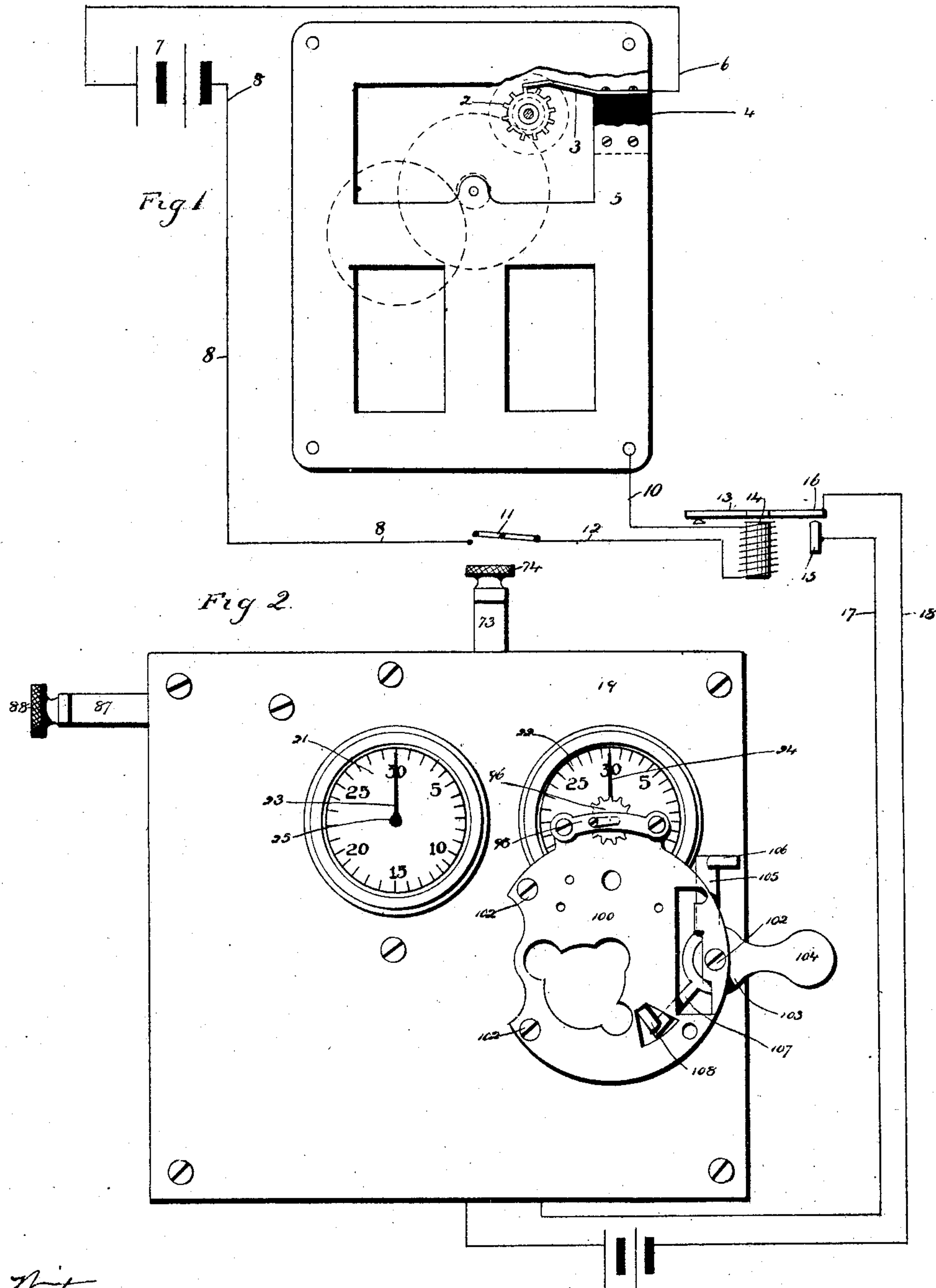


W. E. PORTER.  
ELECTRICAL APPARATUS FOR TIMING CLOCKS AND WATCHES.  
APPLICATION FILED APR. 27, 1908.

906,926.

Patented Dec. 15, 1908.

