

(No Model.)

C. V. WOERD.  
MINUTE WHEEL AND PINION.

No. 318,675.

Patented May 26, 1885.

Fig. 2.

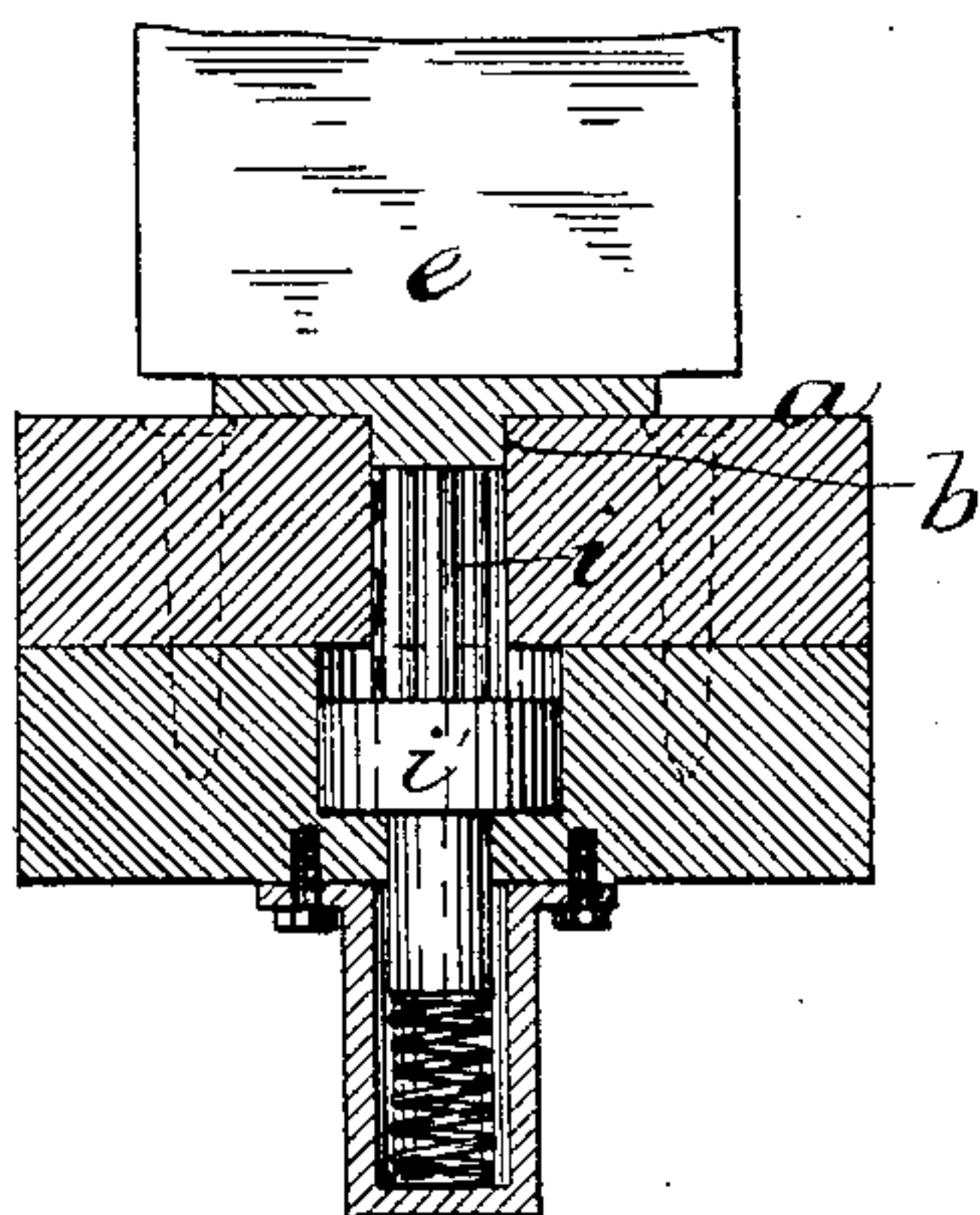


Fig. 1.

