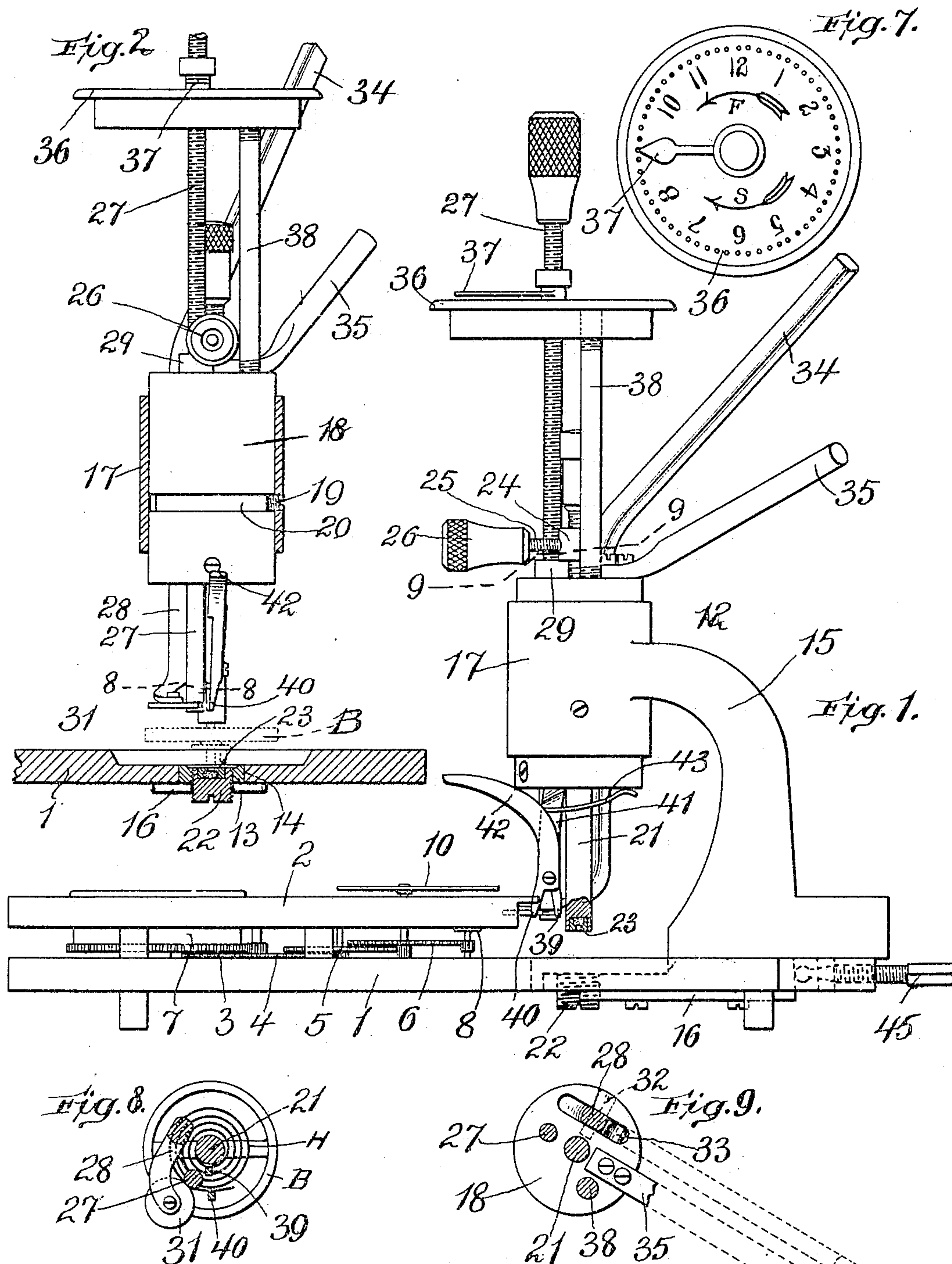


E. DE BARTHE.
APPARATUS FOR ADJUSTING HAIR SPRINGS.

APPLICATION FILED JAN. 4, 1906.

2 SHEETS—SHEET 1.



Witnesses:
P. H. Piquette
E. B. Batchelder

Inventor:
Emerson DeBarthe
by Wright, Brown & Smith
Attorneys.