3 SHEETS—SHEET 1.



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

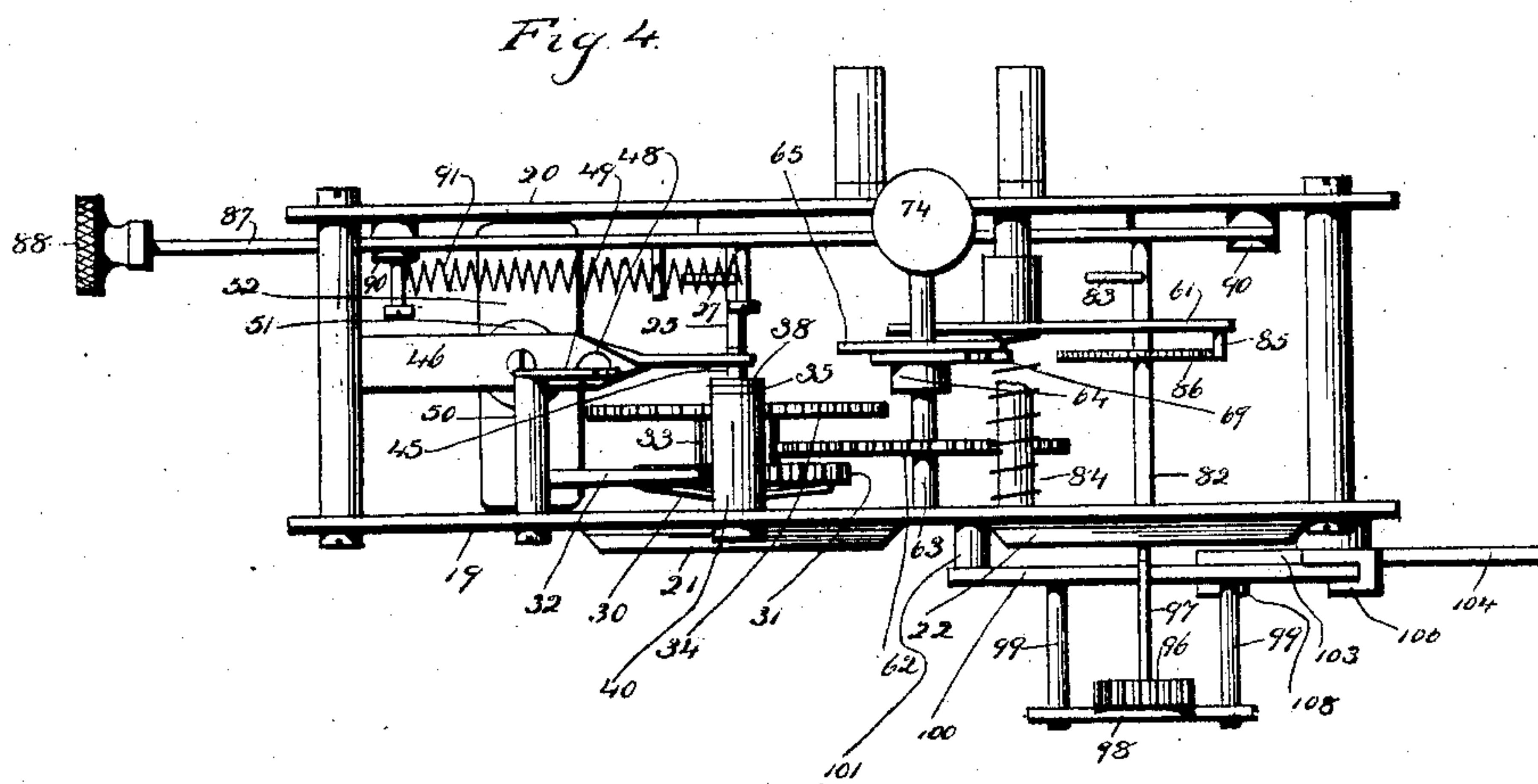
