

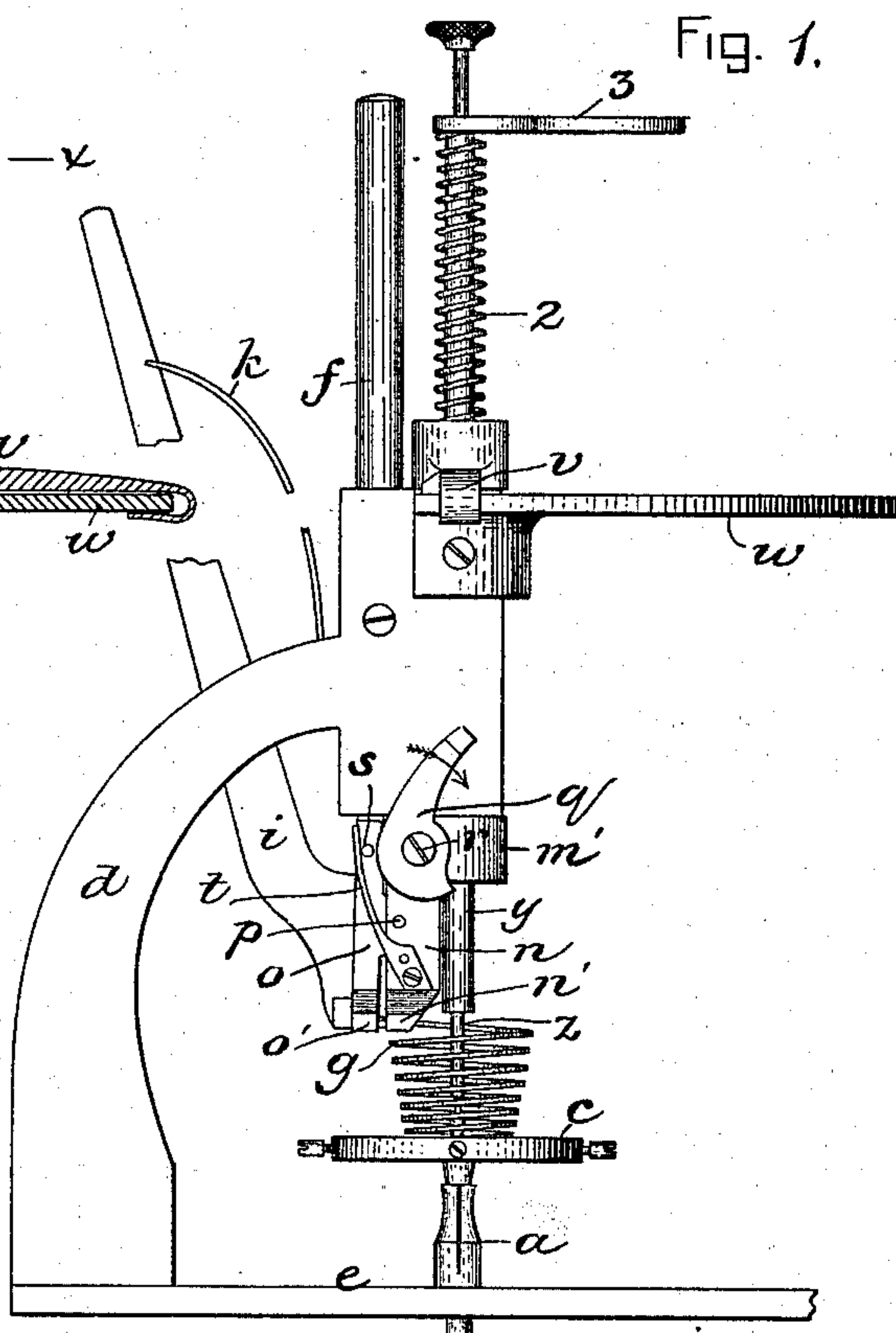
