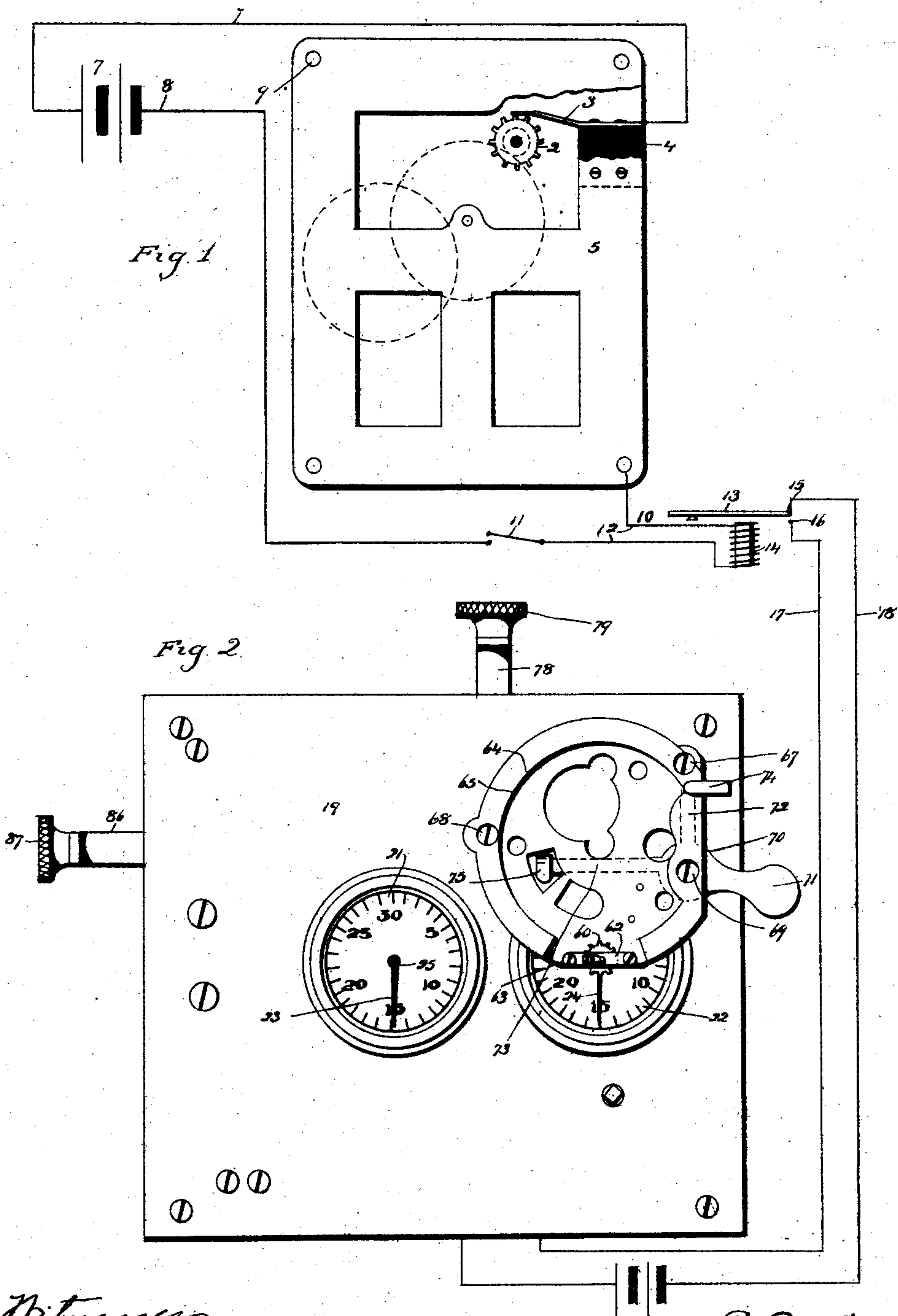


W. E. PORTER.  
ELECTRICAL APPARATUS FOR TIMING WATCHES AND CLOCKS.  
APPLICATION FILED APR. 27, 1908.

906,927.

Patented Dec. 15, 1908.