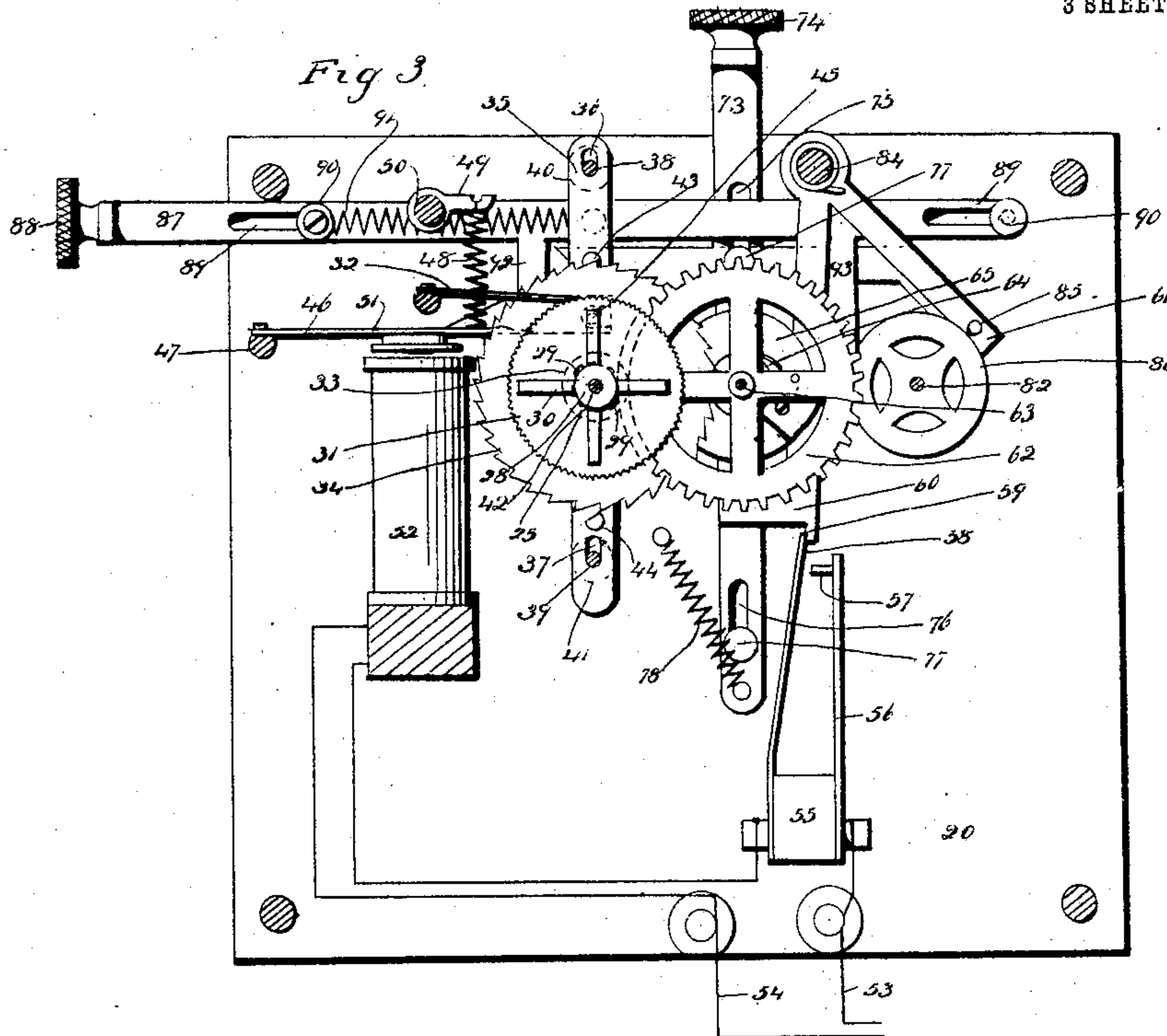
Wilson E. Porter  
Inventor  
by Seymour T. Carey  
Att'y