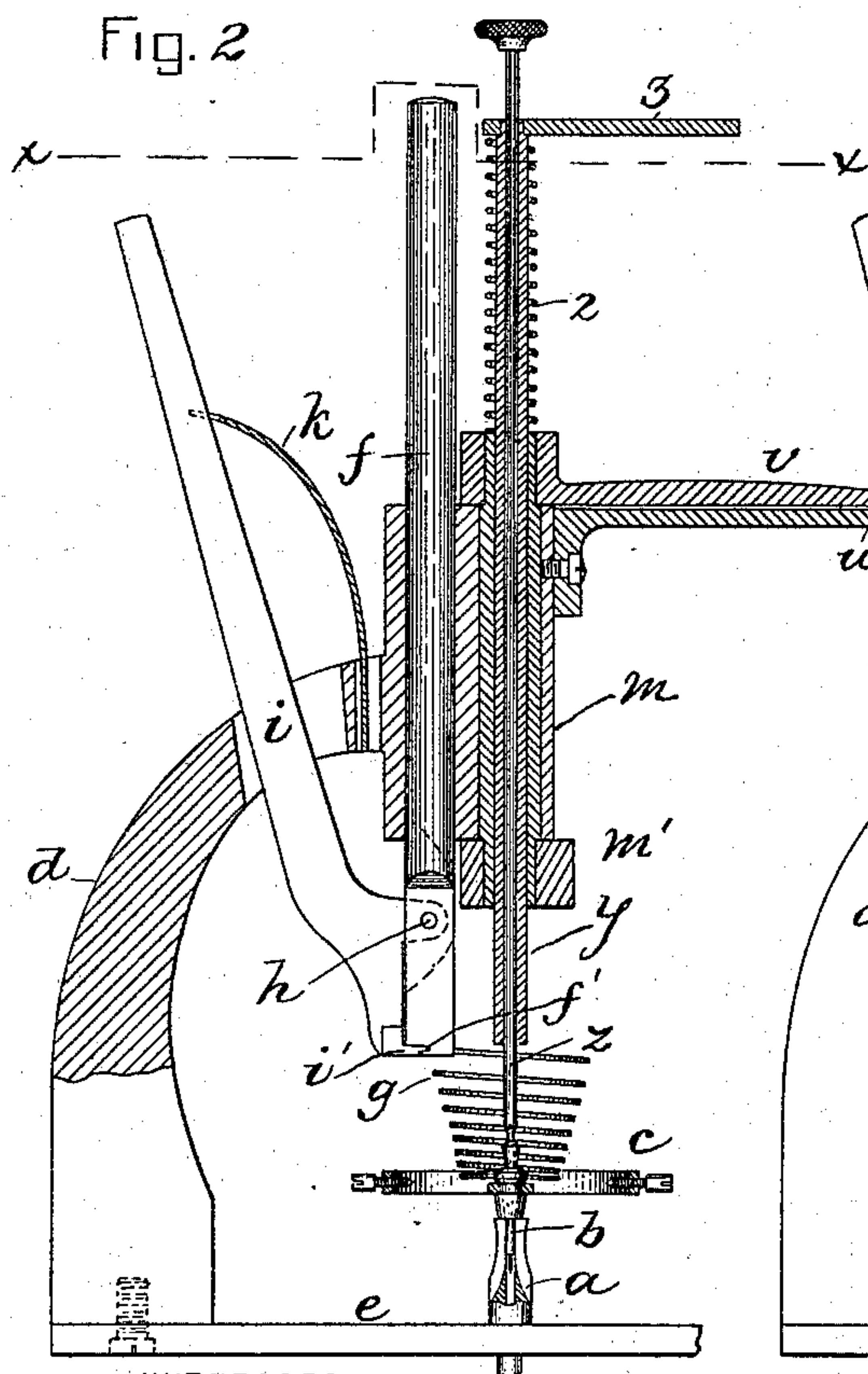
