(No Model.) 3 Sheets—Sheet 1.

E. A. MARSH.

MACHINE FOR CURVING THE ENDS OF MAINSPRINGS FOR WATCHES.

No. 467,703. Patented Jan. 26, 1892.

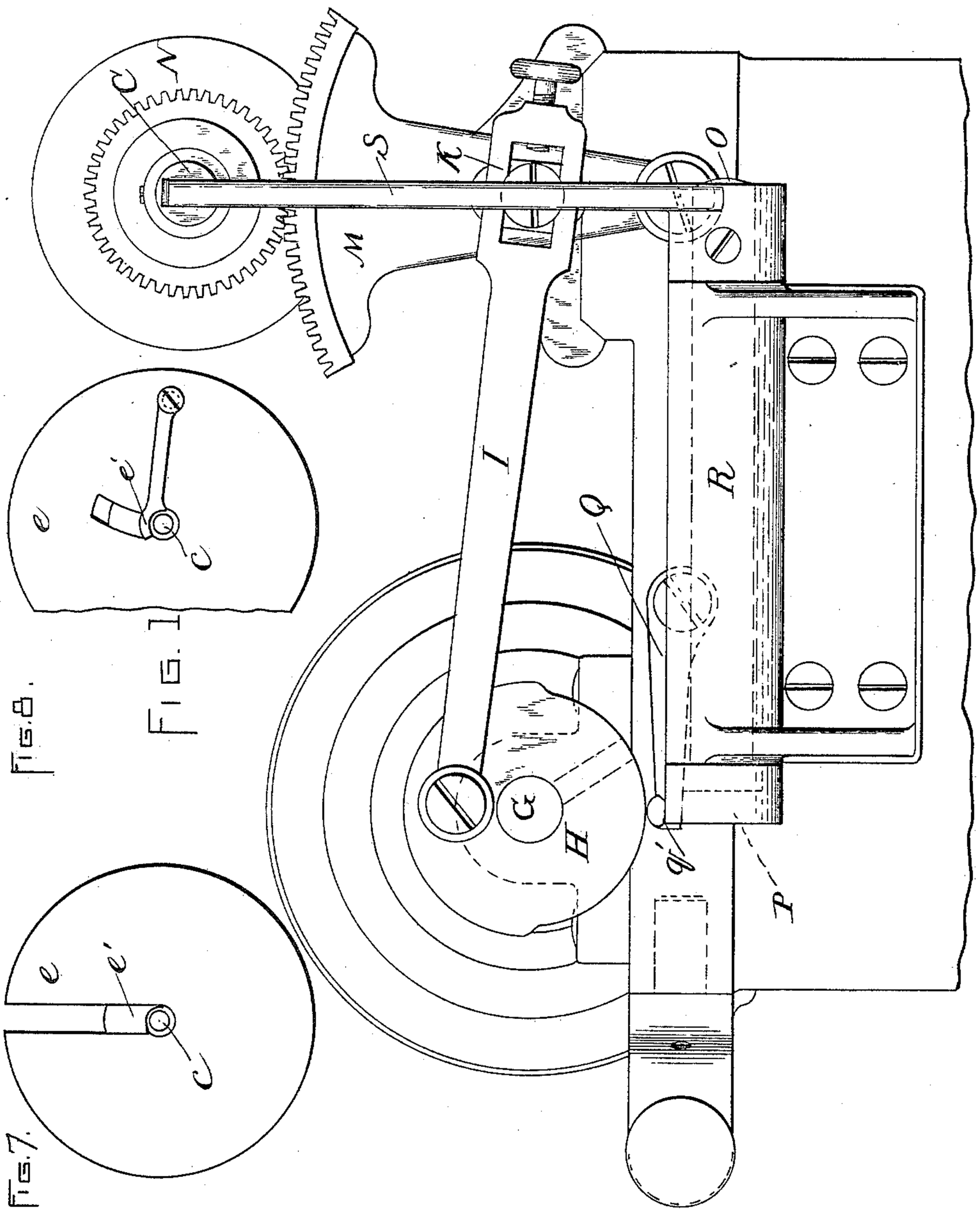

FIG. 1.

FIG. 8.

FIG. 7.

WITNESSES:
A. D. Harrison
H. A. Hall

INVENTOR:
E. A. Marsh.
by
Wilson, Brown & Crosby,
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FIG. 2.