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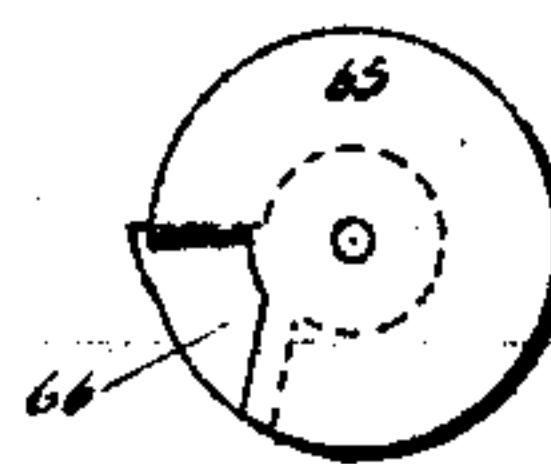
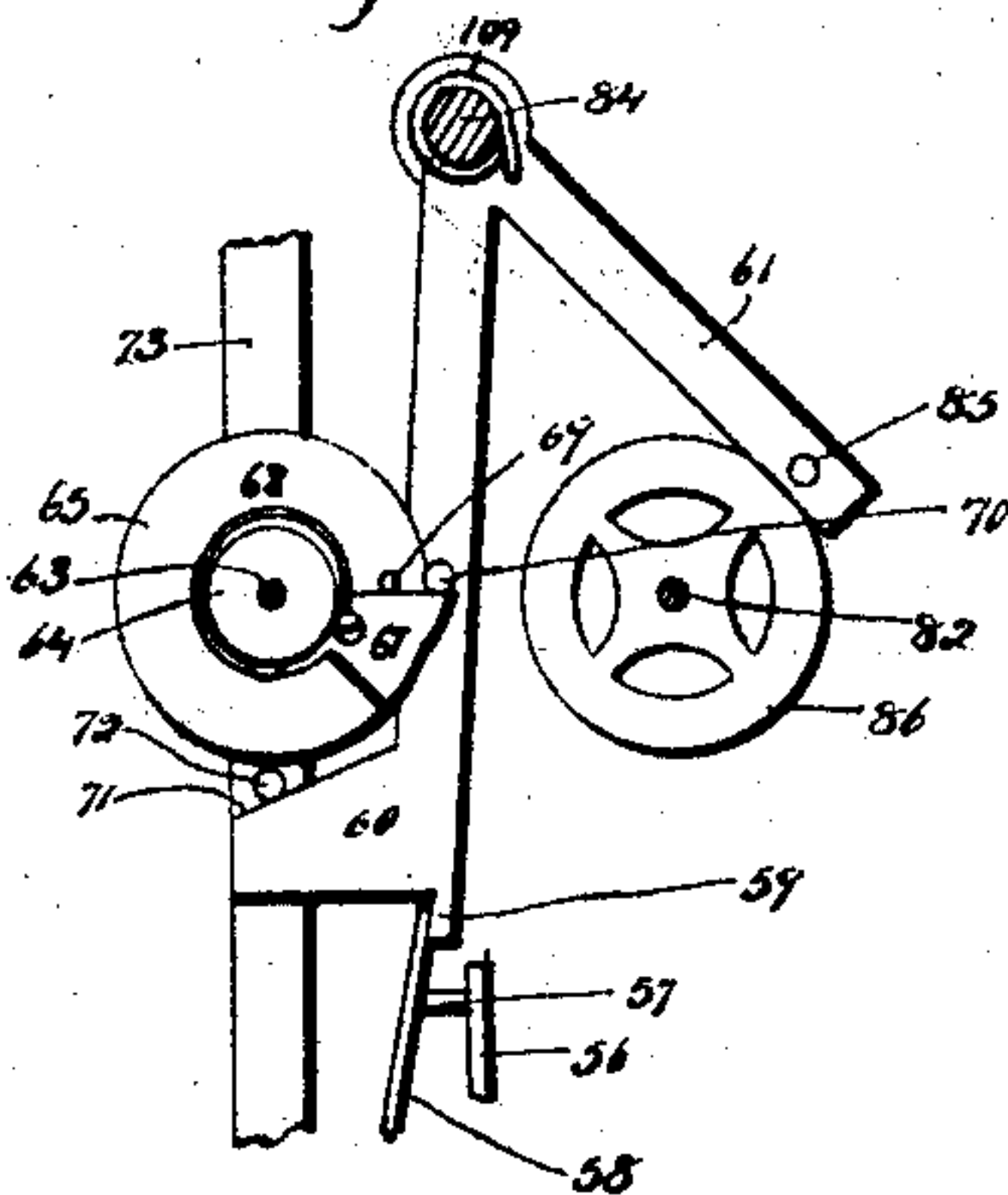
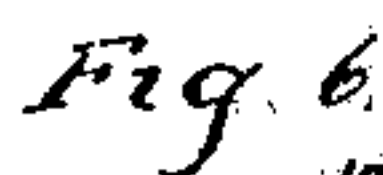
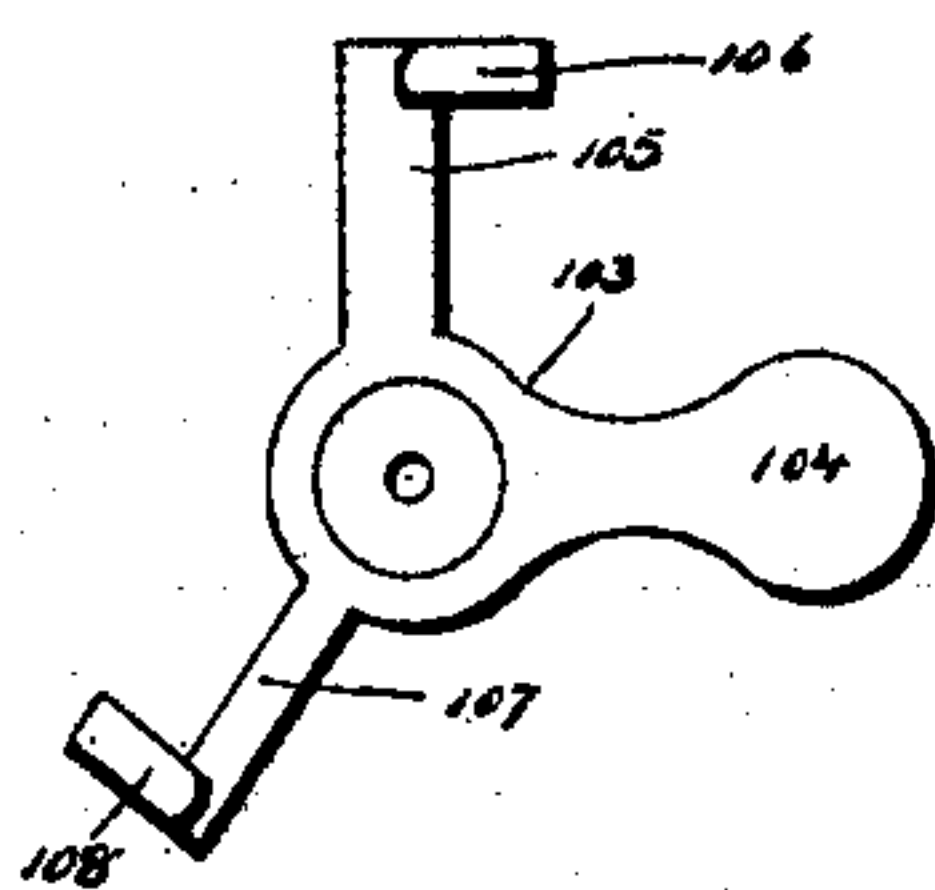


