No. 677,638. Patented July 2, 1901.

D. H. CHURCH.

BALANCE STAFF FOR WATCHES.

(Application filed Nov. 12, 1898.)

(No Model.)

FIG. 1.

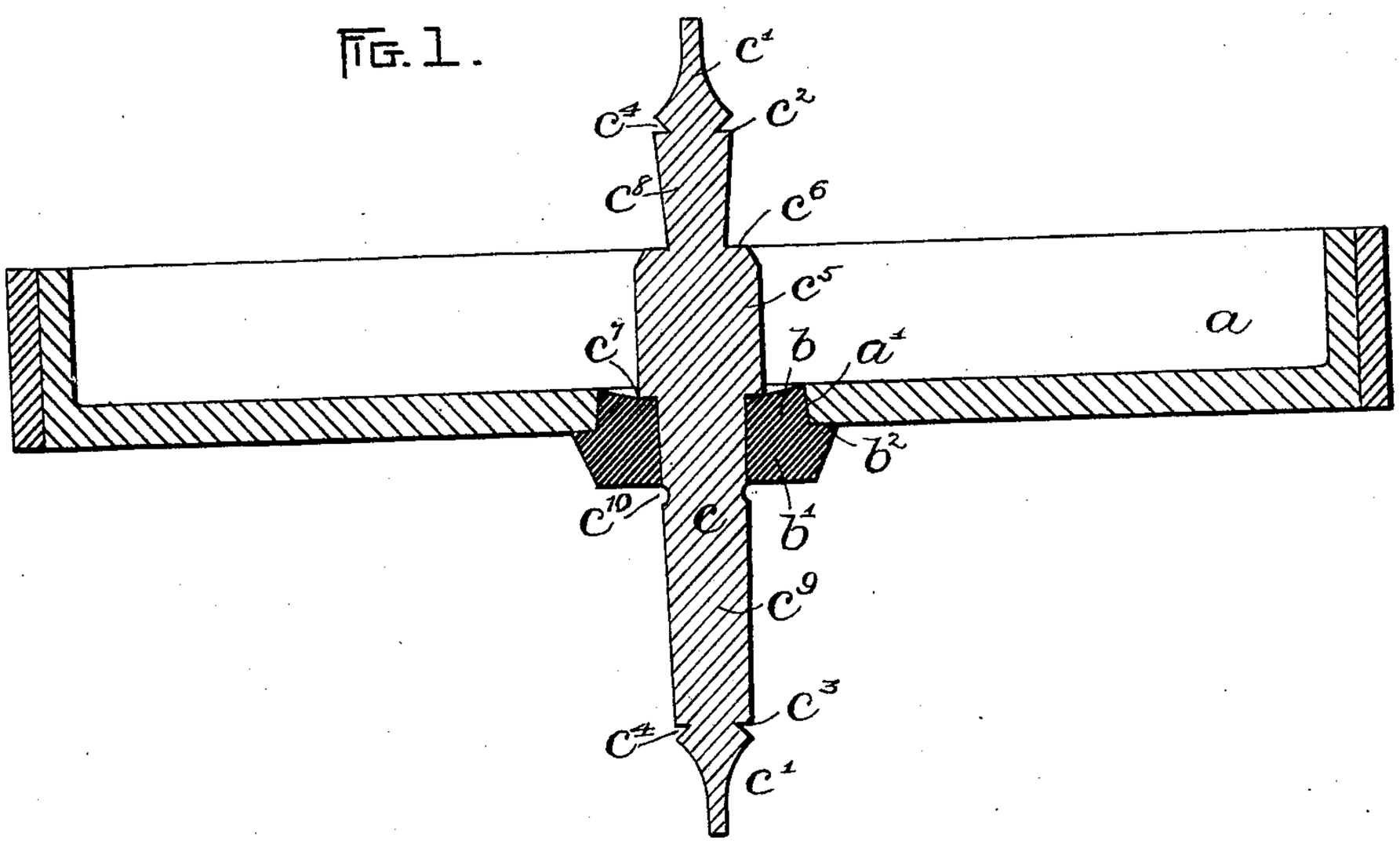
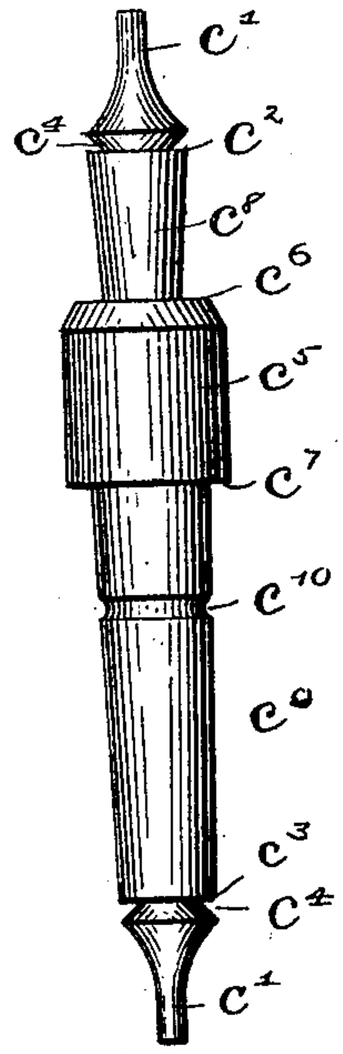


FIG. 2.



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UNITED STATES PATENT OFFICE.

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BALANCE-STAFF FOR WATCHES.

SPECIFICATION forming part of Letters Patent No. 677,638, dated July 2, 1901.

Application filed November 12, 1898. Serial No. 696,194. (No model.)