3 SHEETS—SHEET 1.



Witnesses  
C. J. Reed.  
L. L. Reed

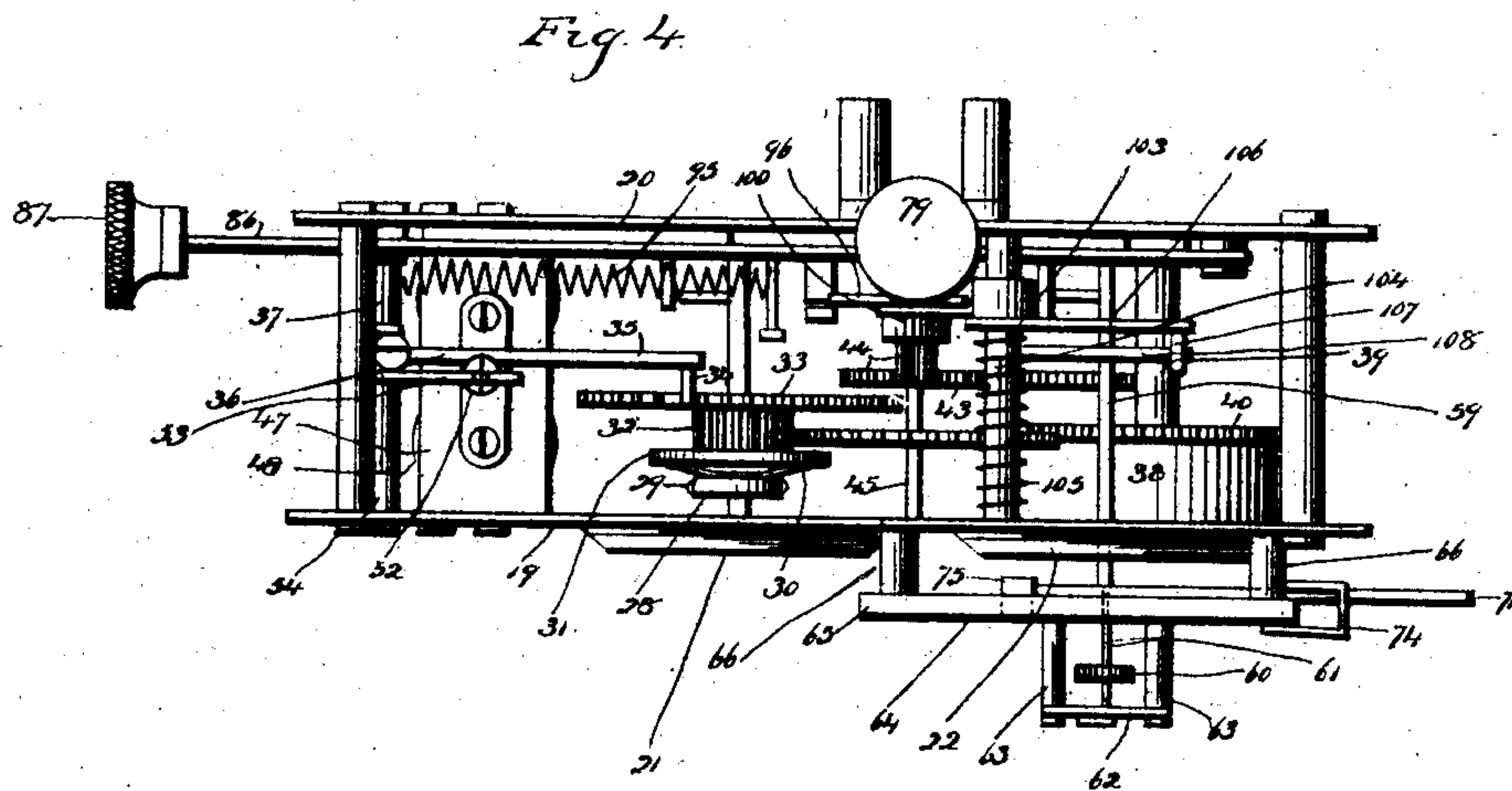
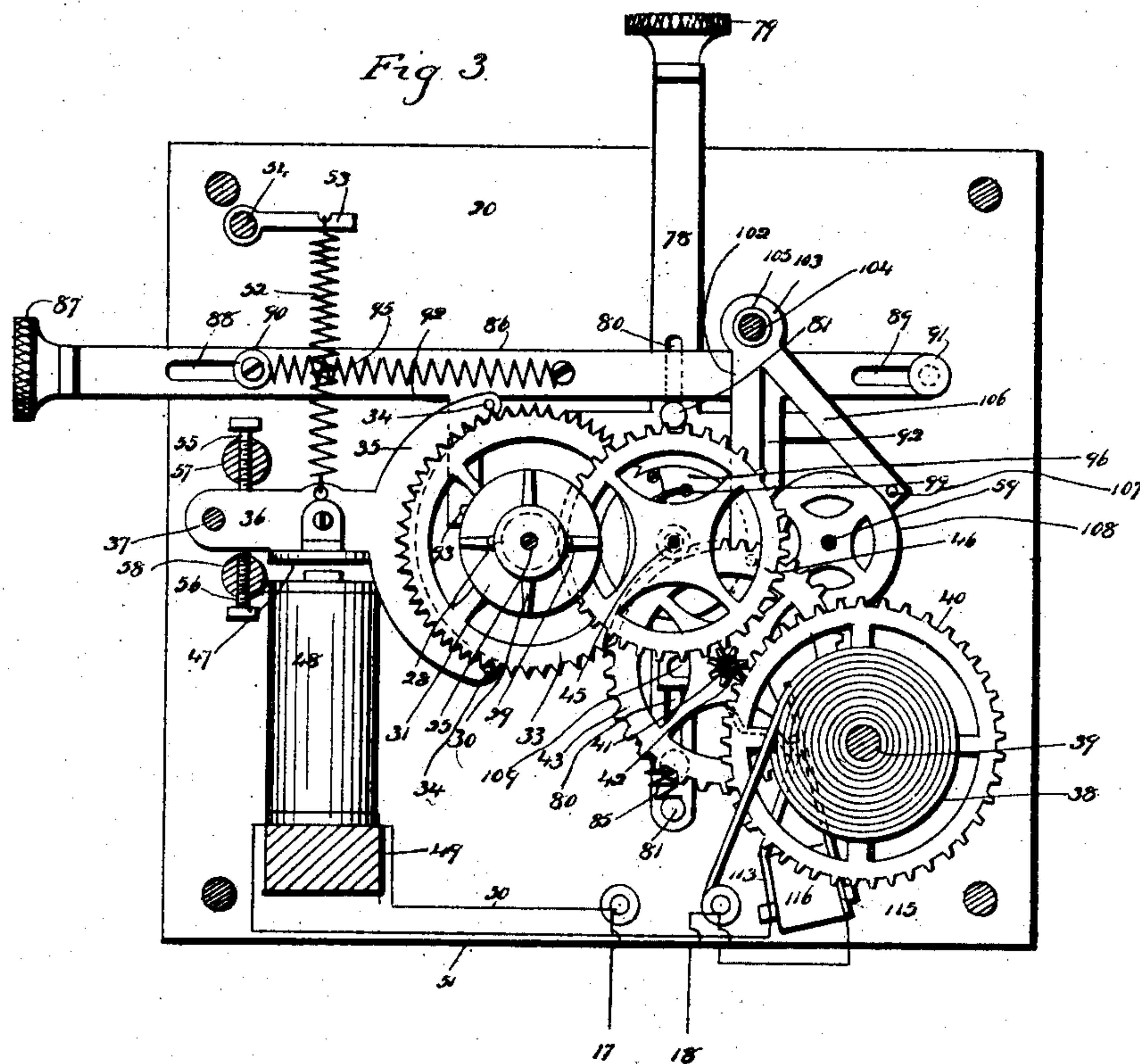
Wilson E. Porter  
Inventor  
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3 SHEETS—SHEET 2.