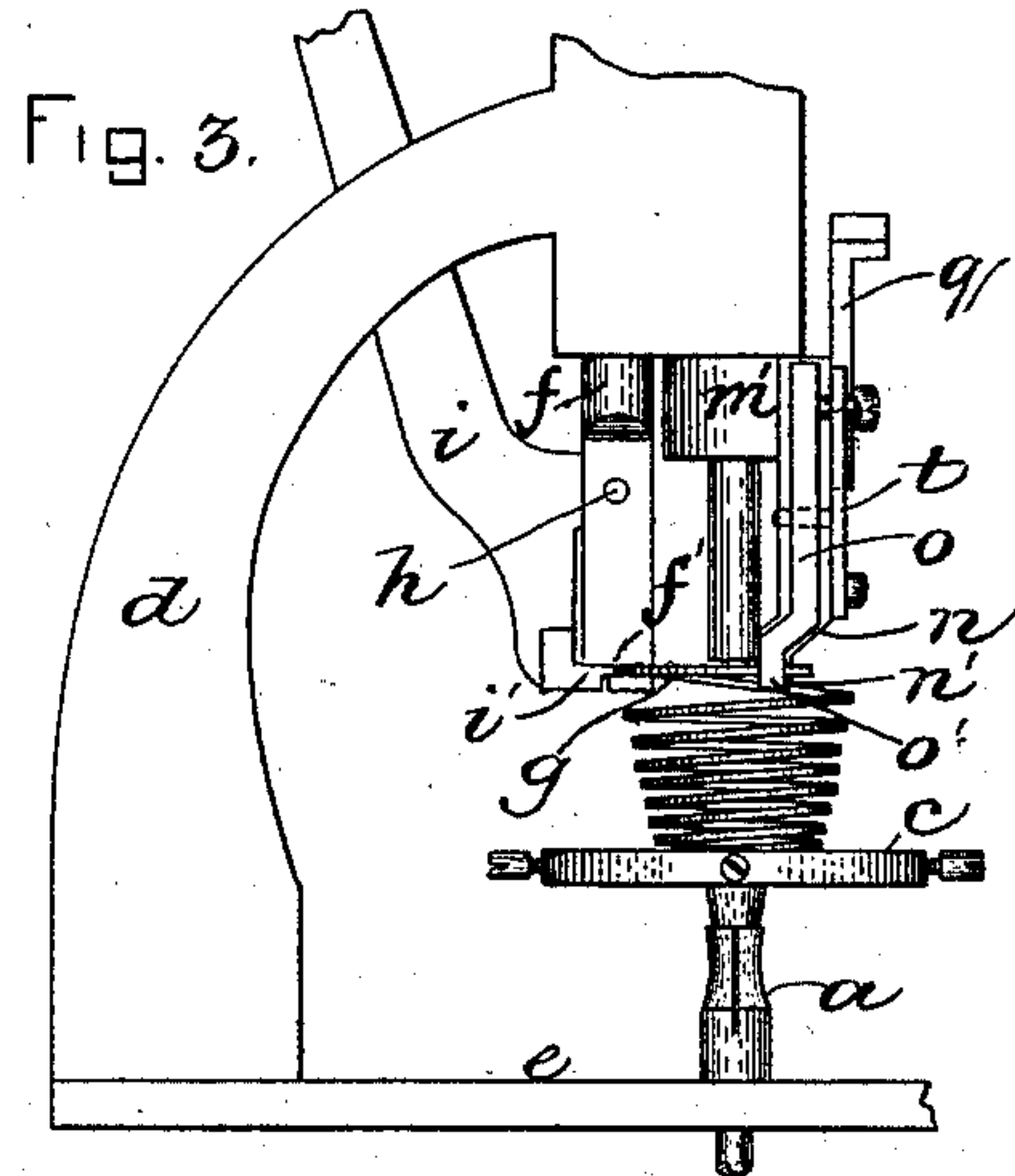