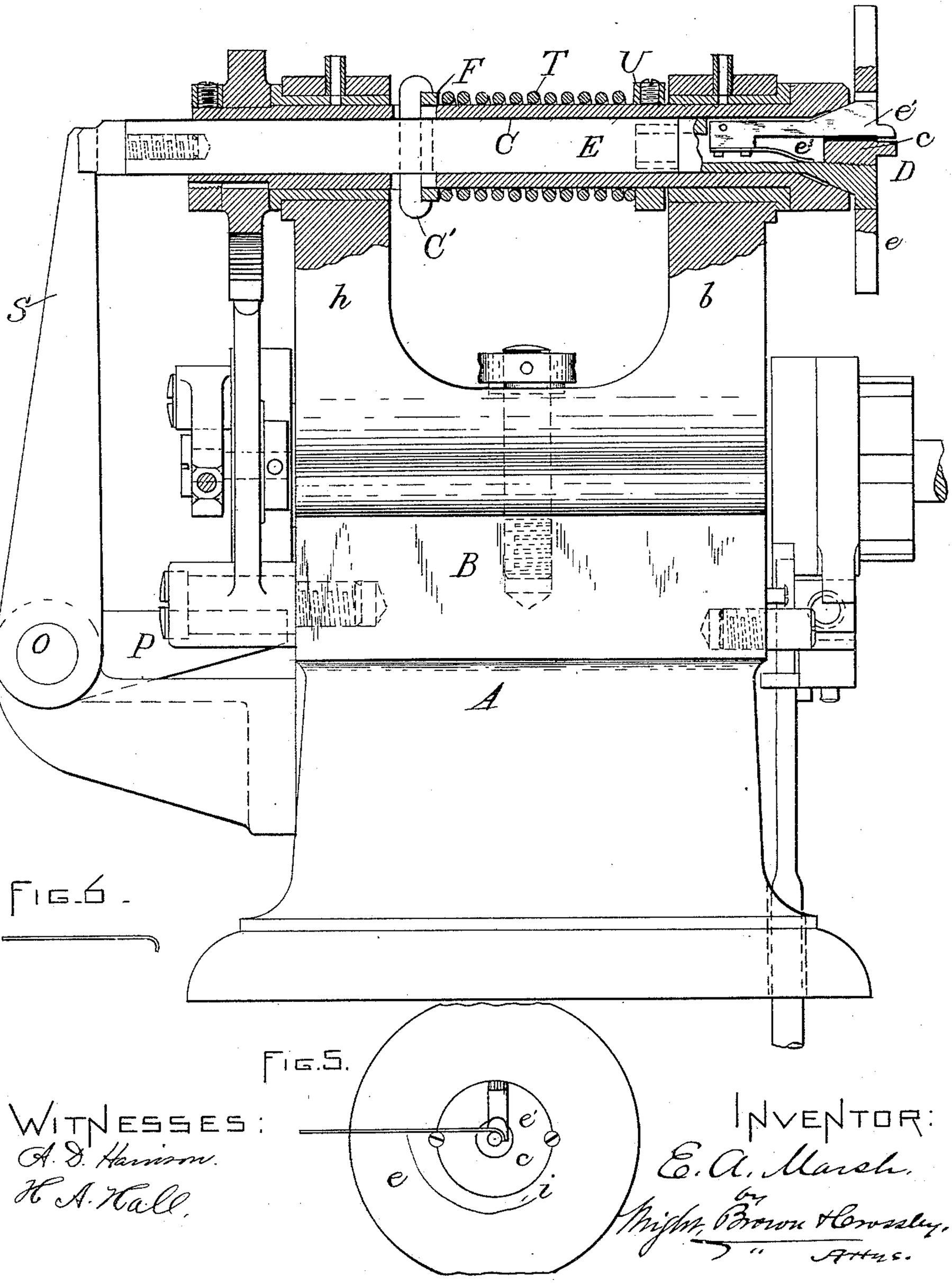

FIG. 6.

FIG. 5.

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(No Model.) 3 Sheets—Sheet 3.