Witnesses  
C. J. Reed.  
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W. E. Porter  
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Attys

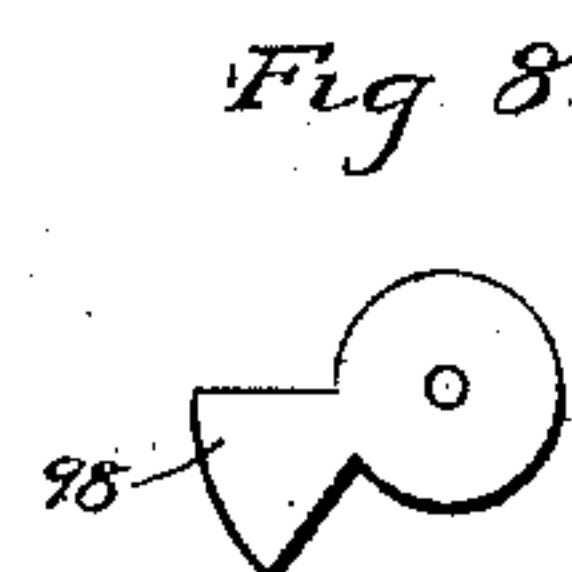
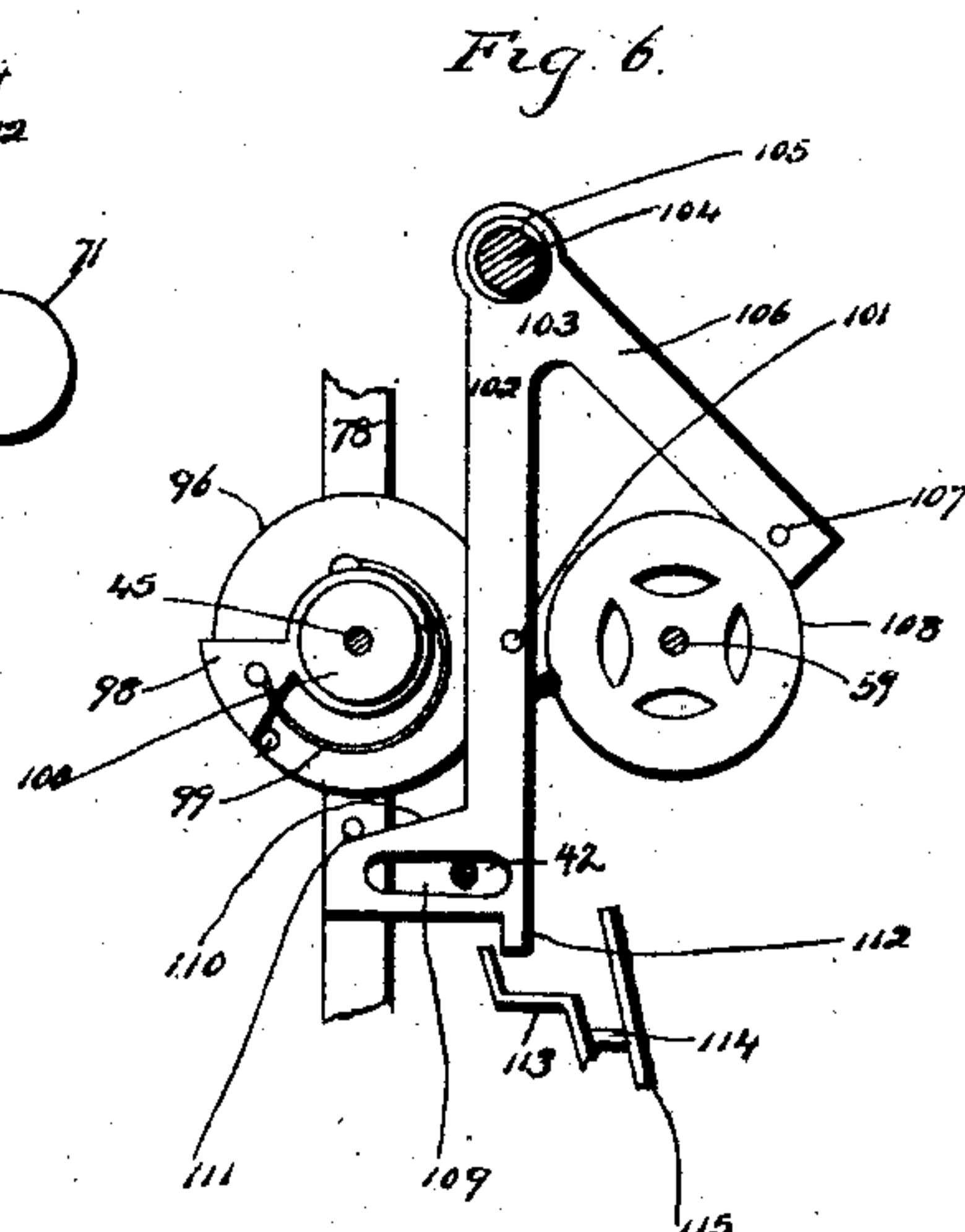