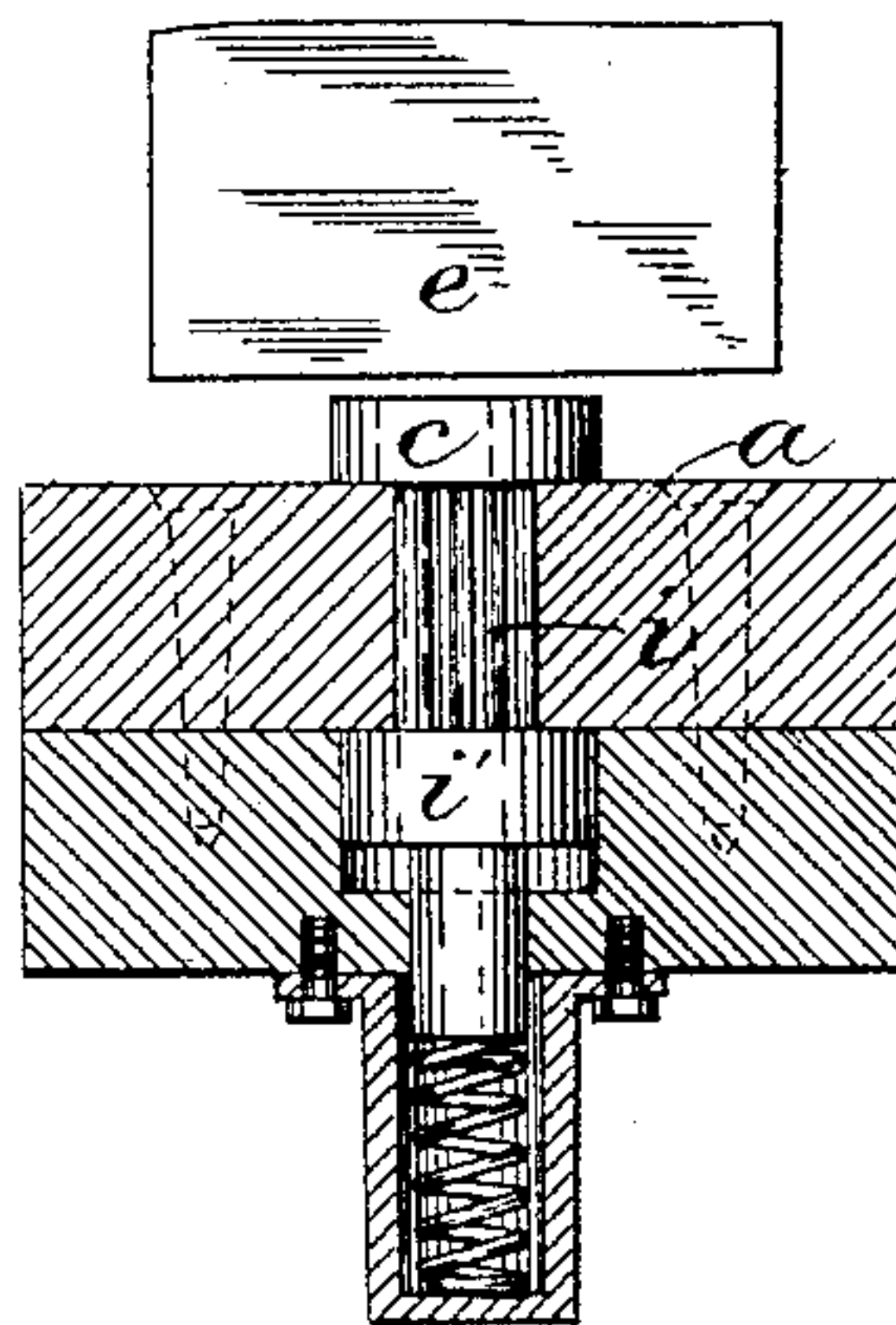


Fig. 3.

