J. PETRILLO.

CLOCK.

APPLICATION FILED JAN. 6, 1908. RENEWED AUG. 20, 1909.

936,352.

Patented Oct. 12, 1909.

3 SHEETS—SHEET 1.

Fig. 1.

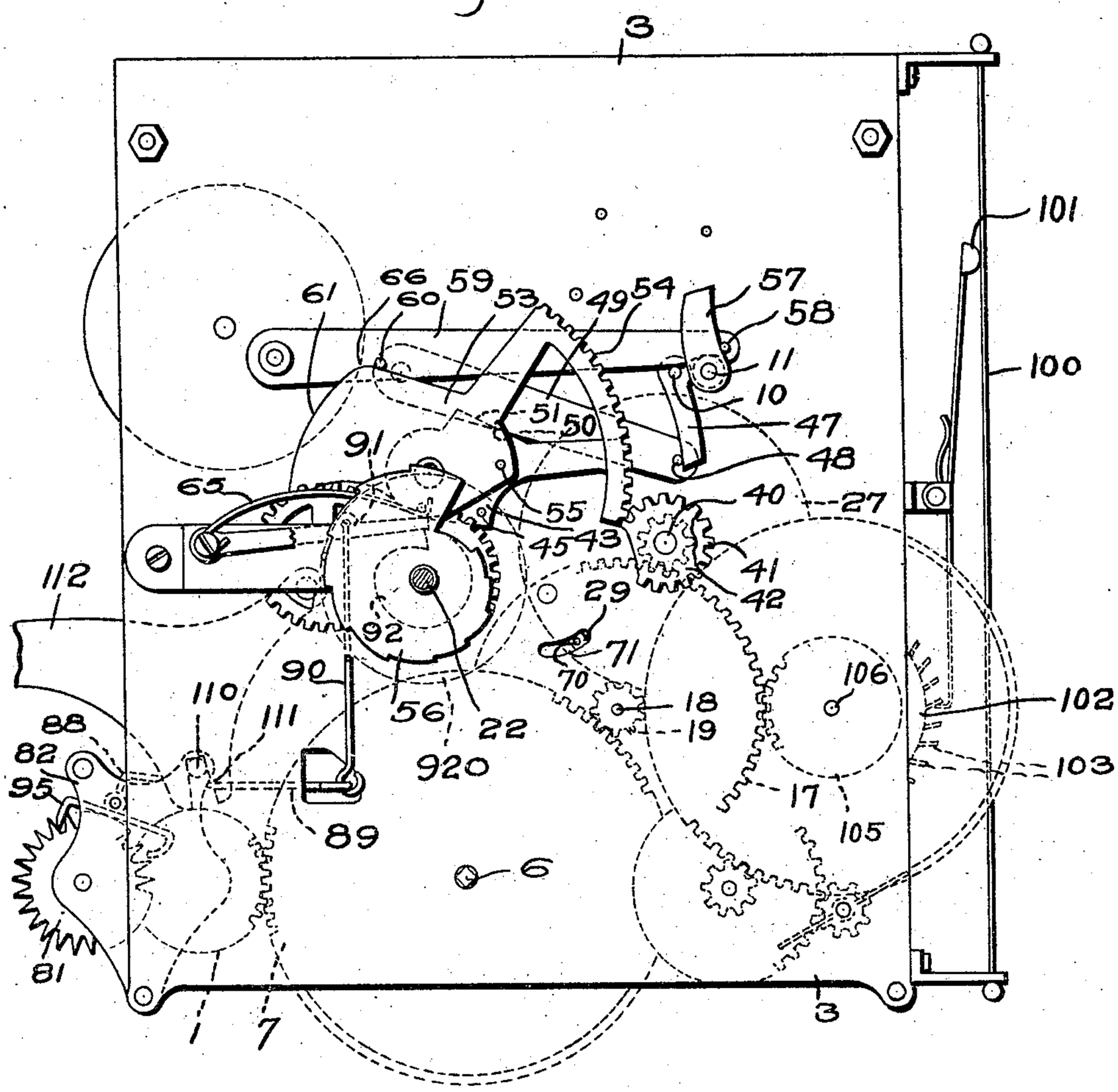


Fig. 2.

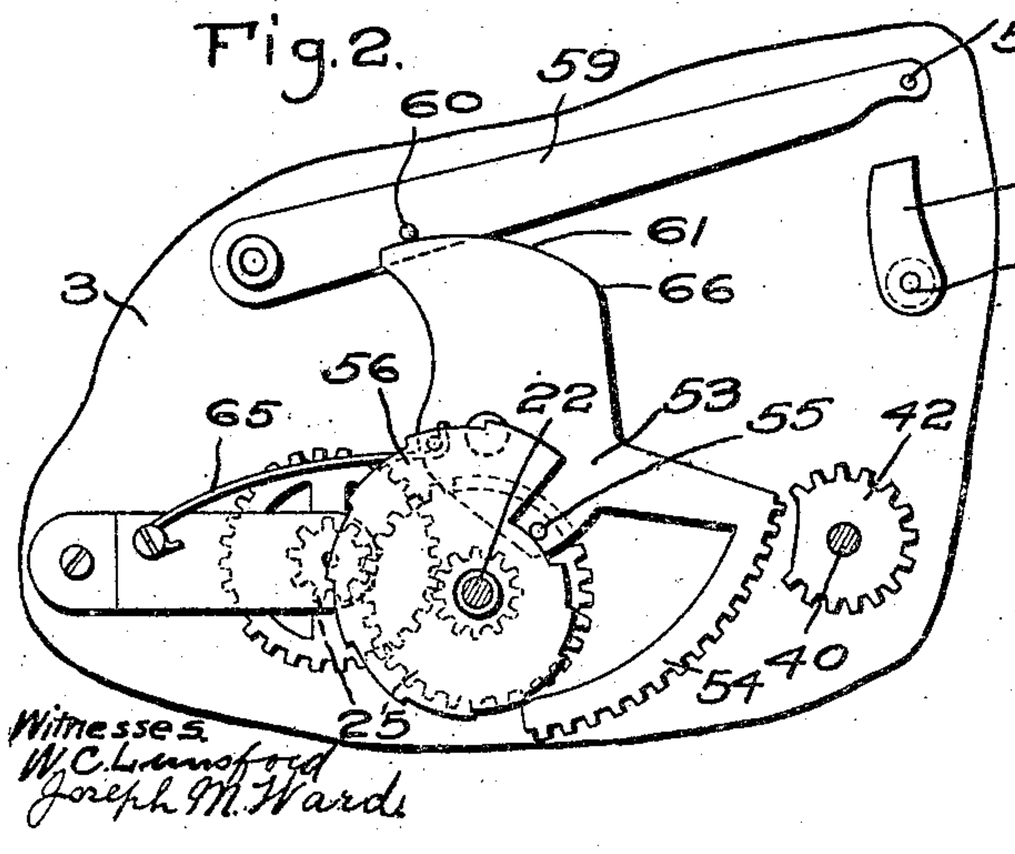
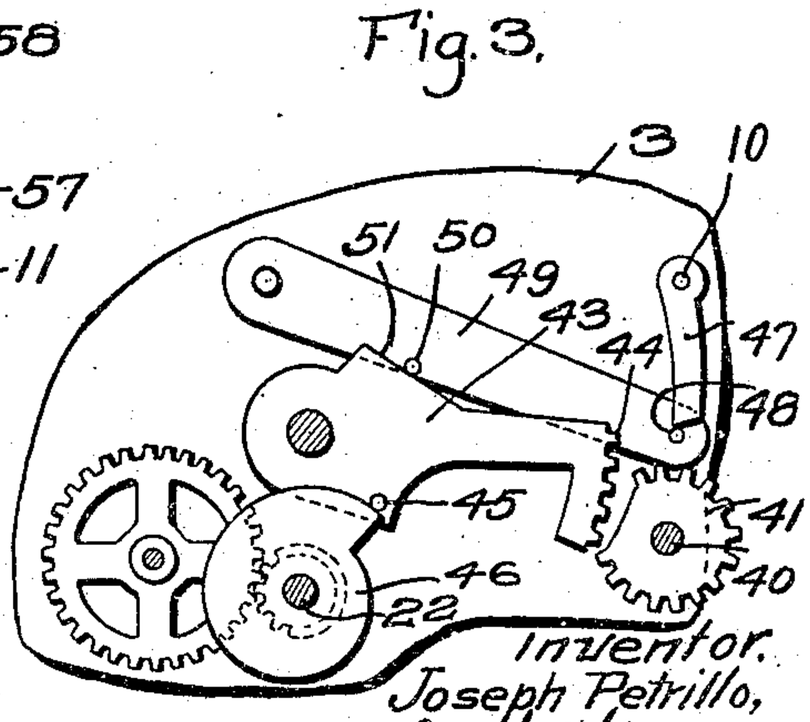