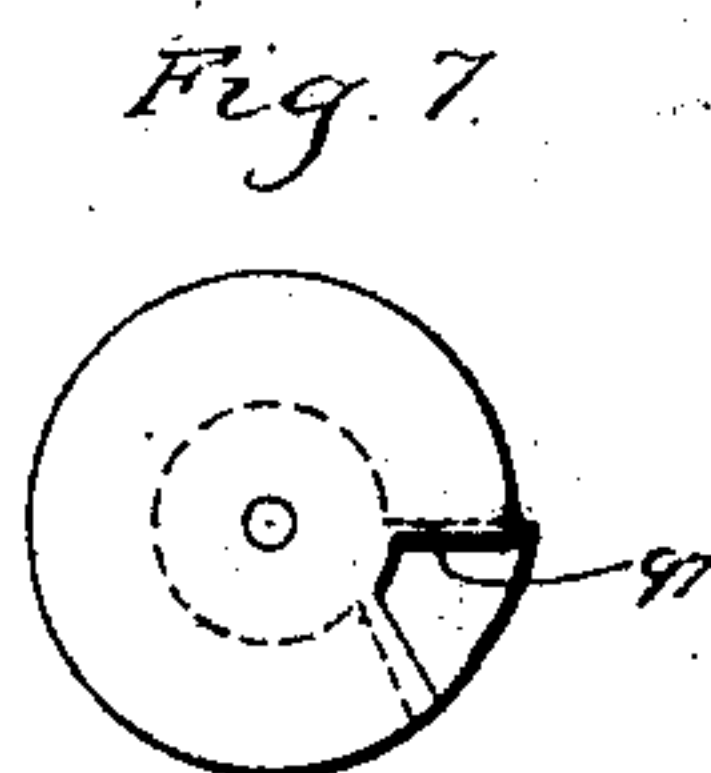
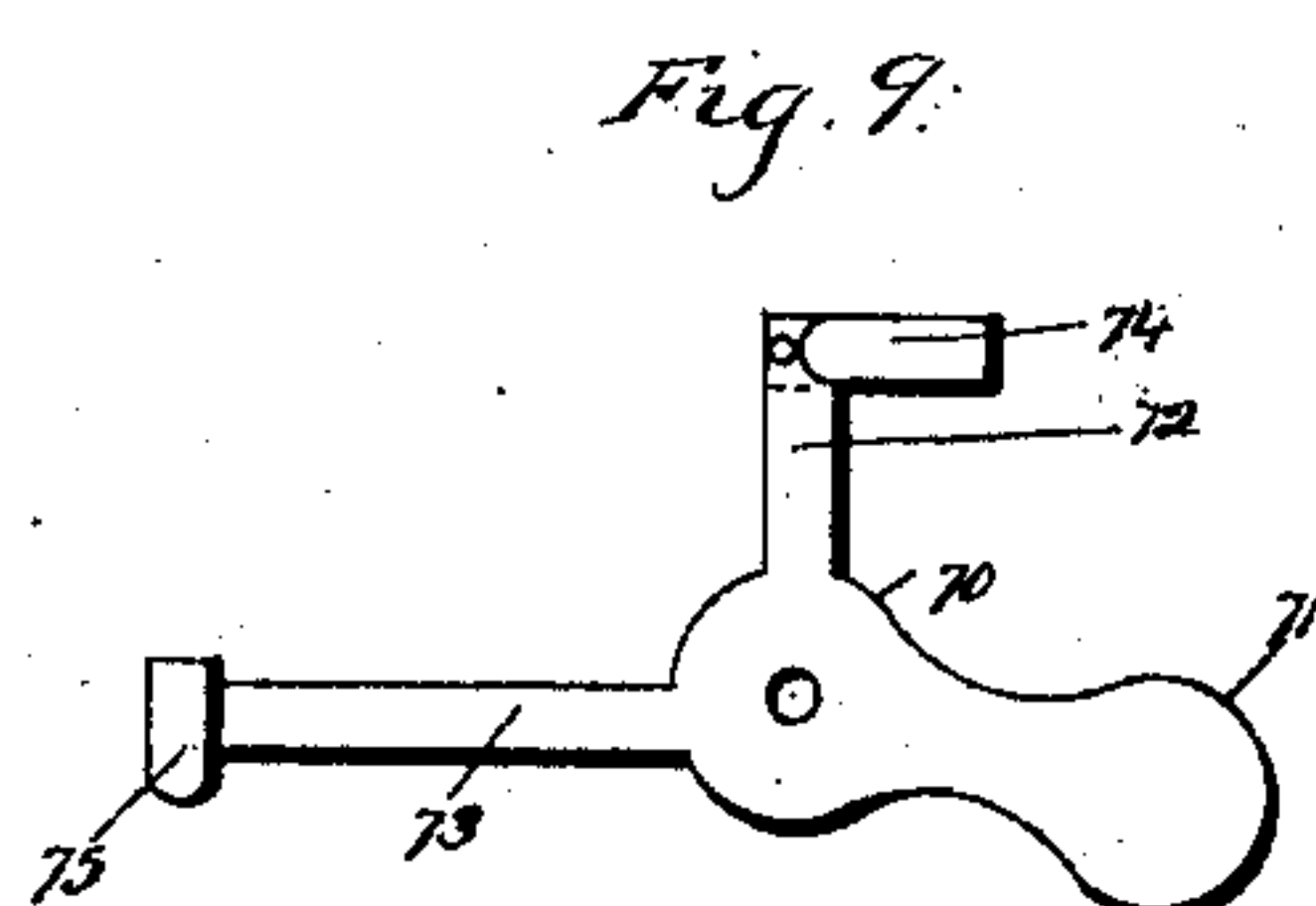
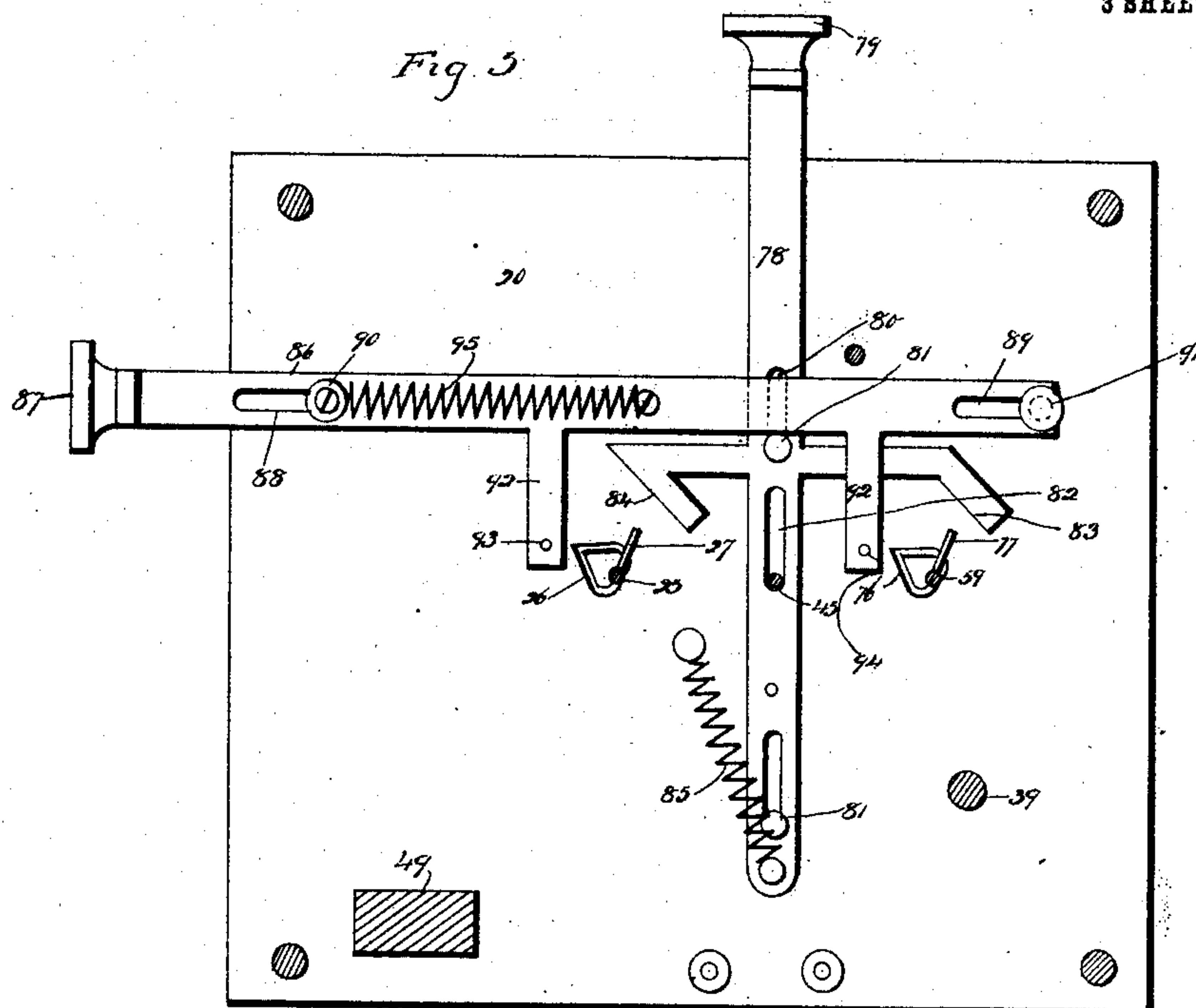
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3 SHEETS—SHEET 3.