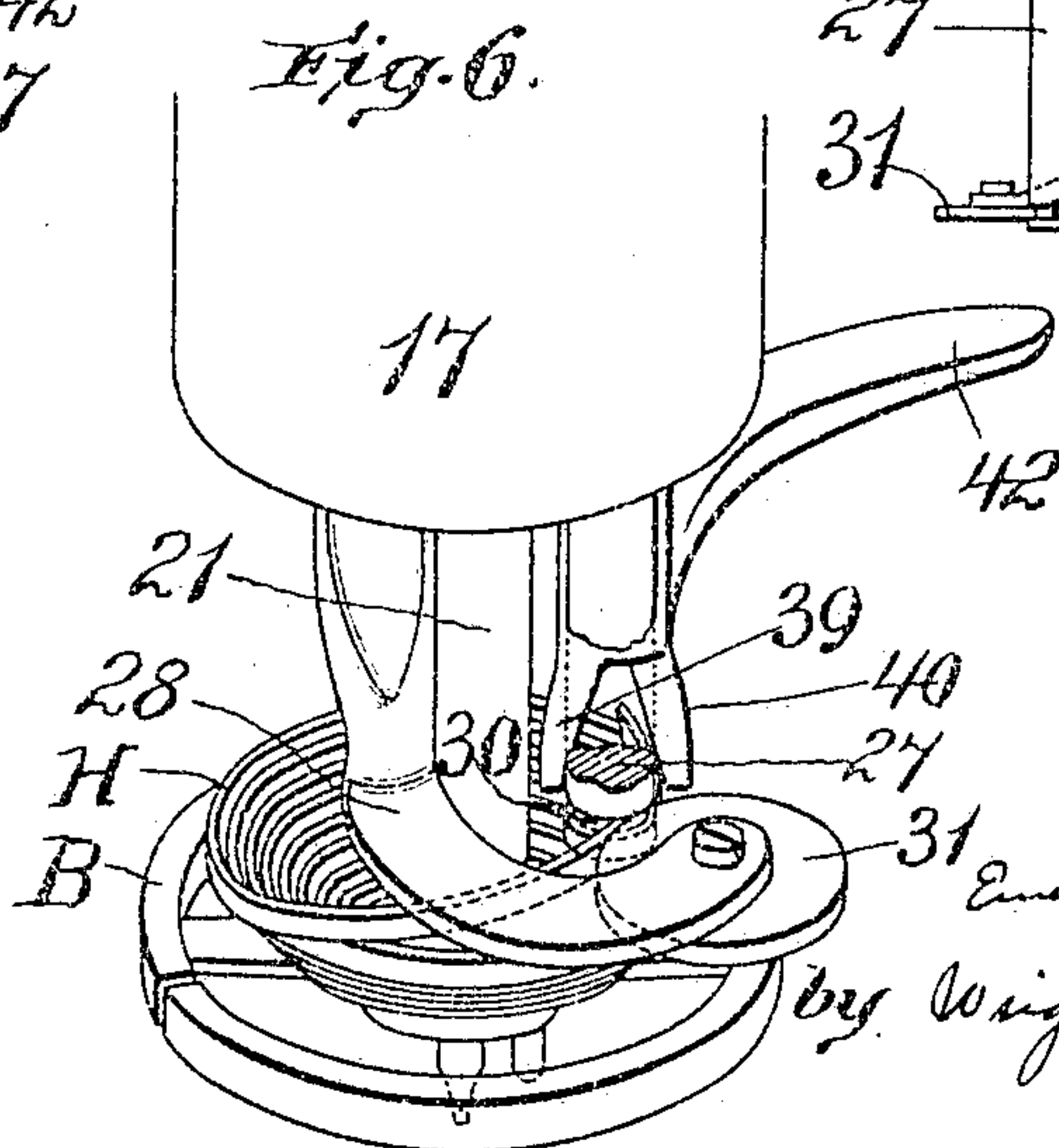