E. A. MARSH.

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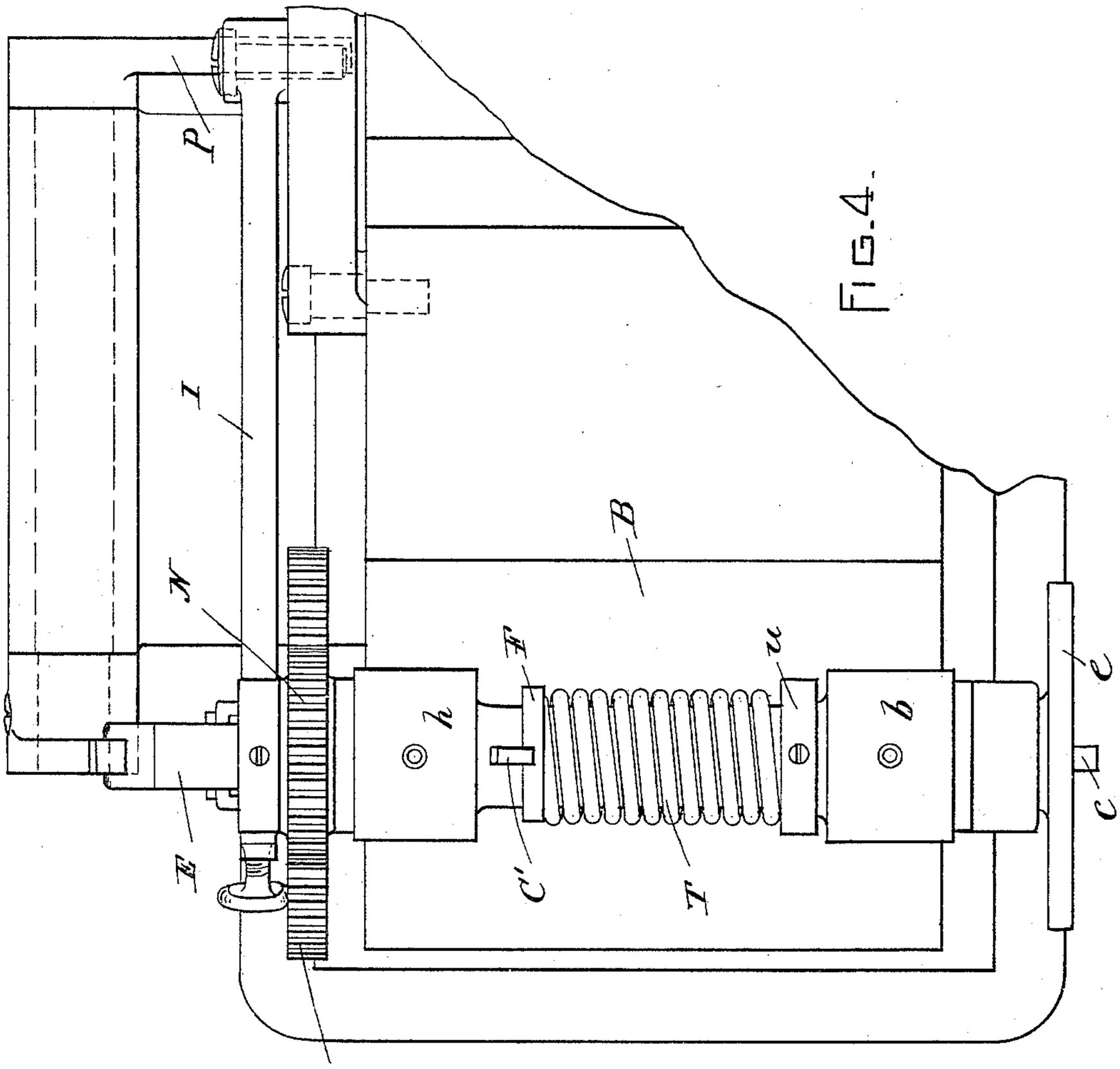

FIG. 4.