To all whom it may concern:

Be it known that I, DUANE H. CHURCH, of Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Balance-Staffs for Watches, of which the following is a specification.

In the construction of pocket-watches it is desirable that the pivots of the balance staff or arbor be made as small as possible in diameter in order to reduce the running friction to the least amount which safety will permit. This construction of necessity involves an element of weakness in these pivots, rendering them specially liable to breakage or injury not alone from the accidents of sudden jars while in the pockets of the watch wearers or accidental falls, as well as from the almost inevitable shocks incident to transportation, but also from the ceaseless dangers which accompany them during the progress of the original manufacture. To in some measure minimize these dangers, the balance-staff pivots are usually made with no abrupt shoulders, such as are common to the pivots of the other members of the watch-train, and which shoulders serve in most cases to receive the end thrust of their several arbors.

It is essential that the balance-wheels of watches be firmly fixed on their staffs and that these wheels shall run absolutely true both "in the round" and "in the flat." The ordinary method of attaching the balance-wheel to its staff is to form the staff with a relatively large portion to fit the axial hole of the wheel, the face of which rests against a shoulder of the balance-staff, and that portion of the staff which fits the hole is made a little longer than the thickness of the balance-arms to allow of staking or riveting the two members firmly together. An unfortunate condition consequent upon this method of attaching the balance and its staff is the difficulty of removing a broken staff and replacing it by a new and perfect one, since there is danger that in removing the broken staff, which had been firmly staked to the balance, the hole will become injured or enlarged, so that the new staff will fail to fit, so as to insure the truth of the balance. Balances have been made with a hub projecting on each side, to which hub on one side was attached the collet of the hair-spring and on the other side the roller-table with its jewel-pin to actuate the pallet lever or fork. These hubs had a straight or slightly tapering axial hole, into which fitted a balance-staff made without any shoulders to govern or fix the position of the balance, which position was obtained by driving or forcing the balance-arbor back and forth until the correct position was obtained, which involved numerous trials and examinations. A very serious difficulty involved in the above method lies in the absence of any shoulders to receive the pressure needful to force the staff in either direction, as it is manifest that the extreme delicacy of the pivots precludes the use of any force at those points.

The object of my invention is to secure the very great advantage of being able to separate the balance from the staff and to apply another staff without danger of injury to the balance, at the same time avoiding the necessity of a retruing of the balance. These results I obtain by the form of construction illustrated in the accompanying drawings and now to be described in detail and finally pointed out in the claims hereto appended.

In the said construction, which embodies one form of my invention, the staff is removable from the balance and is formed with an enlargement which provides two abrupt shoulders and portions projecting in both directions therefrom, one of said portions being tapering and both having pivots on their ends. The tapering portion is adapted to fit within a tapering aperture in a hub or collet, with the adjacent shoulder bearing against the face of the latter, the other shoulder serving to receive the tool by which the staff is forced into place.

Upon the drawings similar letters refer to similar parts or features.

Of the drawings, Figure 1 represents in sectional view a balance and its staff. Fig. 2 represents the staff detached.

The balance is indicated at a upon the drawings and is provided with a central tapering aperture which is relatively large in diameter to receive the tapering boss b of the hub or collet b'. The metal of the boss is upset, as at b^2, to secure the collet or hub rigidly in place after it has been adjusted, the

latter having a shoulder b^2 to abut against the balance, whereby it is easily "trued."

Extending through the hub or collet is an aperture b^3, which is tapering from the face of the boss outward, as shown, and through which is passed the staff *c*. This last-mentioned part is turned at its ends to provide conical pivots c' c', which taper gradually from shoulders c^2 c^3, formed by circumferential grooves c^4 c^4. The upper portion of the staff is enlarged, as at c^5, to form two prominent shoulders c^6 c^7, the part c^8 lying between the shoulders c^2 c^6 being tapering, as shown. From the shoulder c^7 the lower portion c^9 of the staff tapers gradually to the shoulder c^3, being grooved at c^{10} a short distance below the shoulder c^7. The tapering portion c^9 is thrust downward through the hub or collet b' (the degree of taper being similar to that of the aperture *b*) until the shoulder c^7 rests squarely against the concave face of the boss *b*, and it is held against accidental removal by its being wedged in place.

In inserting the staff the tool is placed against the shoulder c^6, formed by the enlargement c^5, and pressure is exerted against it to drive it home. The shoulder c^7 is square, whereby it aids the engaging tapering surfaces or walls to insure that the staff shall be accurately placed in the balance. When it is desired to remove a worn-out staff, the pressure is exerted against the lower end thereof, as injury to the lower pivot need not be avoided since the staff is to be discarded.

From the description which I have given of my invention it will be apparent to those skilled in the art that it possesses many features of advantage to which it is unnecessary to refer specifically more than to state that the pivots may be made as small in diameter as desired, since no pressure is exerted thereagainst in inserting the staff in place, the strain being withstood by the enlarged portion c^5, and the tool can be pressed against the shoulder c^6 without danger of injuring the staff when the latter is being forced into place in the hub or collet.

Having thus explained the nature of the invention and described a way of constructing and using the same, although without attempting to set forth all of the forms in which it may be made or all of the modes of its use, I declare that what I claim is—

1. A balance-staff having conical pivots c' c', a tapering portion c^9, and an enlargement c^5 forming two shoulders c^6 c^7, substantially as described.

2. A balance-staff having end pivots, an enlargement c^5 between the pivots forming two abrupt shoulders c^6 c^7, a tapering portion c^9 between the shoulder c^7 and one of the pivots, and a portion c^8 between the shoulder c^6 and the other of the pivots.

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

DUANE H. CHURCH.

Witnesses:
MARCUS B. MAY,
P. W. PEZZETTI.