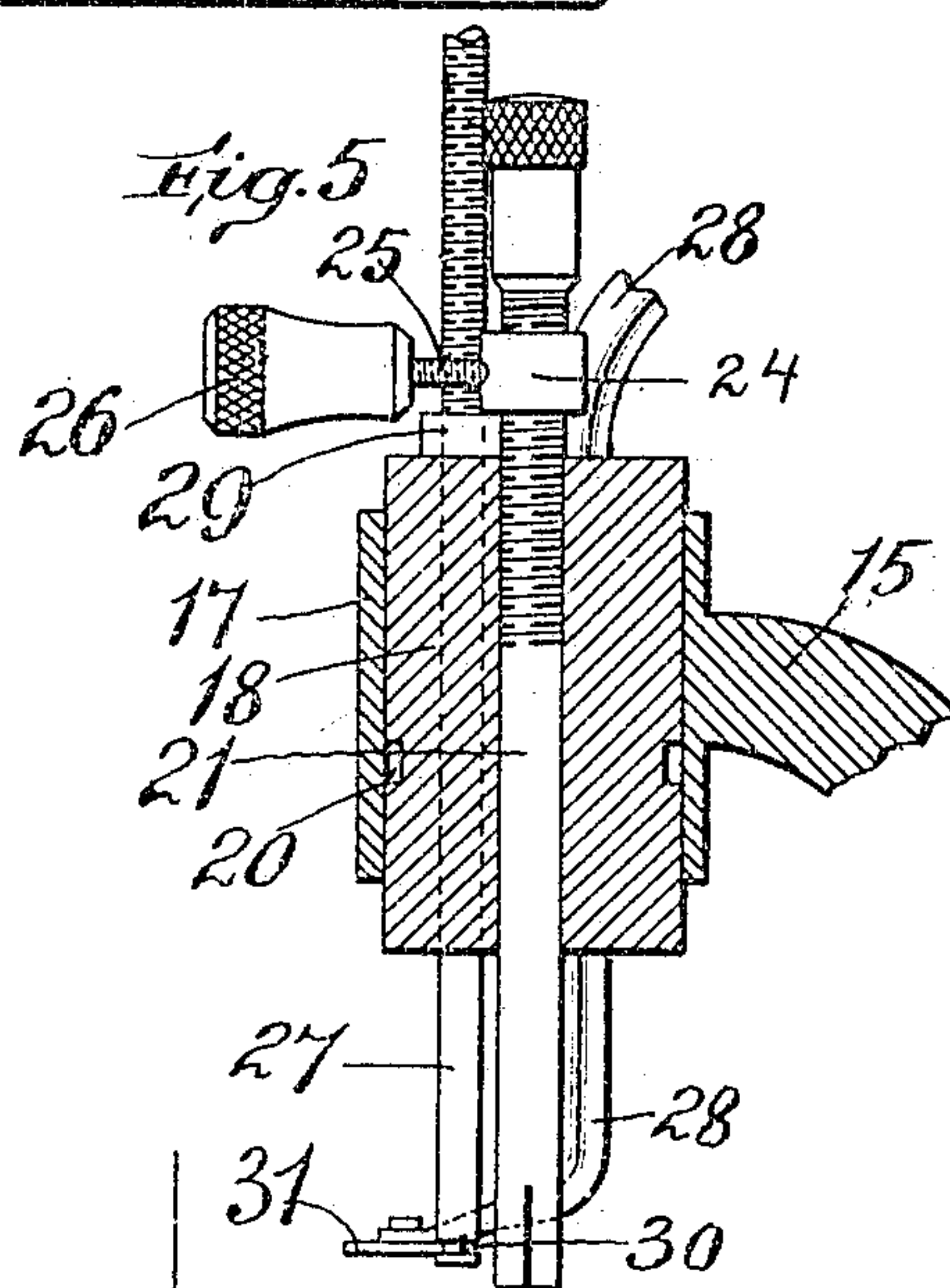
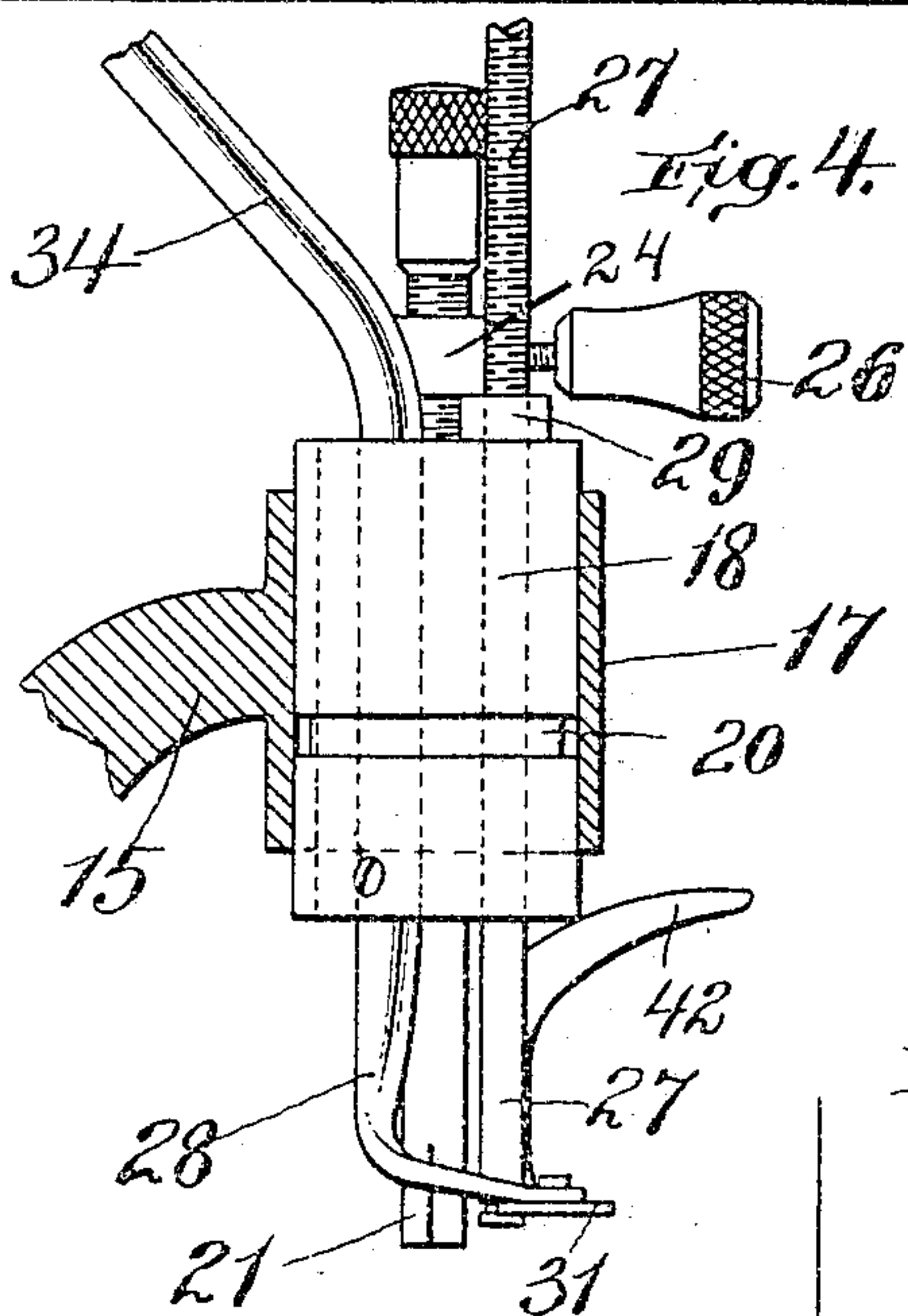