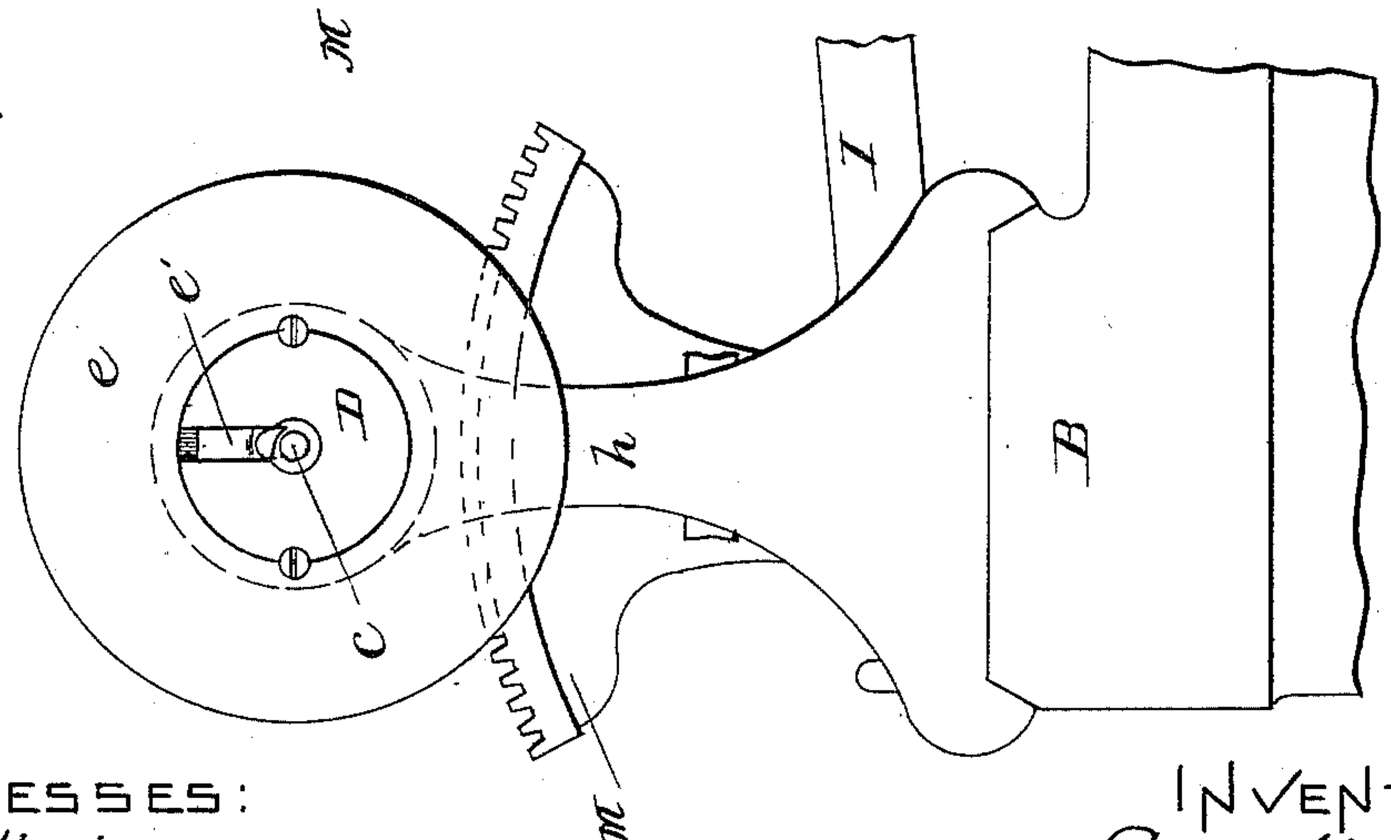

FIG. 3.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDWARD A. MARSH, OF WALTHAM, MASSACHUSETTS.

MACHINE FOR CURVING THE ENDS OF MAINSPRINGS FOR WATCHES.

SPECIFICATION forming part of Letters Patent No. 467,703, dated January 26, 1892.

Application filed October 24, 1891. Serial No. 409,647. (No model.)

To all whom it may concern:

Be it known that I, EDWARD A. MARSH, of Waltham, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Machines for Curving the Ends of Mainsprings for Watches, of which the following is a specification.

My invention has for its object the bending of one of the ends of mainsprings as preliminary to the operation of coiling, the end so bent being that which will be the inner end of the involute spiral. It is to be understood that in the manufacture of such springs the strip or ribbon of steel during all the operations preceding that of coiling is in substantially a straight form, and that the operation of coiling is performed by attaching one end of the strip or ribbon of steel (which has been made of the proper length) to an arbor, which is then revolved, carrying with it the attached end of the steel strip, and such strip, being held by suitable friction, is wound upon itself in successive coils, forming an involute spiral.

For the purpose of attaching the mainspring of a watch to the winding-arbor (through which tension is applied and by which it is held) close to the inner end of the spring is made a small hole, which catches a suitable hook on the arbor. This hole is also employed in similar manner in the original coiling of the spring, the coiling-arbor being provided with a hook, like that of the arbor of the watch. In order that the spring may be securely held by the hook, it is evident that at least a part of a turn around the arbor must have been previously bent, so as to have approximately the same curve as the winding-arbor, and to give this preliminary curve in a uniform and rapid manner is the object of my invention. The ordinary way has been to give this initial turn by means of hand-pliers, which method is open to the three serious objections of slowness, lack of uniformity, and the danger of distorting the end of the spring, so that it will not lie flat on the arbor.