Witnesses  
C. J. Reed.  
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**906,926.**

3 SHEETS—SHEET 3.



Witnesses  
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# 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 CLOCKS AND WATCHES.

No. 906,926.

Specification of Letters Patent.

Patented Dec. 15, 1908.

Application filed April 27, 1908. Serial No. 429,540.

*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 Clocks and Watches; 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 current-interrupting 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 its inner face of its back plate and showing its preliminary and final positioning slides. Fig. 6 a detail view showing the stop-disk, coacting 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 detail view of the clamping lever of the time-piece holder.

My invention relates to an improvement in electrical apparatus for timing clocks and watches from a master-clock.

Heretofore clocks and watches have been rated by expert workmen called "timers", who compare by ear the beat of the clock or watch being timed with the beat of a standard time-piece before them or within their hearing, the problem of the timer being to adjust the hair-spring of the clock or watch being timed until the same beats in unison with the standard time-piece. The timer must exclude as far as possible all other sounds from his ear so as to compare the beating of the standard time-piece with the clock or watch being timed and as many timers work at the same bench the work becomes one of great nervous tension and

varies in accuracy according to the personal equation; the sense of hearing is not alike in any two persons.

The object of my present invention is to simplify this work and make it more accurate by giving it a more mechanical character providing for a visual comparison of the variations in the beating of the standard time-piece and the piece being timed, whereby the personal equation of the timer is largely eliminated and the work done not only more rapidly and accurately, but also with far less nervous strain.

With these ends in view my invention consists in the combination with a master-clock, of a timing-mechanism provided with a rated pointer driven in unison with the master-clock under the electric control thereof, a rating pointer driven by the time-piece to be rated, means for positioning the said pointers for starting them in unison and 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, 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 the 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 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 variations 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 a wheel 31 having fine teeth which are engaged by a spring detent 32 in such manner as to prevent the retrograde movement of the wheel. This wheel is made fast to the forward end of a pinion 33 the rear end of which carries an escapement wheel 34, normally turning the arbor from left to right by reason of being frictionally coupled with the shaft through the medium of the spring 30. The shaft 25 is free, however, to be turned in either direction independent of the wheel 34 in the preliminary and final positioning of the pointer 23 as will be hereinafter described. The said escapement wheel 34 is actuated in step-by-step rotation from left to right to cause the rated pointer 23 to sweep over the dial 21 under the control of the master-clock. For this purpose I employ a vertically reciprocating escapement-lever 35 formed at its upper and lower ends with slots 36 and 37 respectively receiving screw studs 38, 39, entering the rear ends of horizontal posts 40, 41, secured to the front plate 19. The said lever is also formed with a central clearance slot 42 through which the arbor 25 passes and provided at a point above and close to the said escapement wheel with an