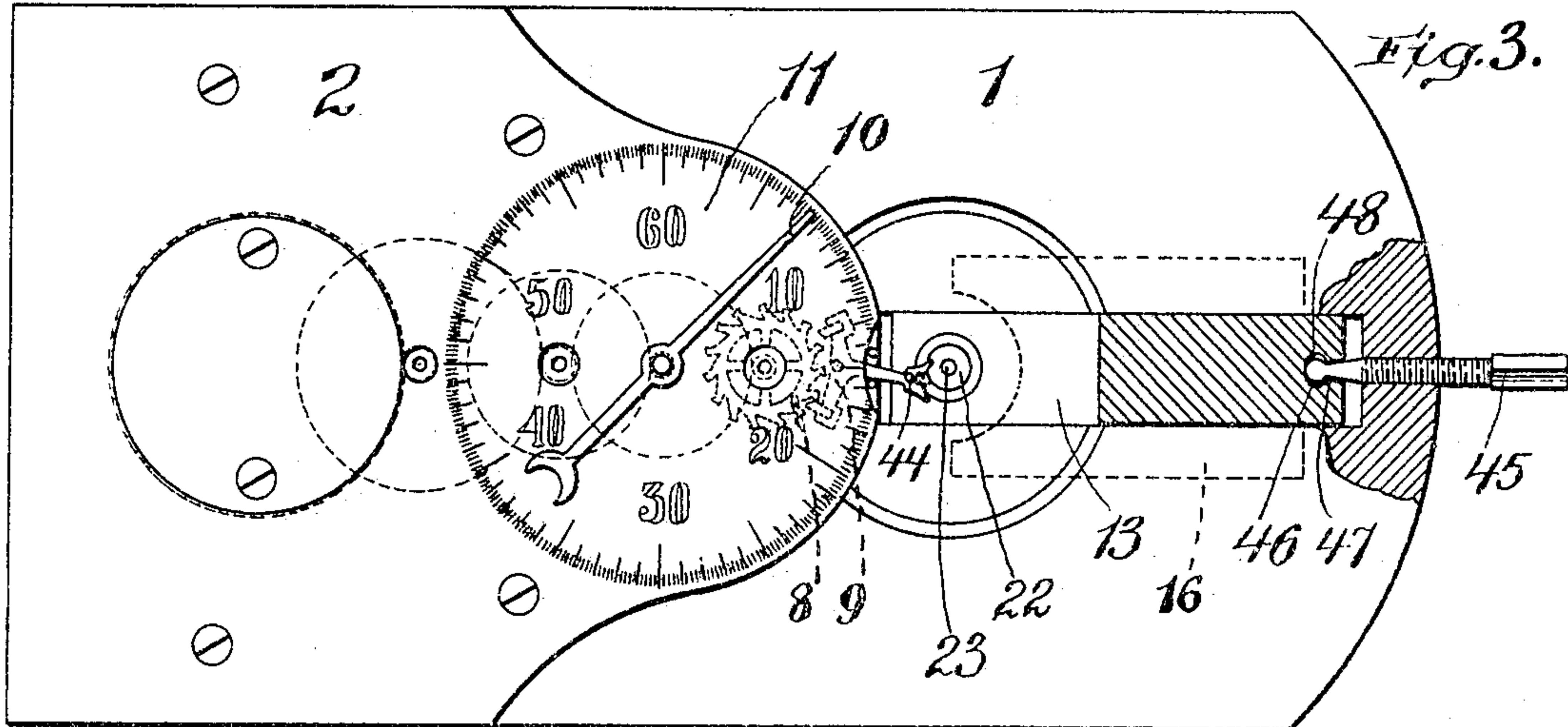
No. 788,027.