All the above objections are overcome in the machine of my invention, which I will now describe by aid of the accompanying drawings, in which—

Figure 1 shows an end view of my machine. Fig. 2 shows a front view of the same, partially in section. Fig. 3 shows a side elevation of a portion of the machine. Fig. 4 is a top plan view of the same. Fig. 5 is a diagram showing a portion of a spring after it has been clamped between the jaws of the machine. Fig. 6 is a diagram showing a portion of the spring after it has been bent by the machine. Figs. 7 and 8 are views of modified forms and arrangements of the clamping-jaws.

In the drawings, A represents the bed of the machine, on the front end of which, for convenience of construction, is bolted a separable piece B, having two uprights *b b'*, in the upper end of which is journaled a hollow spindle C, which spindle has one end bell-mouthed to receive a clamping-chuck D, which chuck at its inner end is provided with a screw-thread, upon which is screwed an interior sliding spindle E. At a coincident point the outer spindle C and the inner spindle E are mortised through their axes to receive a key F, for the purpose of causing the inner spindle to slide within the outer one, and, as it carries with it the chuck D, its alternate movements serve to cause said chuck to grasp and release the inserted strip of steel. The particular construction of this chuck will be hereinafter described.

At the rear end of bed A, in suitable bearings, is journaled a shaft G, carrying at one end a running loose pulley, which forms one member of any suitable clutch, the other member of said clutch being made fast to the shaft, said clutch being constructed in any known way for the purpose of disengaging the two members of the clutch after the running pulley shall have carried shaft G one-half of a revolution. Shaft G at its opposite end carries a face-plate H, in which is fastened a pitman or crank-pin, on which is fixed one end of a connecting-roll I, which at its other end is provided with an elongated hole, in which slides a collar or box K, in which is journaled a pitman which is adjustably secured to a gear-sector M, the teeth of which mesh into and give motion to a pinion N, which is fixed to one end of spindle C.

The periphery of the face-plate H is divided into two parts, which, while concentric, have

different radii with slight inclines connecting the two. As this face-plate is revolved, its periphery acts as a cam to give a reciprocating motion to a rock-shaft O by means of the arm or lever P, between the end of which and the periphery of the face-plate is interposed a rocking arm or lever Q, which carries a small roll q' for reducing the friction between the two parts. The rock-shaft O is journaled in a suitable bearing, (as in a bracket R,) and carries at its opposite end an arm or lever S, which is arranged to give a slight endwise motion to the sliding spindle E for the purpose of moving the clamping-chuck D from the encircling bell-mouth or spindle C, in order to release its grasp of the steel strip, as will be understood by the description of the chuck, to be given hereinafter. Around the spindle C and between the two bearings b b' is a spiral spring T, which is somewhat compressed and held between the collar U, which is made fast to the spindle C, and another collar C', which is free on said spindle C, and by the elastic expanding action of spring T is forced against the key F, which, bearing against one end of the mortise on slide-spindle E, gives it sufficient endwise motion to draw the chuck D hard into the mouth of the outer spindle C. The before-mentioned chuck D is made with a body c, one end of which is screw-threaded, so as to screw into the end of slide-spindle E. The other end of the chuck is enlarged to form a sort of face plate or flange e.

In an axial groove in the body of the chuck is hinged a clamping lever or jaw e', which projects through the face-plate and has its extreme end hollowed or concaved, so as to partly inclose a fixed pin, which forms a part of the body of the chuck, this fixed pin and hinged lever together acting as jaws to grasp and hold the strip of steel to be bent. That portion of the body of the chuck just back of the flange is formed with a bevel or taper to correspond with the mouth of spindle C. The outer edge of the clamping-lever e' is also made with a like bevel or angle. As the chuck is pushed partly from the mouth of the spindle, the clamping-lever is, by means of a spring e^3, caused to open and release its hold.

While the removable jaw is preferably constructed as above described, I do not limit myself to that particular form, as it is evident that the movable jaw might be constructed to slide in a suitable radial groove of the flange e, as shown in Fig. 7, or it might be hinged to or in the flange or face-plate, as is represented in Fig. 8.