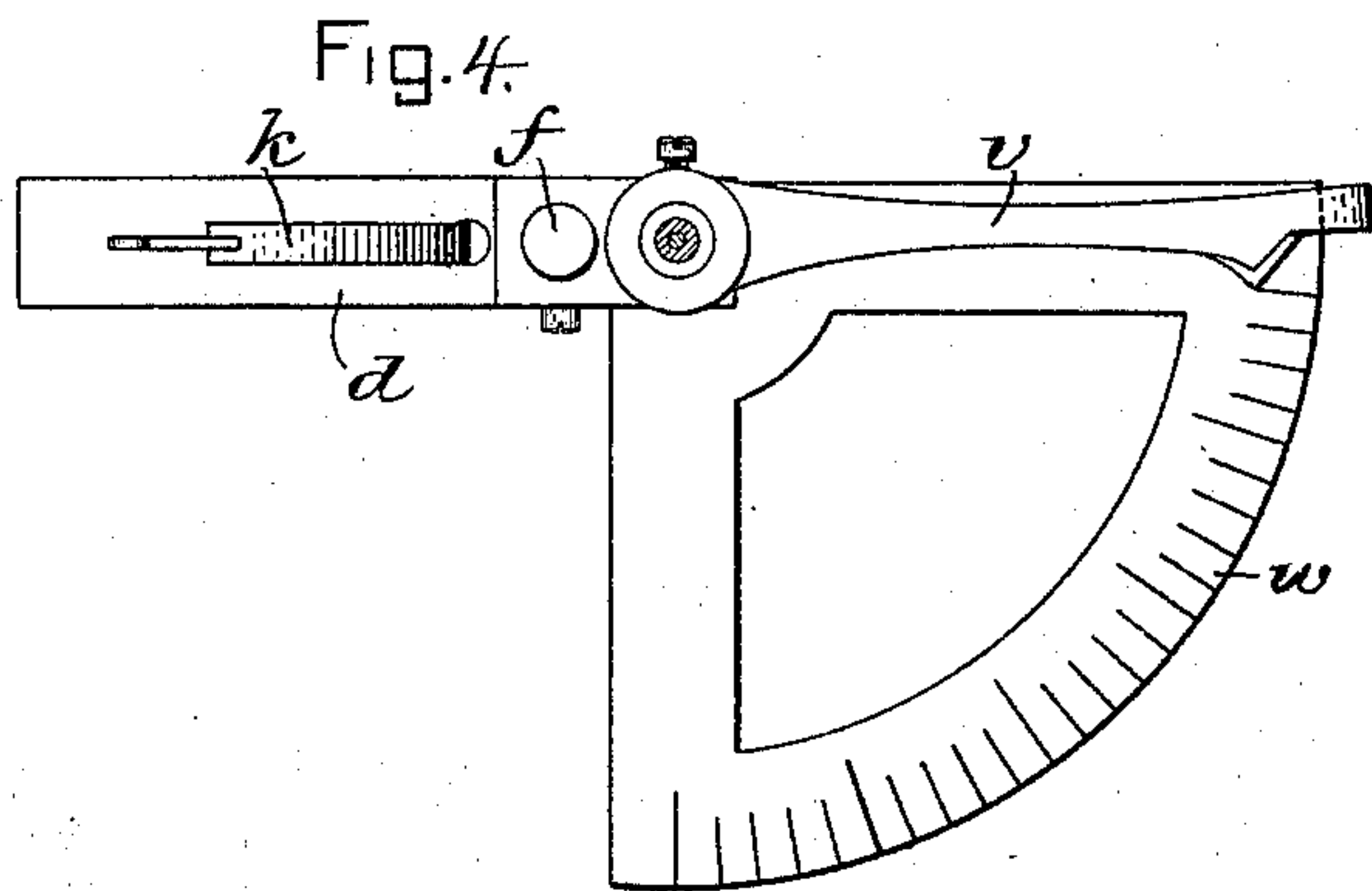
(No Model.)