Fig. 3.



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3 SHEETS—SHEET 2.

Fig. 4.

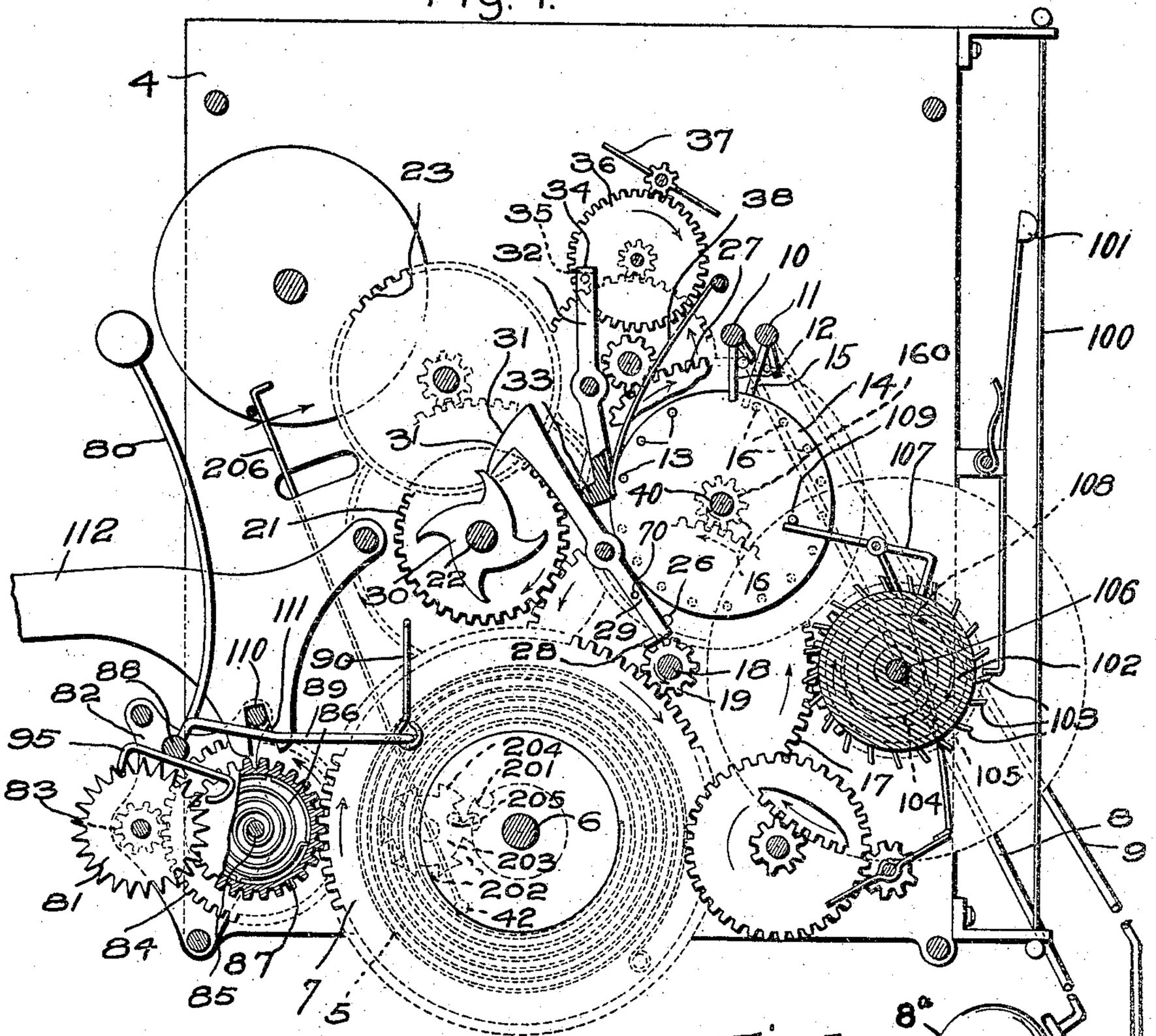
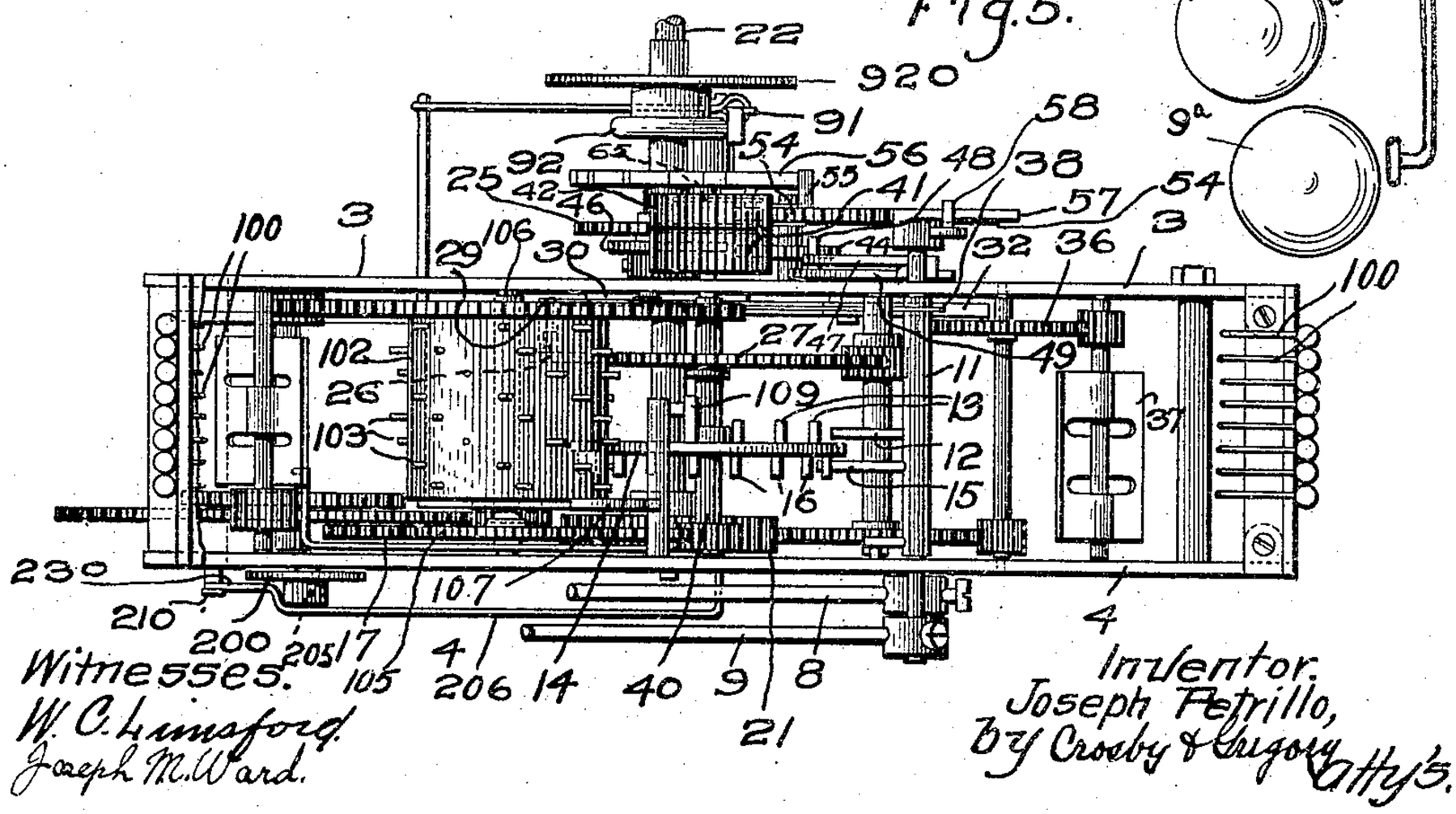