PATENTED APR. 25, 1905.

E. DE BARTHE.
APPARATUS FOR ADJUSTING HAIR SPRINGS.

APPLICATION FILED JAN. 4, 1905.

2 SHEETS—SHEET 2.



Witnesses:
P. W. Pezzetta
E. De Barthe

Inventor:
Emerson De Barthe
by W. S. Wright, Attorney

UNITED STATES PATENT OFFICE.

EMERSON DE BARTHE, OF WALTHAM, MASSACHUSETTS.

APPARATUS FOR ADJUSTING HAIR-SPRINGS.

SPECIFICATION forming part of Letters Patent No. 788,027, dated April 25, 1905.

Application filed January 4, 1905. Serial No. 239,587.

To all whom it may concern:

Be it known that I, EMERSON DE BARTHE, of Waltham, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Adjusting Hair-Springs, of which the following is a specification.

The present invention relates to devices by which the length of hair-springs for watch and clock balances may be adjusted before being assembled in a watch or clock to suit the weight of the balance-wheel, so that the latter may be caused to oscillate at such speed as to cause the watch or clock to keep so nearly accurate time that whatever variation there may be will be within the limits of adjustment of the regulator of the watch or clock.

The invention consists of the improved devices by which a balance provided with a hair-spring to be tested may be adjusted in proper relation with a watch-train and by which the length of the spring may be varied very minutely to approximately the proper amount and requiring the minimum expenditure of time for testing the spring and determining the exact amount by which its length is to be varied, all of which I will now proceed to describe and claim.

Of the accompanying drawings, Figure 1 represents a side elevation of a complete apparatus embodying my invention. Fig. 2 represents an elevation and partial section of the same as seen from the left of Fig. 1. Fig. 3 represents a plan view of the watch-train and a horizontal section of the lower part of the adjustable balance-holder embodying the invention. Fig. 4 represents a fragmentary elevation, partially in section, of part of the balance holder or cock, showing the opposite side from that shown in Fig. 1. Fig. 5 represents a vertical section of the same. Fig. 6 represents a perspective view of the lower portion of the same. Fig. 7 represents a plan view of a measuring device by which the amount of alteration in the length of the hair-spring may be determined. Fig. 8 represents a sectional view on line 8 8 of Fig. 2. Fig. 9 represents a sectional view on line 9 9 of Fig. 1.

The same reference characters indicate the same parts in all the figures.

1 represents the base-plate of the apparatus, and 2 a top plate, in which are journaled the shafts of gears 3 4 5 6, constituting a train which is the exact duplicate in everything except the relative arrangement of the position of the gears of an ordinary watch or clock train, and 7 is a drum containing a main-spring for driving the train.

8 is the escape-wheel, and 9 the pallet, of the train, which together constitute the escapement of the clock mechanism. The shaft of the gear 6 carries a hand or pointer 10, moving over a graduated dial 11, which is preferably provided with graduations indicating fifths of seconds, and the hand 10 is arranged to make one revolution in a minute when the escape mechanism is connected with a balance and hair-spring of the proper length. The gears above described are journaled in jeweled bearings in the plates 1 and 2 and having once been assembled remain in place without further adjustment or change.

The balance-wheels provided with hair-springs to be adjusted are set in bearings in a balance holder or cock 12, which comprises a base portion 13, mounted in a guideway 14 in the base-plate 1, a standard 15, connected to the base portion 13, rising therefrom and overhanging the same, and various devices carried by the standard for holding the balance-wheel and hair-spring and adjusting the same.

A plate 16, having sides extended beyond the limits of the guideway 14, is connected to the base portion 13 of the cock and retains it in proper position in the guideway. The overhanging portion of the standard 15 is provided with a tubular portion 17, in which is rotatably mounted a cylindrical member 18, which carries the various adjusting mechanisms referred to and which for convenience I will here designate a "container." This container fits within the sleeve 17 and is held therein, so as to be freely rotatable, by a set-screw 19, threaded into the sleeve 17 and projecting into a groove 20, extending around the container. The latter member carries the bearing for the