The action of the machine is as follows: When the machine is in readiness for use, the crank-pin will be on its center—*i. e.*, at its extreme back position, and of course the toothed sector at its farthest backward limit. At this time the little roll, which bears on the cam-shaped periphery of the face-plate, will rest on the high part of the cam, but at its extreme point. When in this position, the cam will have forced down the arm on the rock-shaft and give a corresponding movement to the arm S, which, pressing against the protruding end of sliding spindle, moves it lengthwise, carrying with it the chuck D and allowing the clamping lever or jaw to open, as shown in Fig. 2. The operator now takes the steel strip or mainspring (to be) and inserts its end between the movable clamping-jaw and the fixed jaw, holding the edge of the strip in contact with the large flange e of the chuck. Then by means of any suitable means, as a foot-treadle, the clutch is brought into action and the crank-shaft commences to revolve. The high part of the cam immediately passes from the depressed roll and allows the lever on the rear end of the rock-shaft to rise, which it will be forced to do by the expansive action of the spiral spring on spindle C, acting through the key F and slide-spindle E and arm S of rock-shaft. This movement of the slide-spindle has the effect to cause the clamping-jaw e' of the chuck to grasp the inserted steel grip firmly, and by the time this has been effected the movement of the crank will have sufficed to carry the connecting-roll I so far as to have taken up the lost motion on pitman L, which will then be put in motion, causing the toothed sector to swing and carry with it the pinion N, so giving about one-half a revolution to spindle C. The crank-shaft having now accomplished a half-revolution, the driving-clutch is automatically disengaged and the crank-shaft is stopped with the little roll q', just forced down again by the high part of cam H, and by means of the levers and rock-shaft previously described the chuck D will have been opened, so as to allow the removal of the steel strip which had been carried partly around the round pin forming the fixed jaw of the chuck. The bent strip is then removed, the driving-clutch again brought into engagement, serving to again revolve the crank-shaft, which, when it reaches its original position, is again automatically stopped and the operation repeated *ad libitum*. It will be noted that upon the second operation of the spindle to bring the parts back to their original position the toothed sector will give the spindle a rotary motion in a direction contrary to that given it in effecting the bending of the end of the spring. As I make no claim to the clutch, (any convenient form of which may be employed,) I do not give its description.

Having now described the machine, what I desire to claim as new and patentable is—

1. A mainspring-bending-machine comprising in its construction a rotary spindle provided with a chuck consisting of two members or jaws, one of which is provided with a rounded projection or pin and the other with a concaved or hollowed part fitting upon the said pin, as set forth.

2. A mainspring-bending machine comprising in its construction a rotary spindle pro-

vided with a chuck consisting of two members or jaws, one of which is fixed or stationary and the other constructed as a movable clamping-lever, and one being provided with a rounded projection or pin and the other with a concaved or hollowed part fitting upon the said pin, and means for clamping the jaws together and separating the same, as set forth.

3. A mainspring-bending machine comprising in its construction a rotary spindle provided with a chuck consisting of two members or jaws, one of which is provided with a rounded projection or pin and the other with a concaved or hollowed part fitting upon the said pin, and a flange *e*, extending laterally from the said jaws, as set forth.

4. A mainspring-bending machine comprising in its construction a rotary and longitudinally-movable spindle E, provided at one end with a chuck consisting of two members or jaws, one of which is provided with a rounded projection or pin and the other with a concaved or hollowed part fitting upon the said pin, a hollow spindle in which the spindle E is arranged to move longitudinally, the said hollow spindle being provided with a bell-mouthed seat and the members of the chuck being constructed to conform to the said bell-mouthed seat, and means for imparting a rotary and longitudinal movement to the spindle E, as set forth.

5. A mainspring-bending machine comprising in its construction a rotary spindle provided with a chuck consisting of two members or jaws, one of which is provided with a rounded projection or pin and the other with a concaved or hollowed part fitting upon the said pin, and means for first clamping one jaw upon the other and then imparting a rotary movement to the spindle, as set forth.

6. In a mainspring-bending machine, a chuck-carrying spindle provided with a chuck having curved jaws adapting it to grasp the end of a spring and impart a curve thereto, the said spindle having a reciprocating rotary motion, and means, as a toothed sector, for giving the said spindle a portion of a revolution in each direction, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 12th day of October, A. D. 1891.

EDWARD A. MARSH.

Witnesses:

ARTHUR W. CROSSLEY,

A. D. HARRISON.