Fig. 5.



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3 SHEETS—SHEET 3.

Fig. 13.

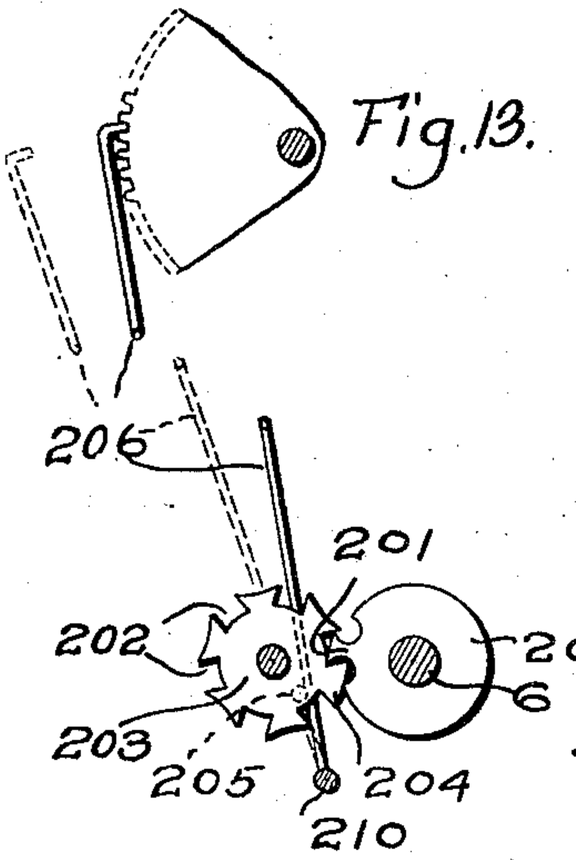


Fig. 6.

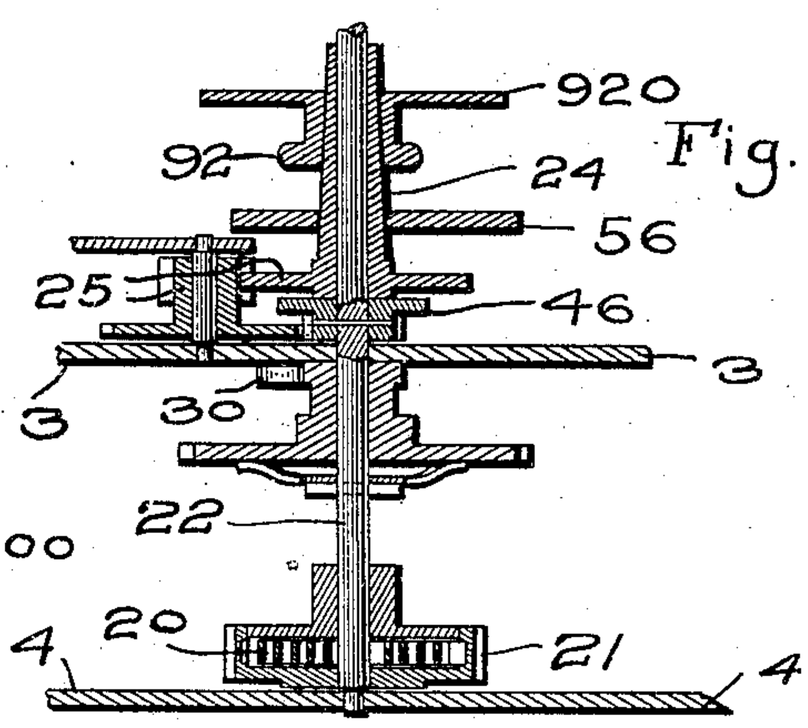


Fig. 14.

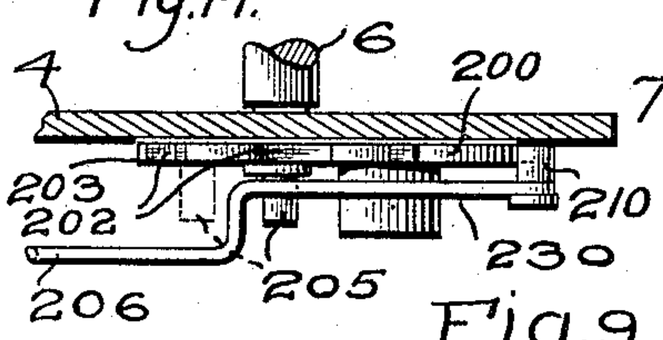


Fig. 7.