staff of a balance, gripping members for engaging the outer end portion of the hair-spring, nippers, a micrometer measuring device, and a handle by which the container may
 5 be rotated and also cooperating with one of the gripping members to constitute an abutment for the operator in operating said gripping member. The balance-staff-bearing member is a spindle or shaft 21, mounted axi-
 10 ally in the container 18 and movable therein toward and away from a complemental bearing 22, mounted in line therewith in the base portion 13. These complemental bearing members are provided each with a jeweled
 15 bearing 23. The first member, 21, extends completely through the length of the container 18 and has mounted on its upper projecting portion a collar 24 in screw-threaded engage-
 20 ment with the spindle, so as to be adjustable longitudinally thereon, and a set-screw 25, set in a tapped hole in the collar 24 and adapted to be screwed against the spindle 21 to hold the collar in its adjusted position and having
 25 also a handle portion 26, by which it may be manually turned, and also affording a handle by which the member 21 may be moved toward and away from the bearing 22. Prefer-
 30 ably the members 18 and 21 are arranged vertically, so that gravity normally tends to hold the member 21 adjacent the bearing 22, and the collar 24, resting against an abutment carried by the container, limits the downward movement of said member. When the appa-
 35 ratus is being used, a balance-wheel is mounted in the bearings 23, the member 21 being separated from the member 22 to permit insertion of the ends of the balance-staff in the bearings and is then lowered upon the upper
 40 free end portion of the hair-spring, which is connected to and carried by the balance-wheel, is then engaged between the gripping members, which consist of a spindle 27 and pivoted arm 28, located at one side of the bearing
 45 member 21.

The member 27 of the grippers is stationary except for a movement of rotation about its own axis and is preferably arranged parallel with the bearing-spindle 21 and extend-
 50 ing above the upper portion of the container 18. It has in threaded engagement with its upper portion a collar 29, adjustable longitudinally thereon, which is adapted to bear upon a portion of the container and hold the spin-
 55 dle 27 in its adjusted position. In its lower end the spindle 27 has a groove 30, with which engages a roller 31, carried by the lower end of the arm 28 and having its circumferential portion adapted to enter the groove.

60 The arm 28 is pivoted in the container at 32 and is normally held by a spring 33 with the roller 31, extending into the groove 30. The upper end 34 of the arm is formed as a hand-engaging portion extending obliquely
 65 away from the spindle 27 and is adapted to

be depressed by the operator to separate the roller from the spindle. A handle 35 is rigidly connected to the container adjacent the handle portion 34 and serves both as an abutment for the hand of the operator while mov-
 70 ing the gripping-arm 28 against the force of spring 33 and also as a handle by which the container and parts carried thereby may be rotated in the sleeve 17.

As affording an index for determining the
 75 amount of rotation of the spindle-gripping member 27 there is provided a dial 36 and pointer 37, of which the former is rigidly connected to the container by a post 38, on which it is mounted, while the pointer is carried by
 80 spindle 27, although, of course, if desired, the relative arrangement of these parts may be reversed. The dial is provided with graduations arranged around its periphery according to any desired system and also has arrows ar-
 85 ranged as shown in Fig. 7 and lettered "F" and "S." Also mounted upon the container 18, at the lower portion thereof, and closely adjacent the gripping members is a pair of nip-
 90 per-jaws 39 40, of which the former is formed upon a bar 41, rigidly connected to the lower portion of the container, and the latter upon an arm 42, pivoted to the bar 41. A spring
 43, carried by the pivoted arm 42, bears against the lower part of the container and normally
 95 tends to hold the nippers separated. As both the gripping members and the nippers are carried by the container, it will be evident that the latter are retained at an invariable distance from the former in whatever position
 100 the container may occupy.

The manner of using the apparatus is as follows: The balance-wheel is mounted in the holder, with the ends of its staff in engagement with the bearings 23, as before stated,
 105 and the grasping-roller 31 is separated from the spindle 27 and the free end of the hair-spring carried by the balance is picked up and inserted in the groove 30, after which roller 31 is allowed to enter the groove under the
 110 influence of spring 33 to grasp the hair-spring and hold it therein. The hair-spring having its outer end tightly held by the gripping members in arriving at a position of equilibrium will turn the balance a certain amount, so
 115 that the jeweled roller-pin will occupy a position which may or may not be such as to properly engage the fork 44 of the pallet 9, which is extended toward the bearing members 21 and 22. In case the jeweled pin is not in position to
 120 engage the fork properly when the balance is started oscillating the container will be turned by the handle 35 until the pin is in proper position, whereupon on starting the balance it will oscillate exactly as when in a watch or clock and
 125 vibrate the pallet. As the roller-pins of different-sized balance-wheels are located at varying distances from the staff, it is necessary that the holder should be capable of adjustment toward and away from the pallet-fork in or-
 130