J. LOGAN.

APPARATUS FOR TESTING WATCH BALANCES AND HAIR SPRINGS.

No. 406,655.

Patented July 9, 1889.



WITNESSES:
A. J. Hanson.
W. B. Ramsay.

INVENTOR
John Logan
BY Wright & Crossley

ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN LOGAN, *OF WALTHAM, MASSACHUSETTS.

APPARATUS FOR TESTING WATCH BALANCES AND HAIR-SPRINGS.

SPECIFICATION forming part of Letters Patent No. 406,655, dated July 9, 1889.

Application filed March 12, 1889. Serial No. 302,996. (No model.)

To all whom it may concern:

Be it known that I, JOHN LOGAN, of Waltham, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Testing Watch Balances and Hair-Springs, of which the following is a specification.

This invention relates to the art or method of testing and grading balances and hair-springs of watches and other time-keepers, by vibrating said balances and hair-springs by means of a standard-time train for a predetermined period and noting the number of vibrations during said period, said method forming the subject of Letters Patent of the United States No. 329,915, granted to me November 10, 1885.

The invention has especial reference to the apparatus for carrying said method into practice, shown in Letters Patent to Edward A. Marsh, John Logan, and Duane H. Church, March 29, 1887, No. 360,234, and consists in the improved devices hereinafter described and claimed for adjusting the length of a flat hair-spring after its rate of vibration has been ascertained by the apparatus described in the last-named patent.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a side elevation of my improved devices. Fig. 2 represents a vertical section of the same. Fig. 3 represents a side elevation of a part of the apparatus, showing the adjusting-jaws in a different position from that shown in Fig. 1. Fig. 4 represents a section on line *x x*, Fig. 2, and a plan view of the parts below said line.

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

In the drawings, *a* represents a chuck, which is attached to or forms a part of one of the arbors of a standard train, such as described and shown in said Patent 360,234, and adapted to receive the staff *b* of a watch-balance *c*, so that a vibrating rotary motion imparted by the train to the chuck *a* will be imparted by the latter to the balance.

d represents a standard attached to the top plate *e* of a casing in which the standard train is located, the chuck *a* projecting through said plate.

The standard *d* has a vertical socket in which is fitted a rod *f*, having a narrow hori-

zontal slot or notch *f'* in its lower end adapted to receive the outer end of a hair-spring *g*, the inner end of which is connected with the balance-staff. To the rod *f* is pivoted at *h* a lever *i*, the lower end of which is formed with a projection *i'*, adapted to enter the slot *f'* and co-operate with the bottom of the latter in grasping the hair-spring end inserted between them, the bottom of the slot *f'* and the projection *i'* constituting spring grasping or holding jaws. A spring *k*, attached to the standard *d* and bearing against the lever *i*, holds the projection *i'* of the latter against the hair-spring and thus maintains the hold of the jaws on the same. The holding-jaws are located above the balance-staff and sufficiently far from the axial line of the chuck and staff to enable them to correspond to the position of the outer end of the hair-spring. The holding-jaws may be vertically adjusted by moving the rod *f* up or down in its socket in the standard *d*; but this is not an essential feature, and the jaws may be non-adjustable if preferred.

m represents a vertical sleeve fitted to rotate in a vertical socket in the standard *d*, and arranged with its axial center in line with that of the chuck *a*. The lower end of said sleeve is provided with a collar or enlargement *m'*, to one side of which is attached a downwardly-projecting arm *n*, the lower end of which constitutes a jaw *n'*.

o represents a bar or lever, pivoted at *p* to the arm *n* and having a jaw *o'* at its lower end arranged to co-operate with the jaw *n'* in grasping the hair-spring *g*. A cam-shaped lever *q* is pivoted at *r* to the collar *m'*, and bears against a pin *s*, projecting from the upper end of the jaw-lever *o*. A movement of the cam-lever *q* in the direction indicated by the arrow in Fig. 1 will force the jaw *o'* toward the jaw *n'*. An opposite movement of the lever *q* will release the jaw *o'* and enable a spring *t*, bearing on the pin *s*, to force the jaw *o'* away from the jaw *n'*. The jaws *n' o'*, which I designate adjusting-jaws, are located at the same distance from the axial center of the chuck *a*, as are the holding-jaws *f' i'*, and they may be moved by the partial rotation of the sleeve *m* in its socket, so as to stand at any desired distance from the holding-jaws.