escapement pallet 43 and at a point below and close to the said wheel by a corresponding escapement pallet 44, these pallets being constructed and arranged so that the upper pallet 43 will, when the lever descends, engage with the teeth of the wheel so as to cause its forward movement through a distance represented by one tooth and so that in the upward movement of the lever, the lower pallet 44 will engage with the teeth of the wheel and cause its forward movement for a distance represented by one tooth, this driving effect being accomplished by the location and pitch of the pallets.

For the vertical reciprocation of the lever 35 it is provided with an operating-pin 45 engaged by the slotted inner end of a horizontally arranged rock-arm 46 secured at its outer end to a rock-shaft 47 mounted in the movement plates 19 and 20. A spring 48 connected at its lower end with the rock-arm 46 is connected at its upper end with an arm 49 carried by a short stud 50 located above the arm 46, the said spring exerting a constant effort to lift the rock-arm 46 and hence the escapement lever 35. For the downward movement of the lever 35 it is provided upon its lower face with an armature 51 located close to the poles of a magnet 52 mounted between the plates 19 and 20 and energized in unison with the pulsations of the master-clock when the circuit thereof is completed through the timing mechanism to which the current is led by wires 53, 54, leading from the main feed wires 17 and 18 before mentioned. The said wire 53 leads to an insulating-block 55 supporting an arm 56 furnished with a contact pin 57 coacting with a delicate contact spring 58 also secured to the block 55 and engaged at its upper end by a finger 59 at the lower end of the cut-out arm 60 of a two-armed lever the other arm 61 of which is a stop arm.

In order that the timing-mechanism may be automatically stopped after a predetermined interval so that the timer may compare the positions of the pointers 23 and 24 and note the variation in the latter from the standard position of the former, I employ a stop-wheel 62 meshing into the pinion 33 aforesaid and mounted upon an arbor 63. A collet 64 rigidly mounted upon the said arbor carries a disk 65 having a stop-notch 66 normally closed by means of an oscillating shutter 67 interposed between the said disk and collet, a spring 68 connected with the shutter exerting a constant effort to hold it in the position in which it closes the notch 66 in the disk 65. A stop-pin 69 mounted in the disk 65 close to one edge of the notch 66 therein stops the shutter in its closed position. The said shutter projects just enough beyond the edge of the disk for engagement and operation by a flattened stop-pin 70 in the cut-out arm 60 which is formed with an



incline or cam 71 coacting with a pin 72 carried by the vertically movable preliminary positioning lever 73 which is furnished at its upper end with a finger button 74 and formed with vertical slots 75 and 76 receiving stud 77 by which it is mounted upon the inner face of the back movement-plate 20. A spring 78 connected with the lower end of the lever and with the said plate 20, exerts a constant effort to lift the lever which is furnished with a cam 79 for co-action with the heart-shaped preliminary positioning cam 26 on the shaft 25 and with a corresponding cam 80 which coacts with a heart-shaped preliminary positioning cam 81 fixed upon the rear end of an arbor 82, also furnished with a final positioning pin 83 corresponding to the pin 27 before mentioned. The stop-arm 61 which is made in one piece with the cut-out arm 60 and oscillates therewith on the arbor 84, is furnished at its lower end with a stop pin 85 which engages with a finely toothed or roughened edge of a stop wheel 86 mounted upon the arbor 82 for stopping the time-piece being rated and hence the rating pointer 24 the instant the pin 70 drops into the stop-notch 66 of the stop-disk 65.

For co-action with the final positioning pins 27 and 83 I employ a horizontally arranged final positioning lever 87 having at its outer end a finger button 88 and formed with slots 89 receiving studs 90 by means of which the lever is mounted upon the inner face of the back movement plate 20. A spring 91 connected with the lever 87 exerts a constant effort to hold it in its retracted or projected position. The said lever is furnished with two downwardly depending arms 92 and 93, the former being provided with a stud 94 for coaction with the pin 27 and the latter being provided with a stud 95 for coaction with the pin 83. When the said lever is pushed inward against the tension of its spring 91, its studs 94, 95 respectively engage with the pins 27 and 83 and turn the arbors 25 and 82 against all frictional restraint, so as to bring the rated and rating pointers 23 and 24 into their zero or setting positions over the dials 21 and 22 as shown in Fig. 2.