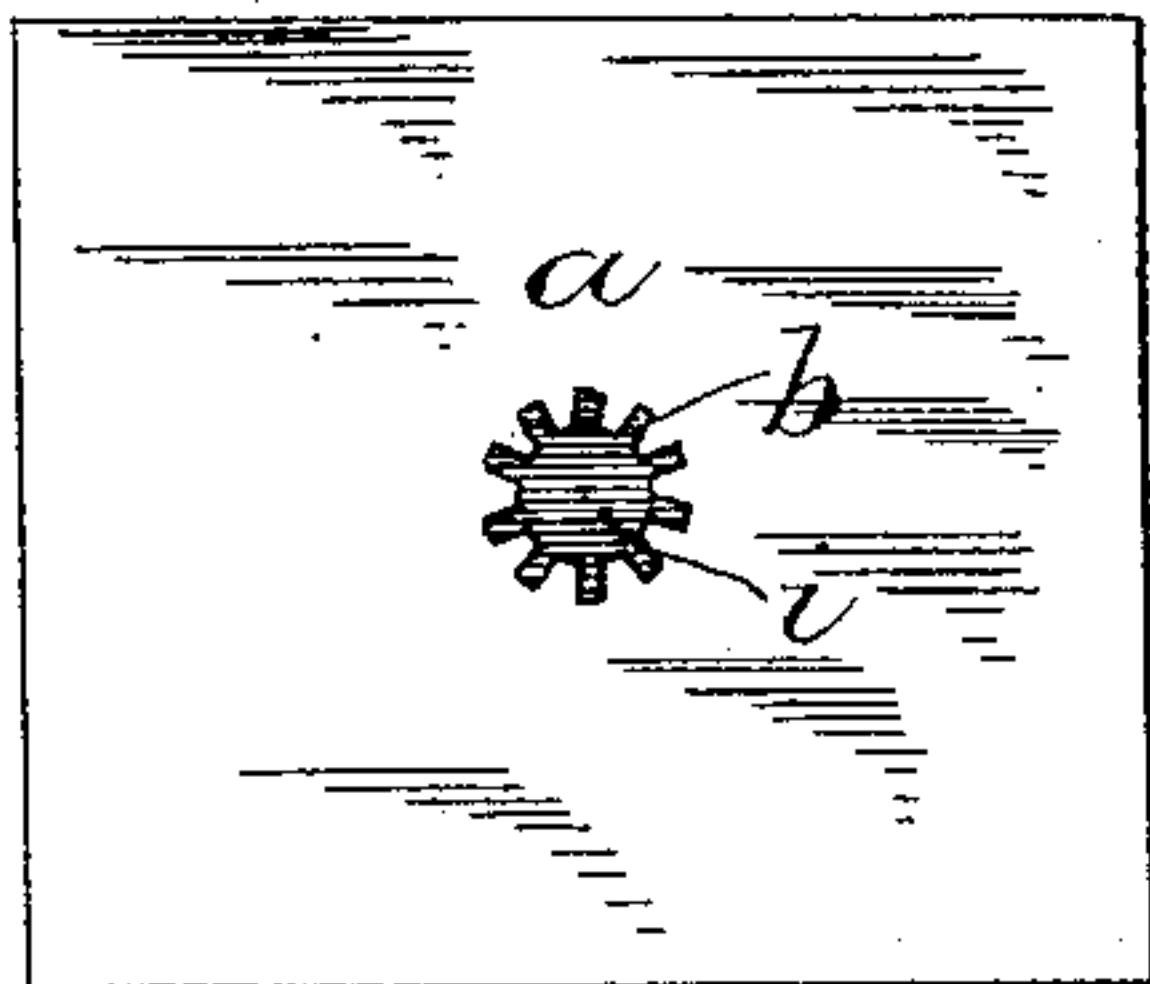


Fig. 4.