Witnesses  
C. J. Reed.  
C. L. Reed

W. E. Porter  
Inventor  
by Seymour T. Carr  
Attorney



# UNITED STATES PATENT OFFICE.

WILSON E. PORTER, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO NEW HAVEN CLOCK CO.,  
OF NEW HAVEN, CONNECTICUT, A CORPORATION.

## ELECTRICAL APPARATUS FOR TIMING WATCHES AND CLOCKS.

No. 906,927.

Specification of Letters Patent.

Patented Dec. 15, 1908.

Application filed April 27, 1908. Serial No. 429,541.

*To all whom it may concern:*

Be it known that I, WILSON E. PORTER, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented a new and useful Improvement in Electrical Apparatus for Timing Watches and Clocks; and I do hereby declare the following, when taken in connection with the accompanying drawings and the letters of reference marked thereon, to be a full, clear, and exact description of the same, and which said drawings constitute part of this specification, and represent, in—

Figure 1, a view in elevation of a portion of the movement of a master-clock such as may be used in conjunction with my invention, one of the plates of the clock being broken away to show its make-or-break wheel. Fig. 2 a view in front elevation of a timing-mechanism constructed in accordance with my invention, it being understood that a series of such mechanisms will be electrically connected with the master-clock. Fig. 3 a view of the timing-mechanism with its front plate removed. Fig. 4 a plan view of the timing-mechanism. Fig. 5 a detail view of the timing-mechanism looking at the inner face of its back plate and showing its preliminary and final positioning slides. Fig. 6 a detail view showing the stop-disk, co-acting shutter and the stop-wheel of the timing-mechanism, together with their immediate co-acting parts. Fig. 7 a detail view of the stop-disk. Fig. 8 a corresponding view of the oscillating shutter of the stop-disk. Fig. 9 a detail view of the clamping-lever of the time-piece holder.

My invention relates to an improvement in electrical apparatus for timing watches and clocks from a master-clock, the object of the invention being to facilitate this work, to secure more accurate results, to minimize the nervous strain upon the "timers", and to enable the work to be carried on largely independent of the shop noises without decreasing its efficiency.