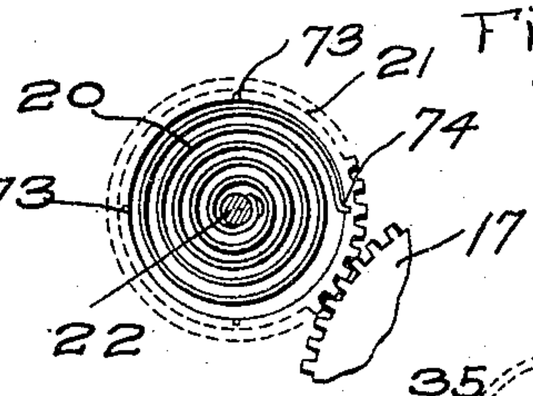


Fig. 9.

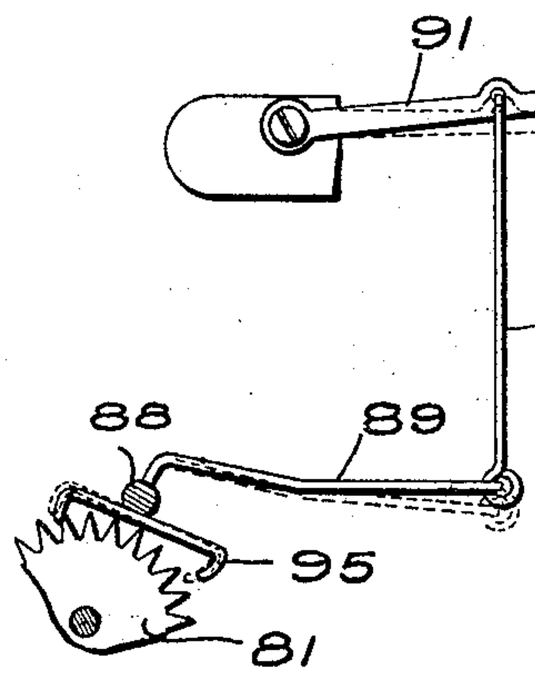


Fig. 8.

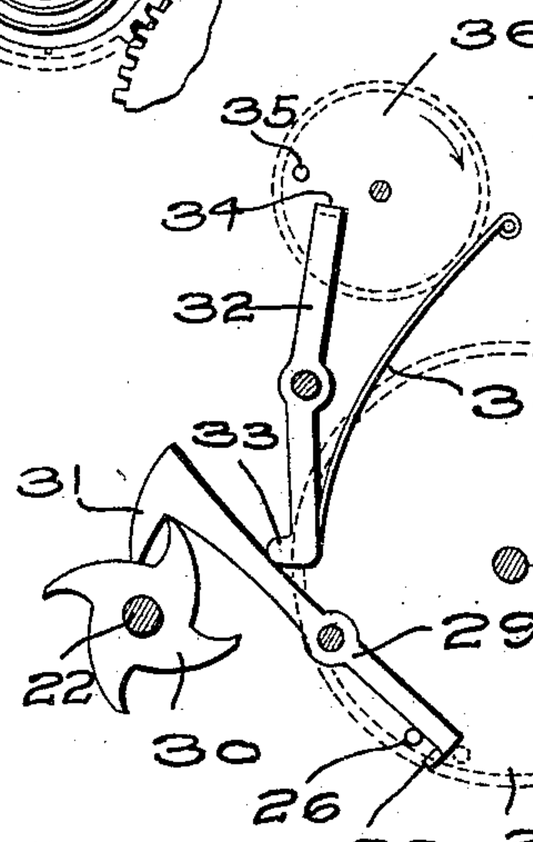


Fig. 10.

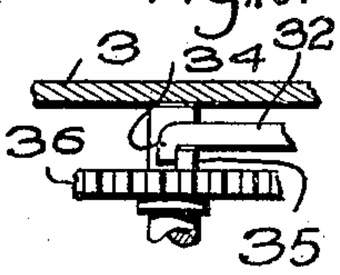


Fig. 11.

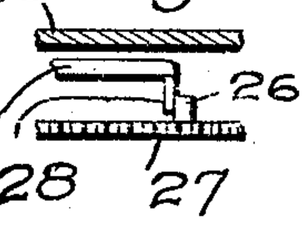
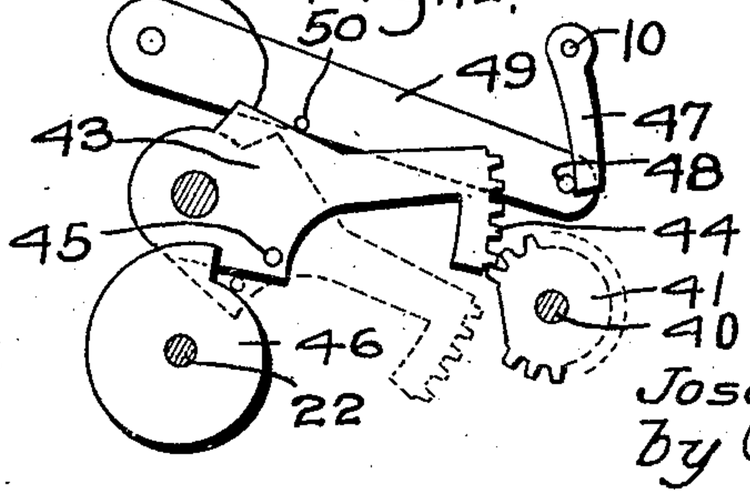


Fig. 12.



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CLOCK.

936,352. Specification of Letters Patent. Patented Oct. 12, 1909.

Application filed January 6, 1908, Serial No. 409,377. Renewed August 20, 1909. Serial No. 513,874.

To all whom it may concern:

Be it known that I, JOSEPH PETRILLO, a citizen of the United States, residing at Boston, county of Suffolk, and State of Massachusetts, have invented an Improvement in Clocks, of which the following description, in connection with the accompanying drawing, is a specification, like numerals on the drawing representing like parts.

This invention relates to clocks, and especially to clocks that are arranged to strike the quarter hours. In most clocks of this character, two main springs are employed, one of which operates to drive the time train, and the other of which operates to drive the striking train.

It is one of the objects of my invention to provide a novel construction of clock wherein but a single spring is employed for operating both the striking train and the time train.

In the present embodiment of my invention the time train is operated by means of an auxiliary spring which is automatically wound by the striking mechanism whenever it operates. The advantage of this construction is that the spring for the time train is wound at frequent intervals and is maintained at all times under substantially uniform tension. I may if desired also add to the clock mechanism an alarm mechanism and some chimes and their operating mechanism, and where this is done, I propose to actuate both the alarm and the chimes from the spring which operates the striking mechanism by interposing between the striking train and both the alarm and the chimes an auxiliary spring which is wound by the striking train whenever the latter is operated.

I will first proceed to describe one embodiment of my invention and then point out the novel features thereof in the appended claims, it being understood that my invention is not limited to the specific embodiment herein illustrated.