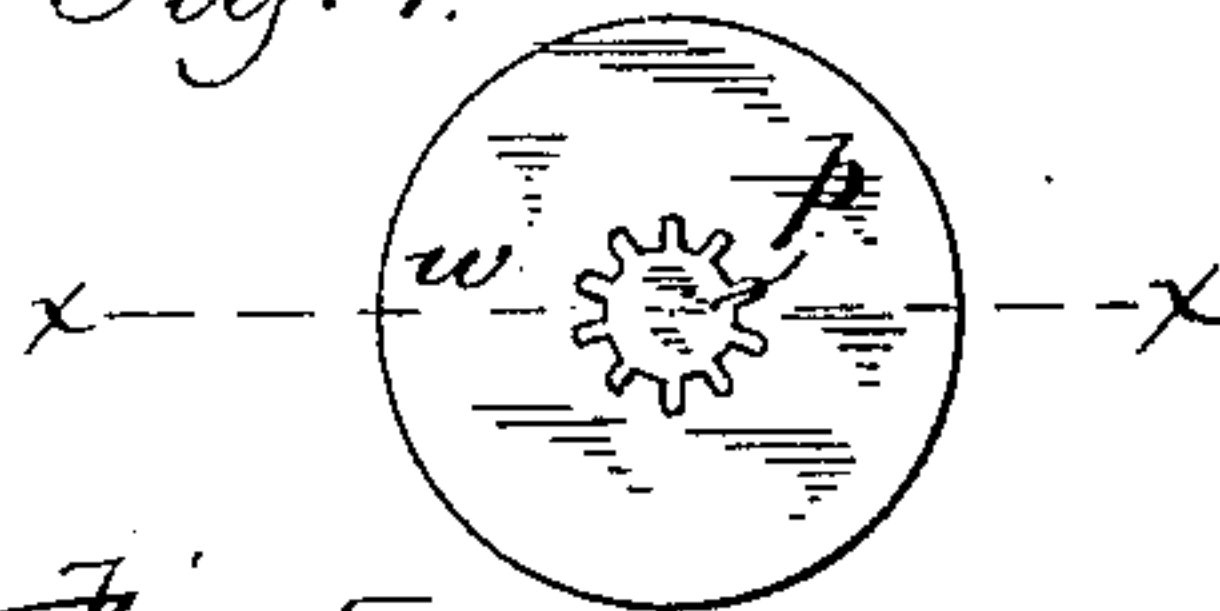


Fig. 5.



Witnesses.  
H. Brown.  
A. White.

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# UNITED STATES PATENT OFFICE.

CHARLES V. WOERD, OF WALTHAM, MASSACHUSETTS.

## MINUTE WHEEL AND PINION.

SPECIFICATION forming part of Letters Patent No. 318,675, dated May 26, 1885.

Application filed November 26, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES V. WOERD, of Waltham, in the county of Middlesex and State of Massachusetts, have invented an Improved Method of and Means for Making Minute Wheels and Pinions, of which the following is a specification.

This invention consists in forming the minute wheel and pinion of a watch in a single piece by swaging or pressing a blank of metal against a flat surface having a die or cavity, into which a portion of the metal of the blank is crowded, said die being formed to convert the metal thus displaced into a pinion, the remaining portion of the blank being flattened or extended laterally by the pressure, and afterward trimmed and provided with teeth, as I will now proceed to describe.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a sectional view of the devices used in carrying out my improved method before the blank is pressed. Fig. 2 represents a similar view after the blank is pressed. Fig. 3 represents a top view of the flat bed or surface having the pinion-forming die. Fig. 4 represents a side view of the wheel-blank and pinion as formed by my improved method. Fig. 5 represents a section on line *x x*, Fig. 1.

The same letters of reference indicate the same parts in all the figures.

In carrying out my invention I provide a block or bed having a flat upper surface, and in it I form a die or cavity, *b*, the walls of which present the exact converse of the pinion to be formed. On the bed *a*, and over the die or cavity *b*, I place a blank, *c*, from which the wheel and pinion are to be formed, said blank having a greater thickness and lesser area than the completed wheel. I then by means of a suitable flat-surfaced platen, *e*, press the blank against the bed *a* with sufficient force to spread the blank laterally, (decreasing its thickness,) and to cause a part of the metal to enter the die *b*, as shown in Fig. 2. The metal entering the die is converted by the latter into a finished pinion, *p*, while

the remaining portion of the blank is extended in area and reduced in thickness by the bed *a* and platen *e* sufficiently to convert it into a blank for the minute-wheel *w*, the wheel being subsequently completed by trimming and forming teeth on the periphery of the blank in the usual or any suitable manner.

Heretofore minute wheels and pinions have been made in separate pieces, which have to be pinned or riveted together. The pinions being very small, (less than one-half the size shown in Figs. 4 and 5,) are very delicate, and therefore liable to be injured by the operation of securing them to the wheels. This difficulty is entirely avoided and a perfect pinion is produced by my improved method.

*i* represents a pinion-shaped follower adapted to move in the die *b*, and fitting the same closely. The upper end of said follower constitutes a flat surface or bed against which the metal which enters the die to form the pinion is forced, the side of the pinion being thus made flat. When the platen is raised, the follower *i* is moved upwardly to eject the pinion from the die. This may be effected by a spring pressing against the lower end of the follower, or by any other suitable means. The longitudinal movement of the follower is limited by an enlargement, *i'*, thereon and the sides of a chamber or cavity in the bed *a* against which said enlargement strikes in rising and falling.

I claim—

1. The improved minute wheel and pinion swaged from a single piece of metal, as set forth.

2. A minute wheel and pinion made in a single piece, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 15th day of November, 1884.

CHAS. V. WOERD.

Witnesses:

THOS. B. EATON,  
THOMAS CURLEY.