With these ends in view my invention consists in the combination with a master clock, of a spring-actuated timing mechanism released for operation under the electric control of the master-clock and provided with a rated pointer driven in unison with the master-clock, with a rating-pointer driven by the time-piece to be rated, with

means for positioning the said pointers for starting them in unison, and with means for stopping them at a predetermined time for the purpose of comparison.

My invention further consists in certain details of construction and combinations of parts as will be hereinafter described and pointed out in the claims.

In carrying out my invention as herein shown, I employ a master-clock which may be of any approved construction and which it is unnecessary for me to show in detail or to explain further than its provision with a make-or-break wheel 2 constructed and arranged as may be necessary to make or break an electric circuit for every beat of the clock, the circuit being made or broken on one beat, and broken or made on the next beat, as the case may be. The teeth of this wheel are engaged by a delicate contact-spring 3 mounted upon an insulating block 4 secured to the movement-plate 5 of the clock. A wire 6 leads from the contact-spring 3 to one pole of the battery 7, the other pole of which is connected by a wire 8 to a switch 11 connected by a wire 12 to a circuit-breaker in the form, as shown, of the sounder of an ordinary telegraph apparatus and consisting of an armature 13, a magnet 14 and contact points 15 and 16 respectively connected with wires 17 and 18 which form, as it were, main feed wires from which other wires lead to all of the clock-like timing-mechanisms of the series. A wire 10 leads from the movement-plate 5 to the magnet 14 and so places the master-clock in the circuit. These clock-like timing mechanisms which are all alike will ordinarily be placed at convenient distances apart upon the long bench at which the "timers" sit, each "timer" confining his attention to the timing-mechanism before him. All of these timing-mechanisms will be operated in absolute unison from the master-clock so that there will be no variation of beat between them. As these timing-mechanisms are duplicates of each other, it will be sufficient for my present purpose to describe one of them.

Each timing-mechanism has a front plate 19 and a back plate 20 corresponding to the front and back movement-plates of a clock-movement and each is provided upon its front plate with two corresponding dials 21 and 22 arranged side by side and correspondingly graduated. As shown the circle



of each dial is divided into 30 spaces numbered 5, 10, 15, 20, 25 and 30. The dial 21 is swept by a rated-pointer 23 which will, under the control of the master-clock, sweep the dial once in 30 seconds. On the other hand, the dial 22 will be swept by a rating-pointer 24 approximately once in 30 seconds but a trifle faster or a trifle slower according as the beat of the time-piece being rated is faster or slower than the beat of the master-clock. The said rated-pointer 23 is fixed to the projecting forward end of a shaft or arbor 25 provided at its rear end with a heart-shaped preliminary positioning cam 26 and a final positioning pin 27. The said arbor 25 has mounted upon its forward end a hub 28 fixed upon it by means of screws 29 and carrying a spider-like friction spring 30 the arms of which engage with the forward face of friction disk 31 rigid with the forward end of a pinion 32 the rear end of which carries an escapement-wheel 33 turning from left to right and having its teeth engaged by pallet pins 34 located in the ends of a yoke-shaped pallet 35 having a horizontal arm 36 mounted upon a horizontal rock shaft 37 journaled in the front and back plates 19 and 20. As the pallet 35 is oscillated its pins 34 are alternately cleared from the teeth of the escapement-wheel 33, whereby the same is permitted to be turned by the main spring 38 which is wound upon an ordinary winding arbor 39 and connected with the wheel 33 through a train of any approved construction, herein shown as consisting of a main wheel 40 meshing into a pinion 41 mounted on an arbor 42 carrying a second wheel 43 meshing into a pinion 44 on an arbor 45 carrying a wheel 46 meshing into the pinion 32 before mentioned. Under this construction the spring 38 exerts a constant effort to rotate the escapement-wheel 33 which is restrained, however, by the pallet pins 34 and allowed to rotate only as the oscillation of the pallet 35 permits the wheel to "escape."

For the oscillation of the pallet I provide it with an armature 47 located adjacent to the poles of a small magnet 48 supported upon a horizontal bridge 49 extending between the front and back plates 19 and 20, the said magnet being connected by wires 50, 51, with the main feed wires 17 and 18 before referred to. Every time the magnet 48 is energized by the closing of a circuit in the master-clock it attracts the armature 47 and pulls the pallet 35 downward against the tension of the pallet-spring 52 whereby the lower pallet pin 34 is disengaged from the escapement-wheel 33 which escapes one tooth and is then caught by the engagement of the same pin with the succeeding tooth consequently upon the demagnetization of the magnet and the lifting of the pallet by the spring 52 the lower end of which is con-

nected with the pallet arm 36 and the upper end of which is connected with the arm 53 carried by an arbor 54. Adjusting screws 55 and 56 mounted in pillars 57 and 58 are provided for regulating the oscillation of the arm 36 and hence of the pallet 35.

It will be seen from the foregoing that the power required for operating the rated-pointer 23 is entirely derived from the spring 38, the electric current being depended upon for nothing more than the operation of the pallet 35 by which the escapement-wheel 33 is released, but the rated-pointer 23 is nevertheless swept over the dial 21 in perfect unison with the beats of the master-clock.