In testing a hair-spring, the outer end of

the spring is inserted between the holding-jaws $f' i'$ and the balance is vibrated a predetermined length of time, and its rate of movement, as indicated by a pointer, actuated by the balance-impelling train and moving over a dial, as shown in Patent 360,234, above mentioned, is noted. If the total number of vibrations is greater or less than the known number of vibrations of a standard balance in the same length of time, the necessity of shortening or lengthening the hair-spring is apparent, and at this point the adjusting-jaws $n' o'$ are utilized. If the spring is to be shortened, the said jaws are moved while opened close to the spring-holding jaws $i' f'$ and are then closed upon the spring. The holding-jaws being then separated, the sleeve m is turned to move the adjusting-jaws away from the holding-jaws, the movement of the adjusting-jaws being in the arc of a circle whose center is the axial center of the chuck a . The hair-spring g is thus drawn through the holding-jaws to an extent which is indicated by a finger or pointer v , attached to the sleeve m , and a graduated segmental index-plate w , affixed to the standard d . Said pointer and index-plate enable the operator to make the exact adjustment of the length of the spring required to correct the defect indicated by the test above mentioned. After the spring has been thus adjusted the holding-jaws are again closed upon the spring and the adjusting-jaws are opened, after which the surplus end of the spring is broken off by any suitable means close to the holding-jaws.

In the sleeve m is fitted a plunger y , which is movable longitudinally in said sleeve. A rod z is fitted to move lengthwise in said plunger, and has a socket or recess in its lower end formed to bear on the upper end of the balance-staff and to steady the same while the plunger y is being depressed to force the lower end of the balance-staff into the chuck a ; or, if desired, it may remain in contact with the balance-staff while it is running. The lower end of the plunger when depressed strikes a shoulder on the balance-staff and forces the latter downwardly into the chuck. Upon the release of the plunger a spring 2 raises it from the balance-staff. The plunger has a handle 3, whereby it may be depressed.

It will be seen that by the conjoint use of the holding-jaws and the adjusting-jaws, the latter being movable in the arc of a circle whose center is in line with the center of vibration of the hair-spring, an accurate adjustment of the hair-spring can be very readily and conveniently effected, the convenience of the device being greatly enhanced by the pointer and graduated index-plate. It is obvious that the positions of the pointer and the index-plate might be reversed, if desired, without any change in the principles involved, the pointer being fixed and the plate movable.

I claim—

1. The combination, with an oscillating or reversely-rotating chuck or balance holder, of holding-jaws arranged to hold the outer end of a hair-spring at one side of the center of oscillation of the chuck and adjusting-jaws movable in the arc of a circle whose center is in line with the said center of oscillation, as set forth.

2. The combination, with an oscillating or reversely-rotating chuck or balance holder, of holding-jaws arranged to hold the outer end of a hair-spring at one side of the center of oscillation of the chuck, adjusting-jaws movable in the arc of a circle whose center is in line with the said center of oscillation, and a pointer and index-plate, whereby the extent of movement of the adjusting-jaws may be determined, as set forth.

3. The combination of the standard d , having the holding-jaws $i' f'$, and the sleeve m , journaled in said standard and having the adjusting-jaws $n' o'$, as set forth.

4. The standard having the holding-jaws, the sleeve journaled in the standard, the adjusting-jaws and the pointer on said sleeve, and the index-plate attached to the standard, all combined substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 11th day of February, A. D. 1889.

JOHN LOGAN.

Witnesses:

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