Figure 1 is a front view of the workings of a clock embodying my invention; Figs. 2 and 3 are details of the striking mechanism; Fig. 4 is a section through Fig. 5 taken immediately beneath the top plate 3. Fig. 5 is a side view of Fig. 1 looking toward the left; Fig. 6 is a section through the center arbor showing the mechanism mounted thereon; Fig. 7 is a detail of the auxiliary spring for driving the time train; Fig. 8 is a detail showing the stop mechanism for the striking train; Fig. 9 is a detail of the alarm mechanism; Fig. 10 is a side view of the wheel 36 and auxiliary stop lever 32. Fig. 11 is a side view of a portion of the wheel 27 and stop lever 29. Fig. 12 is a detail of the parts shown in Fig. 3 showing them in a different position; Figs. 13 and 14 are details of the means to prevent the auxiliary spring from running down.

3 and 4 are the usual front and rear plates which support the clock mechanism. These plates sustain the main spring 5 which may be wound in usual manner by a key applied to the shaft 6. This spring is connected with the main gear 7 which forms part of and drives the striking train. The striking mechanism includes the hammers 8, 9 which are mounted on the rock-shafts 10 and 11 and which are adapted to strike bells or sounding devices 8^a, 9^a. The rock-shaft 10 has rigid therewith a pin 12 which is adapted to be engaged by the three pins 13 that extend from one face of the hammer-actuating wheel 14. The other rock-shaft 11 has fast thereto a pin 15 which is adapted to be engaged by other pins 16 (there being twelve such pins) projecting from the opposite face of the hammer-actuating wheel 14.

The hammer-actuating wheel 14 is operated from the main gear 7 by any suitable train of gearing hereinafter designated the striking train. In the present embodiment of my invention this striking train comprises the pinion 160 fast on the arbor 40 of the hammer-actuating wheel, which pinion meshes with and is driven by a gear 17 fast on the arbor 18 which also has fast thereon a pinion 19 meshing with the gear 7.

Each time that the striking mechanism operates, the hammer-actuating wheel 14 is given one complete revolution, and the means employed for determining how many times the clock will strike at each operation of the hammer-actuating wheel will be described later.

The striking train is normally held from operation by means of a stop device which will presently be described and which in turn is controlled by the time train.

As stated above the time train is driven from the main spring 5. This is accomplished by interposing between the time train and the main gear 7 an auxiliary spring

which is wound up automatically each time that the striking mechanism operates, the power thus stored up in said spring being used to drive the time train. This auxiliary spring is shown at 20 and it is confined within a spring barrel 21 which has gear teeth thereon that mesh with the gear 17 of the striking train. One end of the spring 20 is secured to the barrel 21 and the other end of said spring is secured to the center arbor 22 on which the minute hand is mounted as usual.

The speed at which the spring 20 causes the arbor 22 to rotate is determined by the usual time train 23 which may include the ordinary escapement, not shown.

Each time that the striking mechanism operates, the rotation of the wheel 17 will wind up the spring 20, as shown clearly in Fig. 7, and as said gear 17 and spring barrel 21 are held from backward rotation between the intervals when the striking mechanism operates, the energy stored up in the spring 20 will, of course, drive the time train forward.

The hour hand is mounted on the usual sleeve 24 through which the center arbor 22 extends, and said sleeve is driven at the proper reduced speed by the usual reducing gearing 25.

In the clock herein illustrated the striking mechanism is arranged so that the clock will strike at fifteen-minute intervals, and therefore the auxiliary spring 20 for the time train is wound every fifteen minutes. As a result of this frequent winding, the spring 20 will be maintained at all times under approximately the same tension, and there will be no such tendency to drive the time train faster when the spring is fully wound and slower when the spring is nearly unwound, as is the case where the time train is driven by a spring which is wound only once each twenty-four hours.

The means for locking the striking train and releasing it at the proper intervals will now be described.

The arbor sustaining the hammer-actuating wheel 14 has thereon a gear 27 from which extends a pin 26. This gear 27 is shown broken away in Fig. 4 to better illustrate the parts that are hidden beneath it. This pin normally has engagement with a flange 28 at the end of a pivoted stop lever 29, and by this construction the time train is normally held from movement. The stop lever 29 is adapted to be actuated whenever the clock is to strike, which in the present embodiment is every fifteen minutes. For this purpose I have provided the center arbor 22 with a cam wheel 30 which is provided with four cam teeth that are adapted to engage the nose 31 of the stop lever 29 as said arbor rotates. The teeth of the cam wheel 30 are of such a shape that as each one engages the nose 31, the lever 29 is swung from the position shown in Fig. 8 to that shown in Fig. 4. So long as the stop lever is in the position shown in Fig. 8, the pin 26 has engagement with the flange 28, as shown in dotted lines Fig 8, but when the stop lever has been swung into the position shown in Fig. 4, the flange 28 is moved out of the path of movement of the pin 26 and the wheel 27 may move forward under the impulse of the main spring.

32 is an auxiliary stop lever pivoted to the frame and having one end 33 in position to be engaged by the lever 29. The other end of said auxiliary lever 32 is provided with a stop flange 34 which coacts with a pin 35 carried by a gear 36 forming part of the regulating train for the striking train. This regulating train comprises the usual series of intermeshing gears which terminate at a fan fly 37 or other equivalent regulating means. When the parts are in the normal position shown in Fig. 8 the auxiliary lever 32 is carried by the spring 38 into a position so that the stop flange 34 is out of the path of movement of the pin 35. As the stop lever 29 is acted on by the teeth of the cam wheel 30 and is thrown into the position shown in Fig. 4, the lever 32 is swung to bring the flange 34 into the path of movement of the pin 35, said flange passing under said pin, as will be plainly seen from Fig. 8. As soon as the stop pin 26 is released, as shown in Fig. 4, the main spring 5 moves the striking train slightly, thus rotating the wheel 36. As the wheel rotates in the direction of the arrow Fig. 8, the pin 35 passes around underneath the flange 34 and said flange then operates to arrest further movement of the striking train, see Fig. 4.

During the time that the gear 36 has made its rotation the gear 27 has moved sufficiently to carry the pin 26 underneath the flange 28 and from the dotted line position into the full line position Fig. 8. When the arbor 22 has rotated sufficiently to permit the nose 31 of the lever 29 to drop off from the end of a tooth of the cam wheel 30, both the stop lever 29 and the auxiliary stop lever 32 swing into the position shown in Fig. 8 under the influence of the spring 38, and the flange 34 is thus carried out of the path of movement of the stop pin 35. The striking train is then released and the hammer-actuating wheel will commence its rotation under the influence of the main spring 5, said wheel being arrested at the end of its complete rotation by the stop pin 26 coming into engagement with the flange 28. Where it is desired to have the clock strike every fifteen minutes, the cam wheel 30 will have four teeth thereon, but if it should be desired to have the clock strike at half-hour intervals only, said cam wheel need have but two teeth thereon as will be obvious.