The rating pointer 24 which sweeps the dial 22 is mounted upon an arbor 59 which projects through the dial 22. For the actuation of this arbor by the time-piece to be rated, I apply to its projecting forward end a pinion 60 having a long split sleeve 61 which grips the arbor sufficiently to transmit the movement of the time-piece to be rated to it, but yields to permit the arbor to be turned independently of the said pinion as required for positioning the rating-pointer 24 with respect to the rated-pointer 23 at the time of starting. The outer end of the arbor 59 is supported by a bridge 62 uniting the outer ends of two parallel horizontal studs 63, 63, mounted in the lower portion of a skeletonized plate 64 having a rim-like retaining shoulder 65 conforming to one of the plates of the time-piece to be rated. The said plate 64 will be skeletonized or cut away according to the clearance required for the time-piece to be rated, whether that is a small clock or watch-movement. The said plate is secured to and set forward from the movement-plate 19 upon short pillars 66 receiving screw studs 67, 68 and 69. Upon the stud 69 I mount a clamping-lever 70 having a handle 71 and two arms 72 and 73 carrying spring clamping-fingers 74 75 projecting forward through openings in the plate 64 in position to engage with that plate of the time-piece to be rated which is applied directly to the skeletonized plate 64 and held against lateral displacement thereon by the positioning shoulder 65. When the time-piece to be rated has been clamped upon the plate 64 as described, one of its wheels or pinions will mesh into the pinion 60 so as to rotate the arbor 59 and hence cause the rating-pointer 24 to be swept over the dial 22 in unison with the beats of the time-piece to be rated.

In order to compare the rate of the time-piece to be rated with the rate of the master-clock, it is necessary that the rated and rating pointers be started in unison. For this purpose I employ positioning mechanism comprising the heart-shaped preliminary positioning cam 26 and the final positioning



pin 27 upon the arbor 25 as already described. Upon the arbor 59 I locate a corresponding heart-shaped preliminary positioning cam 76 and a final positioning pin 77. For co-action with the cams 26 and 76 I employ a vertically arranged preliminary positioning lever or slide 78 furnished at its outer end with a finger button 79 and provided with slots 80 by means of which it is secured by headed studs 81, 81, upon the inner face of the back movement plate 20, the lever being also formed with a slot 82 for clearing the arbor 45. For co-action with the cams 26 and 76 the lever is provided with inclined arms 83 and 84 respectively. When the lever is depressed the said arms 83 and 84 engage with the said cams 26 and 76 whereby the same, being correspondingly set with respect to each other, respectively turn the arbors 25 and 59 against the friction of the spring 30 and the split stem 61 of the pinion 60 so as to bring the rated and rating pointers 23 and 24 into corresponding positions over the dials 21 and 22. At this time the arbor 25 is turned one way or the other within the pinion 32 and the escapement wheel 33 without disturbing the same, while the arbor 59 is turned in one way or the other within the split sleeve 61 without disturbing the pinion 60. A spring 85 connected with the lower end of the lever 78 is provided for normally supporting it in its elevated position in which its arms 83 and 84 clear the positioning cams 26 and 76. The parts just described are employed for the preliminary positioning of the two pointers whereby they are brought into corresponding positions to the rear of their zero or starting positions.

For moving the two pointers from their preliminary into their starting positions, I employ a horizontally arranged final positioning lever or slide 86 having a finger button 87 at its outer end and formed with slots 88 and 89 receiving headed studs 90 and 91 by which the slide is connected with the inner face of the back movement plate 20 at a point sufficiently in front of the same to clear the vertically movable slide 58 already described. The slide 86 is provided with depending arms 92 furnished with pins 93 and 94, the pin 93 being located to the left of the final positioning pin 27, and the pin 94 being located to the left of the final positioning pin 77. When the slide 86 is pushed from left to right against the tension of its spring 95, its pins 93 and 94 engage with the pins 27 and 77 and turn the arbors 25 and 59 from left to right against the friction of the spring 30 and the split sleeve 60 whereby the rating and rated pointers 23 and 24 are simultaneously brought into their zero positions. This movement of the two pointers in no wise interferes with the operation of the master clock and the time-piece to be

rated except that the two pointers are as it were crowded ahead faster than they otherwise would be operated.

The two pointers having been started in unison they are allowed to run a predetermined time after which they are simultaneously stopped to permit their comparison from which the "timer" gets the rate of the time-piece to be rated, using it for the adjustment of the hair spring of the same. In order to stop the two pointers simultaneously, I employ a stop-mechanism comprising a stop-disk 96 mounted on the arbor 45 and having a stop-notch 97 normally closed by an oscillating shutter 98 actuated by a spring 99 and interposed between the outer face of the wheel 96 and a collet 100 mounted upon the arbor 45. The oscillating shutter 98 projects just enough beyond the periphery of the disk 96 to engage with a stop-pin 101 in the cut-out arm 102 of a two-armed oscillating lever 103 mounted upon an arbor 104 and operated by a helical spring 105 encircling the said arbor. The stop-arm 106 of the lever 103 carries a stop-pin 107 normally held out of engagement with the roughened edge of a stop-wheel 108 mounted on the arbor 59 carrying the rating-pointer 24. The lower end of the cut-out arm 102 is formed with a slot 109 for the clearance of the arbor 42 of the second wheel 43, with an incline 110 for co-action with a pin 111 mounted in the slide 78, and with a cut-off finger 112 which engages with the upper end of a contact spring 113 and springs the same away from a contact pin 114 carried by an arm 115, the said spring 113 and arm 115 being secured to an insulating block 116 and located in the circuit of the wire 51. Normally the engagement of the pin 101 with the edge of the disk 96 and the edge of the shutter 98, keeps the two-armed lever 103 swung, against the tension of its spring 105, to the limit of its movement to the left whereby its pin 107 is held out of engagement with the rating-pointer stop-wheel 108 and whereby the cut-out finger 112 is held out of engagement with the contact spring 113. Just before the disk 96 completes a revolution, the pin 101 will engage with the edge of the shutter 98 and stop the same. The disk, however, will continue to rotate and will very soon bring its slot 97 under the pin 101 which will drop into it, the lever 103 being swung from right to left by the spring 105 whereby the pin 107 engages with the wheel 108 and stops the rating-pointer 24 and whereby the finger 112 engages with the spring 113 and breaks the circuit through the magnet 48 and so stops the rated-pointer 23. The parts will remain in these positions until the lever 78 is pushed downward, when the pin 111 acting on the incline 110 will swing the lever 103 from left to right and lift its pin 107 away