der that there may be proper engagement between the pin and fork. Such adjustment is provided by an adjusting-screw 45, threaded into the base-plate 1 and having a head 46, adjacent a narrow neck 47, engaged in a socket 48 with a narrow opening in the balance-holder. As will be readily apparent, rotation of the adjusting-screw 45 will move the balance toward and away from the pallet-fork, so that it may be caused to engage therewith with great accuracy. A vertical adjustment for the balance is also provided in case the staff may not be of proper length to bring the pin into accurate engagement with the pallet-fork. This consists in mounting the bearing member 22 in the base portion 13 in such manner that its position may be changed vertically preferably by means of a threaded engagement between the bearing member and base, so that by rotation of the bearing member it may be raised or lowered. This adjustment, although very useful and important, is not absolutely necessary and may be omitted, if desired; but with such adjustment, as well as the lateral adjustment of the cock, a balance-wheel of any size manufactured may be tested by this apparatus. After the device has once been adjusted for a certain-size balance it will usually be allowed to remain in such adjustment, and in a watch-making shop there will preferably be enough machines to take all the balances, so that each separate machine may be used exclusively for a particular-sized balance; but the adjustments described render all the machines interchangeable. After the device has been adjusted so that the balance properly coöperates with the pallet-fork and the mechanism is set running the movement of the hand 10 is observed and compared with that of the seconds-hand of a standard clock. In case of variation between them the length of the hair-spring will be altered by rotating the gripping-spindle 27, which, coöperating with roller 31, will draw the hair-spring between the gripping members. By turning the spindle and pointer 37 in the direction of the arrow marked "F" in Fig. 7 the length of spring between its point of engagement with the gripping members and its point of attachment to the balance is shortened, causing the balance to swing more rapidly, while by turning the spindle in the opposite direction the length of the spring is correspondingly lengthened and the movement of the balance retarded. By suitably operating the spindle the length of the hair-spring may be made such as to cause the balance to beat at the proper rate of speed. When the adjustment has been made, there will be a free end of the hair-spring extending from between the gripping members toward and between the nipper-jaws 39 and 40, which will then be operated to grip the hair-spring, and this free end extending beyond the nippers will be broken

off. The nippers are located with respect to the gripping-jaws so that the length of spring extending between the gripping members and nippers is just sufficient for the attachment thereof to the stud, in which it is fastened to connect it to the plate of a watch-movement. By knowing exactly how much alteration in the speed of the balance the variation of the length of the hair-spring caused by one rotation of spindle 27 will make the operator upon observing the amount by which the hand 10 varies from the standard seconds-hand in fifths of a second after making one rotation can turn spindle 27 until the length of hair-spring has been changed sufficiently to correct the inaccuracy. This amount is indicated on the dial. I have found it good practice to proportion the parts so that one complete revolution of the spindle 27 will vary the speed of the train about one second in a minute. Thus the graduations on the dial will indicate fractions of a second in the variation produced by less than a complete rotation of the spindle, and the adjustment can be made so minutely that an almost exact regulation may be effected after a test of only one minute's duration. By noting the variation in a minute the operator can tell exactly just how much to adjust the spindle 27 to correct the variation, and when the latter has been turned the proper amount the adjustment is complete and the spring is ready to be attached in the watch. Thus it will be seen that the range of adjustment of this device is exceedingly accurate, as the micrometer attachment, consisting of the dial and pointer, permits measurements of adjustments to a very fine degree and is exceedingly rapid, inasmuch as one adjustment after a test of a minute is generally sufficient, thus constituting in my device a great improvement over former ones in which the end of the hair-spring projecting from corresponding gripper-jaws is manually engaged and drawn through between the jaws, when a fine adjustment is impossible and several trials are necessary to get the spring to vibrating at even approximately the right speed.

I have found that the roller 31 coöperating with the groove in spindle 27 produces a grip on the hair-spring which is practically positive and permits of no slipping of the hair-spring, so that after turning the spindle a certain amount and then returning it to its previous position the speed of the hand 10 is exactly the same as before the first change was made. Such a grip of course insures the accuracy of the apparatus and makes possible the rapid adjustment above described of a hair-spring.

It will be readily apparent that by the improvements above specified I have provided an extremely effective device for timing hair-springs and one in which the accuracy and speed with which it can be made to do the

work required is greatly increased over those hitherto known and used.

I claim—

1. An apparatus for adjusting hair-springs having a watch or clock train, and a balance-holding cock adjustable toward and from said train to bring the balance held thereby into engagement with the escapement mechanism of said train.

2. An apparatus for adjusting hair-springs having a watch or clock train, a balance-holding cock adjustable toward and from said train to bring the balance held thereby into engagement with the escapement mechanism of said train, and means for moving said cock toward and from the train.

3. In an apparatus for adjusting hair-springs, a holder for a balance, and gripping members arranged to engage a portion of the hair-spring carried by the balance and adapted for actuation to shift the portion of the hair-spring which is engaged by them.