The clock is arranged to strike the hours in usual way. At the quarter hours the clock repeats the hour and also strikes the quarter. The construction is such that at two o'clock, for instance, the clock strikes two. At quarter past two, the clock strikes once to indicate the quarter hour and twice to indicate the hour. At half past two the clock strikes twice to indicate the half hour and twice to indicate the hour. At quarter of three the clock strikes three times to indicate the quarter hour, and then twice to indicate the hour. At three o'clock the clock strikes three times to indicate the hour as usual. The hours are struck by the hammer 9 which is actuated by the pins 16. The quarter hours are struck by the hammer 8 which is actuated by the pins 13. If desired I may employ bells of two different tones for the two hammers so that the striking of the quarter hour can be readily distinguished from the striking of the hour.

As stated above the hammer-actuating wheel 14 rotates once each time that the clock strikes and during each rotation each of the three pins 13 engages the arm 12 and thus actuates the hammer 8, and each of the twelve pins 16 engages the arm 15 and thus actuates the hammer 9.

Since the hammer 9 is actuated twelve times during each rotation of the hammer-actuating wheel and since the hammer 8 is actuated three times during each rotation thereof, it is necessary to provide some mechanism for governing the number of times that the bells will be struck. In the present embodiment this is accomplished by the mechanism now to be described, and I will first describe the mechanism for controlling the number of times that the hammer 8 strikes the bell at each rotation of the hammer-actuating wheel.

The front plate 3 has pivoted thereto a controlling lever 43 which is formed at its end with a segmental rack 44 adapted to cooperate with a segmental gear 41 which is fast on the arbor 40 of the hammer-actuating wheel. The controlling lever 43 has extending therefrom a pin or projection 45 which coöperates with a controlling cam 46 fast on the center arbor 22. The rock-shaft 10 for the hammer 8 also has fast thereto an arm 47 which is adapted to be engaged by a stop pin or projection 48 carried by a pivoted arm 49. Said arm 49 has a projection 50 that engages the cam surface 51 of the lever 43. See Figs. 3 and 12.

When the parts are at rest between the intervals at which the clock strikes, the segmental gear 41 and segmental rack 44 have the position shown in Fig. 12, said gear engaging the rack and holding it elevated.

When the stop lever 29 releases the hammer-actuating wheel, as above described, thereby to permit said wheel to carry the pin 26 from the full line to the dotted position shown in Fig. 8, the segmental gear 41 is turned sufficiently to bring the mutilated or cut-away portion thereof opposite the rack 44, as shown in Fig. 3, thus permitting the rack to drop until the pin 45 strikes the controlling cam 46. As the lever 43 drops, the swinging arm 49 will also drop, thereby carrying the pin 48 out of engagement with the arm 47. When the hammer-actuating wheel begins its rotation the teeth of the pinion 41 pick up the rack 44 and swing said rack upwardly, such upward movement of the rack lifting the swinging arm 49. As soon as the hammer-actuating wheel begins its rotation the rock-shaft 10 is oscillated and the arm 47 will also oscillate. So long as the pin 48 is below the path of movement of the arm 47 the shaft 10 can oscillate to its full extent and the hammer 8 will strike the bell, but when the arm 49 is raised into the position shown in Fig. 1, the pin 48 comes into the path of movement of the arm 47 and prevents the rock-shaft 10 from oscillating to its full extent, and sufficiently to strike the bell.

The number of times (that is, whether one, two or three) that the bell will be struck, therefore, depends upon the position of the controlling cam 46 which in turn controls the extent of the downward movement of the controlling lever 43. When the cam 46 is in the position shown in Fig. 3 the controlling lever has the shortest downward movement and before the hammer 8 strikes at all the pin 48 will be brought into engagement with the arm 47. This is the position of the parts when the clock is striking the hour and the hammer is silent.

When the cam has turned through a quarter revolution as will be the case at quarter past the hour, said cam will permit the controlling lever 43 to descend sufficiently so that the hammer 8 will strike once before the pin 48 comes into the path of movement of the arm 47. When said cam has made a half revolution from the position shown in Fig. 3, which will be its position at the half hour, the controlling lever 43 will be permitted to fall sufficiently so that the hammer 8 will strike twice before the pin 48 comes into the path of movement of the arm 47. At the three quarter hour when the cam has moved through three quarters of a revolution, the hammer will be permitted to strike three times, as will be obvious.

A somewhat similar mechanism is employed for controlling the number of times that the hour hammer 9 will operate at each revolution of the hammer-actuating wheel. This mechanism comprises a mutilated pinion 42 which is also fast on the arbor 40 of the hammer-actuating wheel, and a controlling lever 53 which is pivoted to the plate 3 and which is provided with the segmental

rack 54 that is adapted to coöperate with the pinion 42. Said controlling lever 53 has a projection 55 extending therefrom which cooperates with a snail cam 56 that is carried by the sleeve 24 on which the hour hand is supported. The controlling lever 53 is also provided with a cam surface 61 which is adapted to be engaged by a pin 60 extending from a pivoted arm 59. The arm 59 has a stop pin 58 which coöperates with an arm 57 fast on the rock-shaft 11 controlling the hammer 9. The snail cam 56 rotates with the hour hand and thus makes a complete rotation once every twelve hours. This cam is provided with the stepped cam surface which has twelve steps thereon, each step being situated at a different radius from the center.

When the parts of the striking mechanism are in their normal position, as they are between the intervals when the clock strikes, the gear 42 and rack 54 are in the position shown in Fig. 1. When the controlling lever 53 is in this position the swinging arm 59 is in its lowered position and the pin 58 has engagement with the arm 57. Whenever the releasing mechanism for the hammer-actuating wheel operates to release the pin 26 whereby to permit the wheel 27 to move from the full to the dotted line position Fig. 8, the pinion 42 is turned sufficiently to bring the mutilated portion thereof in alinement with the rack 54. When this occurs, the rack drops into the position shown in Fig. 2 under the influence of a spring 65, and in so doing the cam surface 61 raises the arm 59 out of engagement with the arm 57. The extent to which the controlling lever 53 will drop depends on the position of the controlling cam 56 and the latter, of course, depends on the hour of the day. At one o'clock, the cam 56 is in such a position that the portion thereof of largest radius will be in position to engage the stop pin 55 and thus the controlling lever 53 will have its minimum downward movement. At two o'clock, the cam will have moved one step forward, and when the controlling lever 53 swings downwardly, the pin 55 will strike the portion of said cam of next largest diameter. On the other hand, at twelve o'clock, the portion of the cam of smallest diameter is in line with the pin 55 so that the controlling lever 53 will when released have its maximum downward movement. This is the position shown in Fig. 2. As soon as the controlling lever 53 has dropped into engagement with the snail cam 56, the rotation of the pinion 42 will cause its teeth to pick up the teeth of the rack 54, and said rack and controlling lever will, therefore, be gradually swung upward. As said controlling lever is swung upward, the cam surface 61 passes under the pin 60, and so long as the concentric portion of said cam surface is in engagement with the pin 60, the swinging arm 59 will be elevated. As soon as the point 66 of the cam surface passes under the pin 60 the arm 59 will commence to descend. During all this time that the controlling lever 53 has been moving upwardly, the hammer-actuating wheel 14 has been rotating and the pins 16 thereon have been engaging the arm 15, thus actuating the hammer 9. The engagement of the arm 15 with the pin 16 causes the rock-shaft 11 and consequently the arm 57 to oscillate. As the arm 59 descends, as above described, the pin 58 thereon comes finally into the path of movement of the arm 57, as shown in Fig. 1, and prevents said arm and consequently the rock-shaft 11 from having a movement sufficient to cause the hammer 9 to strike the bell. The time necessary to lift the controlling lever 53 from its lowered position to a point where the pin 58 is permitted to engage the arm 57 depends upon the extent to which said lever drops when released by the pinion 42, and this in turn depends upon the position of the snail cam 56.