For the actuation of the arbor 82 upon which the rating pointer 24 is fixed, by means of the time-piece to be rated, I apply to the projecting forward end of the arbor a pinion 96 having a long split sleeve 97 which grips the arbor sufficiently to transmit the movement of the time-piece being rated to it but yields to permit the arbor to be turned independently of the said pinion. The outer end of the shaft 82 is supported by a bridge 98 secured to parallel horizontal studs 99 projecting forward from the extreme upper end of a skeletonized plate 100 forming the main part of the time-piece

holder and secured to and set forward from the movement plate 19 upon short pillars 101 receiving screw studs 102. The plate 100 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 a watch movement. As shown, the plate is furnished at its right end with a locking lever 103 hung upon one of the pillars 101 and furnished with an operating handle 104, with an upper locking-arm 105 having a gripping finger 106, and with a lower locking-arm 107 having a gripping finger 108, the said fingers 106 and 108 being arranged to engage with one of the movement plates of the time-piece to be rated and beveled so as to seat the same firmly upon the plate 100 of the time-piece holder in such position that some wheel or pinion of the time-piece to be rated will mesh into the pinion 96 with the beats of the said time-piece.

Having now described my improved apparatus, I will briefly set forth the method of using it.

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 23 actuated in unison with the beats of the master-clock. As all of the timing-mechanisms are just alike, the rating of one time-piece by a timer will explain the use of all. The timer first applies the time-piece to be rated to the plate 100 of the time-piece holder and clamps it in position thereon by means of the handle 104 of the two-armed clamping lever 103, whereby one of the wheels or pinions of the time-piece to be rated is meshed into the transmitting pinion 96 without, however, starting the rating pointer 24 which is held by the engagement of the stop-pin 85 with the roughened periphery of the stop-wheel 86 on the rating arbor 82. The timer now uses the finger-button 74 to depress the slide 76, whereby the pin 85 is lifted from the wheel 86 by the riding of the pin 72 over the incline 70 of the cut-out arm 60. As the arm 60 is swung from left to right, the pin 70 is lifted out of the stop-notch 66 in the disk 65 whereupon the shutter spring 68 immediately acts to actuate the shutter 67 in closing the said notch, the shutter being thus brought into apposition to the pin 20 which engages with the edge of the shutter as soon as downward pressure is removed from the finger button 74 and the spring 78 allowed to act and lift the slide 73. The engagement as described of the pin 70 with the edge of the shutter 67 prevents the stop-pin 85 from reengaging with the stop-wheel 86 on the rating-arbor 82 so that the operation of the slide 73 has released the rating-pointer 24 to be operated by the time-piece to be rated and has also released the train of the rated pointer 23. The downward movement of the slide



73 also permits the contact spring 58 to engage with the contact pin 57, whereby the timing mechanism is cut into the circuit of the master-clock every make or break of which will now effect the actuation of the rock-arm 46 and the escapement-slide 35 which will begin the actuation of the rated-pointer 23 in unison with the beating of the master-clock. The rating and rated pointers 23 and 24 have now been started almost simultaneously, but not with any accurate relation to each other as to the time of starting. Obviously no accurate comparison can be made between the rate of movement of the two pointers except as they are started together so that their divergence of performance may be used as means for adjusting the hair-spring of the time-piece to be rated. Just before the slide 73 reaches the limit of its downward movement its arms engage with the preliminary positioning cams 26 and 81, whereby the arbors 25 and 82 are rotated against the friction of the friction spring 30 and the friction sleeve 97 causing the pointers 23 and 24 to assume corresponding positions a few points to the left of the zero position. The horizontal positioning final lever 87 is now operated by its finger button 88, whereby the pin 94 engages with the pin 97 and the pin 95 engages with the pin 83, causing the arbors 25 and 82 to be rotated against their frictions and the rating and rated pointers to be simultaneously brought to their zero positions on the respective dials 21 and 22. This movement of the two pointers in no wise interferes with their operation by the master clock and the time-piece to be rated respectively except in the sense that both pointers are crowded ahead faster than they would be otherwise operated. Both pointers having been thus crowded ahead into absolutely corresponding positions, now start even and the rating pointer 23 will lag behind or get ahead of the rated 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 a revolution of the disk 65. Before the disk completes a revolution, the slightly projecting edge of its shutter 67 will engage with the pin 70 carried by the cut-out arm 60. From this instant, the shutter will be held against rotation with the disk but the disk continuing to revolve will gradually bring its stop-notch 66 into registration with the pin 70 which will drop into the said notch just as the disk completes its revolution. The instant the pin drops into the notch the spring 109 on the arbor 84 acts to swing the lever from right to left whereby the stop pin 85 is engaged with the stop-wheel 86 and the finger 59 engaged with the contact spring 58 so as to lift it away from the contact point