from the wheel 108, thus releasing the rating-pointer. As the lever 103 swings from left to right the pin 101 is lifted out of the notch 97 leaving the shutter 98 free to be quickly shot by its spring 99 into its normal position in which it closes the notch 97. Now when downward pressure upon the slide 78 is removed the lever 103 will be swung from right to left by its spring 105, but only for a short distance as this movement is arrested by the engagement of the pin 101 with the edge of the shutter 98. This prevents the pin 107 and finger 112 from functioning again until the disk 96 has completed a revolution and the shutter 98 has been pushed out of the way by the pin 101 to expose the slot 97.

Although the description of the timing-mechanism has been interspersed with descriptions of its operation, I will briefly set forth the method of using my improved timing apparatus.

The master-clock being located in any convenient position and connected with a series of timing mechanisms such as described, they will have their rated-pointers actuated in unison with the beats of the master-clock except as any one or more of them may be temporarily short-circuited in the manner described. As all of the timing mechanisms are just alike, the rating of one time-piece by the "timer" will explain the use of all. The "timer" first applies the time-piece to be rated to the plate 64 of the time-piece holder and clamps it thereupon by means of the handle 71, whereby one of the wheels or pinions of the time-piece to be rated will be meshed into the transmitting pinion 60. The "timer" now uses the finger button 79 to depress the slide 78, whereby the pin 111 riding over the incline 110 swings the two-armed lever 103 from left to right against the tension of the spring 105 and so lifts the pin 101 out of the slot 97 and permits the shutter 98 to be shot by its spring 99 under the pin 101. The swinging movement of the lever 103 from left to right has lifted the pin 107 away from the wheel 108 and the finger 112 away from the contact spring 113, thus releasing the rating-pointer 24 to be driven by the time-piece to be rated through the pinion 60 and closing the circuit through the magnet 48 the intermittent energization of which from the master-clock will now operate the pallet 35 in permitting the wheel 33 to escape. The depression of the slide 78 has also effected through its arms 83 and 84 and cams 26 and 76, the preliminary positioning of the rated and rating pointers which are now brought into their final or starting positions by the "timer" who for this purpose pushes the slide 86 inward, whereby the two pointers are simultaneously brought to their zero positions on the dials 21 and 22, their zero positions be-

ing over the marks 15 as shown on the dials illustrated. Both pointers having been thus crowded ahead into corresponding positions, now start even and the rated-pointer 23 will run ahead of or lag behind the rating pointer 24 according as the rated time-piece is running slower or faster than the master-clock. The two pointers are allowed to run together in this way for two minutes, the time required for the revolution of the stop disk 96, as the mechanism shown is constructed, though that time may be varied as desired. Before the disk 96 completes a revolution the slightly projecting edge of the shutter 98 will engage with the pin 101 stopping the rotation of the shutter with the disk but not stopping the rotation of the disk, the further rotation of which brings its notch 96 under the pin 101 just as the time—two minutes—is up. The instant the pin 101 drops into the notches 97 the spring 105 will operate to swing the two-armed lever 103 from left to right and so engage the pin 107 with the wheel 108 and the finger 112 with the spring 113 whereby the two pointers will be simultaneously stopped, leaving the performance of the time-piece to be rated recorded upon the dials in so far as by their comparison they will now show to the "timer" how far the rate of the time-piece to be rated varies from the rate of the master clock. The "timer" now adjusts the hair spring of the time-piece to be rated as required and repeats the operation above described. This he does over and over until the rate of the time-piece to be rated is so nearly the same as the rate of the master-clock that the difference may be taken care of by its regulator in the ordinary way. Under no circumstances does the "timer" expect to do more than to bring the regulation of the time-piece within the scope of the correcting function of its own regulator.

I claim:—

1. In an electric apparatus for timing watches and clocks, the combination with an electric circuit, of a master-clock, located in the said circuit a spring-actuated timing-mechanism located in the said circuit and electrically synchronized with the master-clock and provided with a rated-pointer driven in unison with the master-clock, with a rating-pointer driven by the time-piece to be rated, with means for positioning the said pointers for starting them in unison, and with means for stopping them at a predetermined time for the purpose of comparison.

2. In an electric apparatus for timing watches and clocks, the combination with an electric circuit, of a master clock located in the said circuit, a spring-actuated timing-mechanism located in the said circuit and electrically synchronized with the master clock, and adapted to have the watch to be



rated temporarily applied to it and provided with a rated-pointer driven in unison with the master clock, with a rating pointer driven by the time-piece to be rated, with  
5 means for positioning the said pointers for starting them in unison, and with means for stopping them at a predetermined time for the purpose of comparison.

3. In an electric apparatus for timing  
10 watches and clocks, the combination with an electric circuit, of a master-clock, located in the said circuit a timing mechanism located in the said circuit and having a spring-actuated train including an escapement-wheel, a  
15 pallet co-acting with the said train, an armature carried by the pallet, a magnet for the armature, the said magnet being controlled

through the said circuit in unison with the beats of the master-clock, a rated-pointer driven by the said train in unison with the  
20 master clock, a rating-pointer driven by the time-piece to be rated which is applied to the said timing mechanism, means for positioning the said pointers for starting them in unison, and means for stopping them at  
25 a predetermined time for the purpose of comparison.

In testimony whereof, I have signed this specification in the presence of two subscribing witnesses.

WILSON E. PORTER.

Witnesses:

GEORGE DUDLEY SEYMOUR,  
CLARA L. WEED.