When the high portion of the snail cam is in position to engage the pin 55, the lever 53 will have its minimum downward movement and the clock will be permitted to strike but once before the stop pin 58 comes into engagement with the arm 57. On the other hand, when the cam 56 is half way around as it will be at six o'clock, the controlling lever will be permitted to fall a sufficient distance so that the clock will strike six times before the pin 50 is moved into the path of the arm 57.

At twelve o'clock when the cam is situated so that the lowest point thereof is adjacent the pin 55, the controlling lever has its greatest movement and the clock will strike twelve times before the pin 58 comes into engagement with the lever 57.

The clock is provided with the usual repeater mechanism by which the striking may be repeated at any time. This repeating is accomplished by providing the lever 29 with a pin 70 which extends through a slot 71 in the plate 3, see Fig. 1, and connecting said pin with a hand pull (not shown) by suitable connections so that by pulling on the pin the controlling lever 29 may be given the same movement as is given to it by the cam wheel 30.

Since the auxiliary spring for driving the time train is wound up each time that the clock strikes, it will follow that if the repeating mechanism is operated frequently, the spring 20 will be wound up faster than it will be unwound. This is so because the mechanism is normally of such a construction that the winding which it receives every fifteen minutes is just sufficient to keep the spring under the proper tension. To pre-

vent the spring 20 from becoming broken by being wound too tight when the repeating mechanism is operated, I provide a connection between the spring and the spring barrel 21 which will yield or give when the spring has been wound to a certain extent, thus preventing breaking of the spring.

As herein shown the barrel is provided with a plurality of notches 73 on its inner face into one of which the outwardly turned end or lip 74 of the spring 20 is received. This lip 74 has sufficient engagement with the recess 73 to wind the spring 20 to the ordinary amount when the spring barrel 21 is rotated. When, however, the spring is wound to a certain maximum tension the lip 74 will be drawn out from the recess 73 with which it is in engagement by the tension of the spring, and said spring will unwind until the lip catches into the next recess 73. This construction, therefore, prevents the spring from being wound sufficiently tight to cause any damage thereto even though the repeater mechanism be operated frequently.

Since the auxiliary spring for operating the time train is wound only by the striking mechanism, it follows that if said auxiliary spring should become run down the clock can only be started by setting the striking mechanism in operation. If, therefore, the main spring 5 as well as the auxiliary spring 20 should become run down, the winding of the main spring 5 would not start the clock of itself because it would be necessary to first cause the striking mechanism to operate, thereby to wind up the auxiliary spring. To prevent such a condition from arising, I have provided a device which is set in operation when the main spring 5 is unwound to stop the time train before the auxiliary spring is fully unwound. When the clock stops, therefore, due to the running down of the main spring 5, it stops with the auxiliary spring still under some tension, which tension is sufficient to set the time train in operation as soon as the main spring 5 is wound up. In the present embodiment of my invention I accomplish this by a device operated by the usual Geneva stop which is employed in connection with the main spring. This Geneva stop is shown in dotted lines in Fig. 4 and also in Fig. 13, and is employed primarily to prevent the main spring 5 from becoming wound too tightly. It comprises the usual wheel 200 which is secured to the shaft 6 of the main spring and which has the single tooth 201 that works in the various notches 202 formed in the stop wheel 203. The stop wheel is provided with the usual large tooth 204 which locks the wheel 200 against rotation. The wheel 203 is provided with a pin 205 which is adapted to engage a stop lever 206, pivoted at one end at 210. The other end of said lever is adapted to engage one of the wheels of the time train when said lever is actuated by the pin.

The stop lever is offset as shown in Fig. 5 so that said pin 205 will pass beneath the offset portion without actuating the lever; but the portion 230 of said lever is in position to be engaged by said pin. The pin and the portion 230 of the lever are so disposed that when the spring 5 is nearly unwound, said pin strikes the stop lever and swings the latter in the direction of the arrow Fig. 4 into engagement with the time train thereby stopping the movement of the time train. This occurs, of course, before the spring 20 is entirely run down and therefore when the clock is practically run down it stops with the spring 20 still under some tension. As soon as the main spring 5 is wound again, the pin 206 is carried by the operation of the Geneva stop out of engagement with the stop lever 207 and into the position shown in Fig. 4, and the latter is swung out of engagement with the time train by a suitable spring or otherwise, thus leaving the time train free to start.

I have also incorporated in my improved clock both an alarm and some chimes, each of which is operated by an auxiliary spring that is in turn wound by the striking mechanism.

The alarm is of the usual construction comprising a vibrator or hammer 80 which is operated by the toothed wheel 81 in usual manner. This toothed wheel is carried by a swinging frame 82 and has rigid therewith a pinion 83 meshing with and driven by a gear 84 which in turn is fast on the arbor 85. Said arbor has connected thereto one end of the auxiliary spring 86, the other end of which is connected to the spring barrel 87 which is provided with gear teeth meshing with the teeth of the gear 7. The alarm may be set by any of the usual means employed in setting alarms.

As herein shown, the rock-shaft 88 carrying the vibrator 80 has rigid therewith an arm 89 which is connected by a link 90 (see Figs. 4 and 9) with a pivoted arm 91. The latter arm bears on a setting cam 92 of usual construction which is loosely mounted on either the center arbor or the sleeve 24 for the hour hand. Said cam has associated therewith any suitable indicator disk 920 for indicating the position of the cam or in other words the time when the alarm will go off. So long as the lever 91 is on the high portion of the cam 92, the vibrator is held in the position shown in Fig. 4 and the wheel 81 is locked from rotation. As soon as the lever 91 drops off from the high portion of the cam, as shown in dotted lines Fig. 9, the escapement 95 is released and the wheel 81 allowed to rotate under the influence of the spring 86 thereby sounding the alarm in usual manner. The same

yielding connection between the spring 86 and the spring barrel 87 is employed as that employed between the spring 20 and its barrel 21.

I have also provided means for throwing the alarm out of commission in case it is desired that it should not be operated. This is accomplished by mounting the spring-barrel 87 on the swinging frame 82 above referred to and providing means for swinging said frame to carry the spring barrel out of engagement with the wheel 7. Said frame 82 is shown as having a pin 110 which is received in a slot 111 in a lever 112. By lifting said lever the alarm is disconnected from the striking train and by restoring the lever to the full line position in Figs. 1 and 4, the alarm is brought back into connection with the striking train.