4. In an apparatus for adjusting hair-springs, a holder for a balance, and rotatable gripping members arranged to engage a portion of the hair-spring carried by the balance and adapted for actuation to shift the portion of the hair-spring which is engaged by them.

5. In an apparatus for adjusting hair-springs, a balance holder or cock having bearings for holding the staff of a balance, and means for holding the outer end portion of the hair-spring carried by the balance, the said means being completely rotatable about the axis of said bearings.

6. In an apparatus for adjusting hair-springs, a balance-cock having a base and a standard, bearings for holding the staff of a balance carried by said cock, a rotatable member supported by said standard concentrically with respect to the axis of said bearings, and means for holding the free end portion of a hair-spring carried by said rotatable member, the latter and the hair-spring-holding means being completely rotatable about the axis of the bearings.

7. In an apparatus for adjusting hair-springs, a holder for a balance, gripping members arranged to engage a portion of the hair-spring carried by the balance, and a micrometer adjustment by which the gripping members may be actuated to vary the length of the hair-spring between its point of engagement with the gripping members and its point of attachment to the balance.

8. In an apparatus for adjusting hair-springs, a holder for a balance, a pair of rotatable gripping members adapted to grasp a portion of the hair-spring which is connected to the balance, means whereby one of said gripping members may be rotated to move the portion of the spring engaged by them, and provisions for measuring the amount of rotation of said member.

9. In an apparatus for adjusting hair-

springs, a holder for a balance, a pair of rotatable gripping members adapted to grasp a portion of the hair-spring which is connected to the balance, means whereby one of said gripping members may be rotated to move the portion of the spring engaged by them, and provisions for measuring the amount of rotation of said member comprising a pointer and a graduated dial adjacent the pointer, one of the latter elements being carried by said member.

10. In an apparatus for adjusting hair-springs, a balance holder or cock comprising bearing members adapted to engage the staff of a balance, gripping members located at one side of the bearing members and adapted to grasp the outer end portion of the hair-spring carried by the balance, and nippers located adjacent the gripping members at an invariable distance therefrom and adapted to be actuated to grip the end of the hair-spring projecting from the gripping members.

11. In an apparatus for adjusting hair-springs, a balance holder or cock comprising bearing members adapted to engage the staff of a balance, gripping members located at one side of the bearing members and adapted to grasp the outer end portion of the hair-spring carried by the balance, and nippers located adjacent the gripping members at an invariable distance therefrom, the gripping members and nippers being completely rotatable about the axis of the bearing members.

12. In an apparatus for adjusting hair-springs, a balance holder or cock comprising a base, a standard rising from and overhanging the base, a bearing for the staff of a balance supported by the standard, a complementary balance-staff bearing mounted in the base in line with said first-named bearing and adjustable toward and from the same, and means for adjustably holding the outer end portion of the hair-spring connected to the balance.

13. In an apparatus for adjusting hair-springs, a balance holder or cock comprising a base, a bearing for the staff of a balance mounted in the base, a standard rising from and overhanging the base, a container rotatably mounted in the overhanging portion of the standard, a spindle axially mounted in said container in line with said bearing mounted for movement toward and from the same and carrying a complementary balance-staff bearing, and gripping members also mounted in the container and comprising a rotatable spindle at one side of the first-said spindle and a pivoted arm carrying at one end a roller arranged to engage the second of said spindles, the said bearings being adapted to hold the staff of a balance and the said gripping members to grasp between their engaging portions the outer end portion of a hair-spring carried by the balance.

14. In an apparatus for adjusting hair-

5 springs, a balance holder or cock comprising
a base, a bearing for the staff of a balance
mounted in the base, a standard rising from
and overhanging the base, a container rota-
10 tably mounted in the overhanging portion of
the standard, a spindle axially mounted in
said container in line with said bearing mount-
ed for movement toward and from the same
and carrying a complemental balance-staff
15 bearing, gripping members also mounted in
the container and comprising a rotatable spin-
dle at one side of the first-said spindle and a
pivoted arm carrying at one end a roller ar-
ranged to engage the second of said spindles,
15 the said bearings being adapted to hold the
staff of a balance and the said gripping mem-
bers to grasp between their engaging portions
the outer end portion of a hair-spring carried

by the balance, and nippers mounted in the
container adjacent the gripping members. 20

15. In an apparatus for adjusting hair-
springs, a balance holder or cock having bear-
ings for the staff of a balance, and gripping
members for holding the outer end portion of
a hair-spring carried by the balance compris- 25
ing a rotatable spindle having a peripheral
groove and a pivoted arm movable toward
and away from said spindle carrying a roller
arranged to project into said groove.

In testimony whereof I have affixed my sig- 30
nature in presence of two witnesses.

EMERSON DE BARTHE.

Witnesses:

A. C. RATIGAN,
A. H. BROWN.