C. GRIVOLAS.

METHOD OF HARDENING CLOCKWORK PIVOT HOLES.

APPLICATION FILED JAN. 17, 1908.

915,762. Patented Mar. 23, 1909.

FIG. 1.

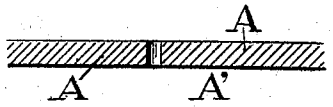


FIG 2

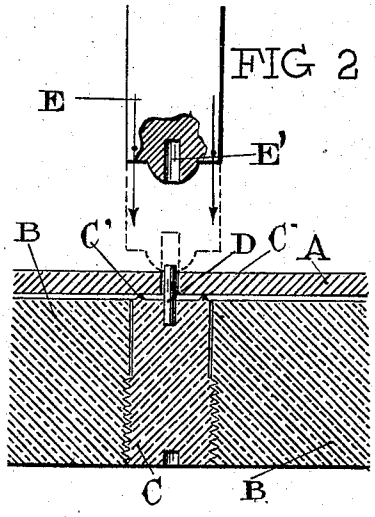


FIG 3

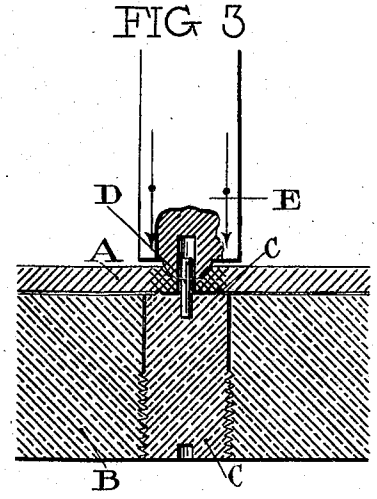


FIG-4

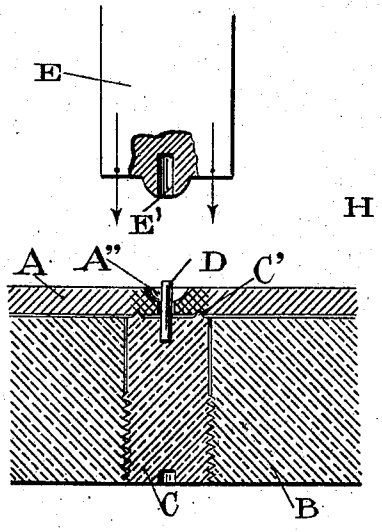


FIG-6

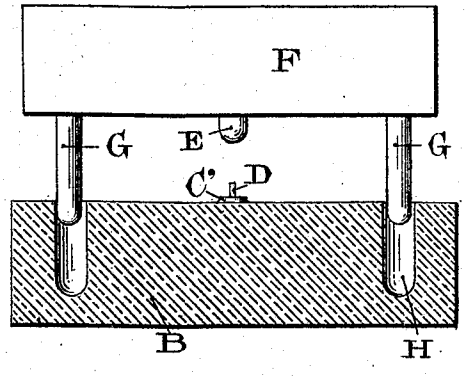
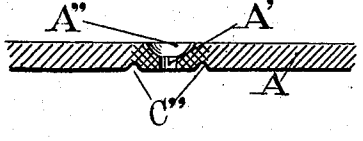


FIG 5



Witnesses

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CLAUDE GRIVOLAS, OF ST. CLOUD, FRANCE.

METHOD OF HARDENING CLOCKWORK PIVOT-HOLES.

No. 915,762. Specification of Letters Patent. Patented March 23, 1909.

Application filed January 17, 1908. Serial No. 411,351.

To all whom it may concern:

Be it known that I, CLAUDE GRIVOLAS, a citizen of the French Republic, residing at St. Cloud, in France, have invented certain new and useful Methods of Hardening Clockwork Pivot-Holes, of which the following is a specification.

The pivot holes in the plates of clockworks, meter movements and the like have hitherto usually been made by drilling the metal plate, usually of brass, which is to support the pivot, and making at one end or orifice of the perforation a hemispherical enlargement for the reception of a small quantity of lubricant. Owing to the small degree of hardness of the metal used the metal is rapidly worn away and the holes become untrue, involving eccentricity of the pivots. It has been proposed to obviate this disadvantage by using hard stones, such as rubies, in the holes, but the high price of these stones when they are of large size prevents the use thereof in pendulum and meter movements and generally speaking in all clock movements of comparatively high power or low cost.

I am aware that it is not broadly novel to compress or densify metal around a hole for various purposes but the present invention provides a method of hardening the plate, at the part where the pivot is to be placed, by compressing the metal in a special way hereinafter fully described and specifically pointed out in the claim so that the molecular condition thereof is modified at the said part.

The manner in which the method is carried into effect is illustrated in the annexed drawing, in which—

Figure 1 is an illustration of the first stage of the process, Figs. 2, 3 and 4 successive stages, Fig. 5 the finished product and Fig. 6 means for guiding the dies employed in the process, these figures being diagrammatic sections.

A is a plate usually of copper, with a pivot-hole A′ produced with the aid of a drill or punch. The plate A is then placed on the bed-plate of a press B with a steel die C having a steel projection D and a small circular ridge C′ which prevents slipping of the plate. The movable die E of the press shaped to produce the cup-like recess A″ in the plate is also of steel and has a hole E′ of the same diameter as the projection D.

The plate A is placed in the press so that the projection D traverses the hole A′, and then the die E is lowered so that it strongly compresses the metal surrounding the hole A′. At the same time the ridge C′ is pressed into the metal and by this means also confines the compression to the part adjacent the hole. The die E is then raised and the plate A removed from the press. Fig. 5 is a section showing the plate after this treatment. The perforation is similar to an ordinary pivot-hole, but the metal between the circumference of the hole and the circular groove C″ is strongly compressed and therefore better adapted to withstand wear.

In order that the movable die may always act perfectly vertically on the plate A, the plate F to which said die is fixed may have four downwardly projecting guide rods G (Fig. 6) adapted to work in holes H provided in the bed-plate B.

If desired a plurality of dies may be provided and so arranged that a plurality of pivot-holes can be simultaneously treated.

The method may be modified in such a way that the compression is performed before the plate is perforated.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

The method of hardening the plates of clockworks and meter movements and the like immediately about the pivot-holes by strongly compressing the metal surrounding the holes and preventing the dispersal of said metal beyond a certain limit, said method consisting in forming a hole in the plate, placing the latter on a die having a projection traversing said hole and a circular rib about said projection, to prevent slipping of the plate and confine the compression and pressing a centrally perforated die on said plate so that the perforation engages the projection, substantially as described.

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

CLAUDE GRIVOLAS.

Witnesses:
DEAN B. MASON,
LEON GRIVOLAS.