The chimes comprise the usual strings or rods 100, the hammers 101 to strike said rods and the drum 102 for operating the hammers, said drum having the pins 103 thereon properly arranged. This chime mechanism is such as is usually found in clocks. The drum 102 is rotated at proper intervals by a spring 104 which is contained within a spring drum 105 and one end of which is fastened to the shaft 106 of the drum 102. The other end of said spring is fastened to the drum 105 and the latter has gear teeth thereon which mesh with the teeth of the gear 17. Each time that the striking mechanism operates, therefore, the spring 104 will be wound. The drum 103 is normally restrained from movement by a pivoted stop 107 one end of which is adapted to engage a recess 108 formed in the drum. The other end of said pivoted stop is adapted to be engaged by a pin or projection 109 extending from the hammer-actuating wheel. Said pin 109 is so positioned that when the wheel is released and begins to rotate thereby to cause the striking mechanism to operate the drum 102 will be released before the hammers 8 or 9 are operated and the chimes will thus be sounded, the arrangement being such that the operation of the chimes will be completed before the clock begins to strike. This may be conveniently arranged by properly positioning the pins 13 and 16 on the hammer-actuating wheel. When the drum 102 has made a complete rotation its further movement is stopped by the pivoted stop 107 engaging in the recess 108.

Having described my invention what I claim as new and desire to secure by Letters Patent is:—

1. In a clock, the combination with a main spring, of a striking apparatus operated thereby, a time train, an auxiliary spring for operating the same, means to wind said auxiliary spring by the operation of the striking apparatus, an alarm device, an auxiliary spring therefor for operating said alarm, and means to wind said latter auxiliary spring by the operation of the striking apparatus.

2. In a clock, the combination with a main spring, of a striking apparatus operated thereby, a time train, an auxiliary spring for operating said time train, means to wind said auxiliary spring by the operation of the striking apparatus, a chime mechanism, an auxiliary spring therefor, and means to wind said auxiliary spring by the operation of the striking apparatus.

3. In a clock, the combination with a main spring, of a striking apparatus operated thereby, a time train, an auxiliary spring for operating the same, an alarm device, an auxiliary spring for operating said alarm device, a chime mechanism, another auxiliary spring for operating said chime mechanism, and means to operate all said auxiliary springs by the operation of the striking apparatus.

4. In a clock, the combination with a main spring, of a striking apparatus operated thereby, a time train, an auxiliary spring for operating the time train, an alarm device, an auxiliary spring for operating the alarm device, means to wind both of said auxiliary springs by the operation of the striking apparatus, and means to stop the movement of the time train before the auxiliary spring therefor is completely run down.

5. In a clock, the combination with a main spring, of a striking apparatus operated thereby, a time train, an auxiliary spring for operating the time train, a chime mechanism, another auxiliary spring for operating the chime mechanism, means to wind both the auxiliary springs by the operation of the striking mechanism, and automatic means to lock the time train from movement before the auxiliary spring therefor is completely run down.

6. In a clock, the combination with a hammer and a sound producing device to be struck thereby, of a hammer actuating wheel having a plurality of hammer operating pins, means to rotate said wheel once for each striking operation, said hammer being actuated by each pin during each rotation of the wheel, and means to render certain movements of the hammer inoperative to strike the sound producing device.

7. In a striking mechanism for a clock, the combination with a hammer and a sound producing device to be struck thereby, of a hammer actuating wheel having a plurality of hammer operating pins, means to give the wheel a complete rotation at each operation of the striking device, each pin actuating the hammer as the wheel rotates, and a stop device to render inoperative certain movements of the hammer.

8. In a striking mechanism for a clock, the combination with a hammer and a sound

producing device to be struck thereby, of a hammer actuating wheel having a plurality of hammer operating pins, means to give the wheel a complete rotation at each operation of the striking device, each pin actuating the hammer as the wheel rotates, a stop device to render inoperative certain movements of the hammer, and means to move the stop device into and out of operative position.

9. In a clock, the combination with a main spring, of a striking apparatus operated thereby, a time train and an auxiliary spring wound by the striking apparatus for operating said time train, said striking apparatus comprising a hammer, a hammer-actuating wheel having a plurality of hammer-operating pins each of which operates the hammer as the wheel rotates, and a stop device controlled by the time train for permitting the extent of movement of the hammer when actuated by certain pins.

10. In a clock, the combination with a time train, of an auxiliary spring for operating the same, a striking apparatus, a main spring for operating the striking apparatus, and means to wind the auxiliary spring by the operation of the striking apparatus, said striking apparatus comprising a rock-shaft, a hammer carried thereby, a hammer-actuating wheel operated by the main spring, means to permit said wheel to make one complete revolution only at each operation of the striking apparatus, a stop device for limiting the extent of movement of the rock-shaft, and controlling means to determine the length of time which said stop device shall be operative or inoperative.

11. In a clock, the combination with a time train, of a rock shaft, a hammer therefor, a hammer-actuating wheel, an arm on said rock shaft, a stop device to engage said arm to permit the movement of the rock-shaft, a controlling lever governing the movement of said stop device, and a cam associated with the time train and operated thereby for governing the movement of the controlling lever.

12. In a clock, the combination with a time train, of a striking apparatus, a hammer-actuating wheel having two series of pins thereon, and means to rotate said wheel once at each operation of the striking apparatus, a hammer to be actuated by all the pins of each series during each rotation of said wheel, and a controlling device for each hammer to determine the extent of movement of the hammer when actuated by the pins.

13. In a clock, the combination with a main spring and a striking apparatus operated thereby, of a time train, an auxiliary spring for operating the time train, means to wind said auxiliary spring by the operation of the striking apparatus, and means to stop the movement of the time train before the auxiliary spring is completely run down.

14. In a clock, the combination with a main spring and a striking apparatus operated thereby, of a time train, an auxiliary spring for operating the time train, means to wind said spring by the operation of the striking apparatus, and means operated from the main spring when the latter is nearly run down to lock the time train from movement.

15. In a clock, the combination with a main spring and a striking apparatus operated thereby, of a time train, an auxiliary spring for operating the time train, means to wind said spring by the operation of the striking apparatus, and means operated from the main spring when the latter is nearly run down to lock the time train from movement before the auxiliary spring is completely unwound.

16. In a clock, the combination with a main spring and a striking apparatus operated thereby, of a time train, an auxiliary spring for driving the time train, means to wind said auxiliary spring by the operation of the striking apparatus, and means actuated by or through the main spring when the latter is nearly run down to stop the clock while the auxiliary spring is still under tension.

17. In a clock, the combination with a main spring and a striking apparatus operated thereby, of a time train, an auxiliary spring for driving the time train, means to wind said auxiliary spring by the operation of the striking apparatus, a Geneva stop device to limit the unwinding movement of the main spring, and means operated by said Geneva stop to lock the time train from movement while the auxiliary spring is still under tension.

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

JOSEPH PETRILLO.

Witnesses:
LOUIS C. SMITH,
MARGARET A. DUNN.