57. Therefore the rating and rated pointers will be simultaneously stopped, leaving the performance of the time-piece to be rated recorded upon the dials. 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 electrical apparatus for timing clocks, the combination with an electric circuit, of a master-clock, a timing-mechanism located in the said circuit and provided with a rated pointer driven in unison with the master clock under the electric control thereof, a rating pointer driven by the time-piece to be rated, means for positioning the said pointers for starting them in unison, and automatic means for simultaneously stopping the pointers at a predetermined time for the purpose of comparison.

2. In an electrical apparatus for timing clocks and watches, the combination with an electric circuit, of a master-clock adapted to interrupt the said electric circuit, a timing-mechanism located in the said circuit and therefore electrically connected with the said master-clock, having a rated pointer and mechanism electrically controlled by the pulsations of the master-clock for operating the said rated pointer in unison therewith, a rating-pointer, means for actuating the rating-pointer in unison with the time-piece to be rated, means for positioning the said pointers for starting them in unison, and automatic means for simultaneously stopping the pointers at a predetermined time for the purpose of comparison.

3. In an electrical apparatus for timing clocks and watches, the combination with an electric circuit, of a master-clock adapted to interrupt the said electric circuit, a timing mechanism located in the said circuit and therefore electrically connected with the said master clock, having a rated-pointer and mechanism electrically controlled by the pulsations of the master-clock for operating the said rated pointer in unison with the beats of the master-clock, a rating pointer, a time-piece holder for the time-piece to be rated, means for transmitting the beat of the time-piece to be rated to the rating-pointer, a preliminary positioning lever coacting with the two pointers, a final positioning lever also coacting with the two pointers and simultaneously bringing them to zero positions for starting them in unison, and automatic means for simultaneously



stopping the pointers at a predetermined time for the purpose of comparison.

4. In an electrical apparatus for rating clocks and watches, the combination with  
 5 an electric circuit, of a master-clock adapted to interrupt the said electric circuit, a timing-mechanism located in the said circuit and therefore electrically connected with the said master-clock and having two dials,  
 10 a rated and a rating pointer respectively arranged to sweep the said dials, electrically controlled mechanism for actuating the rated pointer in unison with the beating of the master-clock, a time-piece holder, means  
 15 for transmitting the beating of the time-piece, when applied to the said holder, to the rating pointer, means for positioning the two pointers so that they may start in unison without stopping either of them, the pointers being frictionally connected with the  
 20 instrumentalities by which they are driven, and automatic means for simultaneously stopping the pointers at a predetermined time for the purpose of comparison.

25 5. In an electrical apparatus for timing clocks and watches, the combination with an electric circuit, of a master-clock adapted to interrupt the said electric circuit, a timing mechanism located in the said circuit and  
 30 therefore electrically connected with the said master-clock and having a rated pointer, means connecting the said pointer with the armature of a magnet, whereby the pointer is actuated in unison with the movement of  
 35 the armature, a rating pointer, a time-piece

holder, means for transmitting the beats of a time-piece applied to the said holder, to the rating pointer, means for starting the two pointers in unison, the said pointers being frictionally connected with the in- 40  
 strumentalities by which they are driven so that they may be brought into their starting positions without stopping the said instrumentalities, and automatic means for simultaneously stopping the pointers at a pre- 45  
 determined time for the purpose of comparison.

6. In an electrical apparatus for timing clocks, the combination with an electric circuit, of a master-clock adapted to interrupt 50  
 the said electric circuit, a timing mechanism electrically connected with the said master-clock and having a rated pointer electrically controlled by the beats of the master clock, a rating-pointer, a time-piece holder, means 55  
 for transmitting the beats of a time-piece applied to the said holder, to the rating-pointer, means for positioning the said pointers whereby they may be started in unison, and automatic mechanism for simul- 60  
 taneously stopping both pointers at a predetermined time for a comparison of their rate of motion.

In testimony whereof, I have signed this specification in the presence of two sub- 65  
 scribing witnesses.

WILSON E. PORTER.

Witnesses:

GEORGE DUDLEY SEYMOUR,  
 CLARA L. WEED.