitized coating on the dial and exposed to a strong light, preferably from an electric-arc lamp, the oiled silk being at the outer side or between the negative and the light. The light hardens the portions of the sensitized coating to which it has access through the transparent portions of the negative, leaving soluble the portions of the coating that are protected by the opaque portions of the negative, the hardened portions being fac-similes in form of the characters, lines, &c., to be applied to the dial.

After a sufficient exposure the negative is removed and the dial is placed on a board, and its coated side is entirely covered with lithographers' or engravers' proof-ink, applied by a suitable inking-roll. The dial is then immersed in a bath of water, which dissolves and washes off the soluble portions of the sensitized coating and the ink thereon, but leaves the ink or a considerable portion thereof adhering to the hardened portions of the coating, the removing of the soluble por-

tion of the coating and the ink thereon being facilitated by wiping the dial gently with a soft cloth while it is in the water. The dial is next thoroughly dried and warmed to soften the ink remaining on the hardened portions of the sensitized coating. While the dial is warm and the ink soft dry powdered enamel or enamel-paint is dusted onto the dial, and adheres only to the inked portions, all of the powder that falls on the uninked portions of the dial being shaken or blown away. The characters and lines of the dial are now covered with the powdered enamel held by the ink, and in case there are any imperfections in said characters and lines they are remedied by the application of enamel-paint by a fine brush. Lastly, the dial is fired to unite the powdered colored enamel with the white enameled face of the dial.

The employment of the tough and elastic yielding pellicle containing the negative is regarded as an important step in this improved process. The faces of watch-dials are generally, if not always, crowning or slightly convex. The negative, to secure good results, must closely fit all parts of the face of the dial. The curvature or degree of convexity of the dial-face is not uniform, so that it is impossible to insure the necessary accuracy of fit by making the negative on a concave glass surface. For these reasons it has been found very difficult to insure the necessary intimacy of contact between the negative and dial. An attempt has been made to overcome the difficulty by attaching the negative to sheets of mica; but this material is so resilient that it will not adapt itself to slight depressions in the dial, but will bridge them over, so to speak, thus forming slight crevices between the negative and sensitized coating, which crevices, though hardly perceptible, are sufficient to cause diffusion of light inside of the negative and thus impair the result.

The limp yielding pellicle made in accordance with this invention conforms closely to

the entire face of the dial whether the same be more or less crowning and sinks into any slight depressions or undulations on said face. This step of the process—viz., the application of a negative protected by a limp and yielding pellicle—is not limited to use conjointly with the succeeding steps above described, but may be used in a process which includes any other order of steps whereby colored enamel may be left on the hardened portions of the sensitized coating and the remaining portions of the face of the dial left clean—as, for example, applying an ink containing powdered enamel immediately after exposure through the negative, then washing to remove the enamel-charged ink from the soluble portions of the coating, leaving said ink on the hardened portions of the coating, and finally firing, as described in the application of Schmalz and Firmbach for a patent for method of applying designs to watch-dials, filed February 20, 1886, Serial No. 192,724.

I claim—

The improved process of applying characters and lines to dials, &c., the same consisting in applying to the dial a sensitized coating, exposing portions of said coating to light through a photographic negative of the characters and lines to be produced, then covering said coating with ink, then subjecting the whole to a bath of water to remove the soluble portions of the coating and the ink thereon, then drying and warming the dial to soften the ink, then while the ink is soft dusting on powdered enamel or enamel-paint, which is retained only by the inked portions of the dial, and finally firing the dial to fuse the powdered enamel, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 14th day of March, 1888.

FRANÇOIS SCHMALZ.

Witnesses:

C. F. BROWN,
A. D. HARRISON.