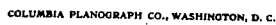


APPLICATION FILED SEPT. 30, 1911.

Patented May 6, 1913.

4 SHEETS--SHEET 1.



B. Z. FRIEDMAN.

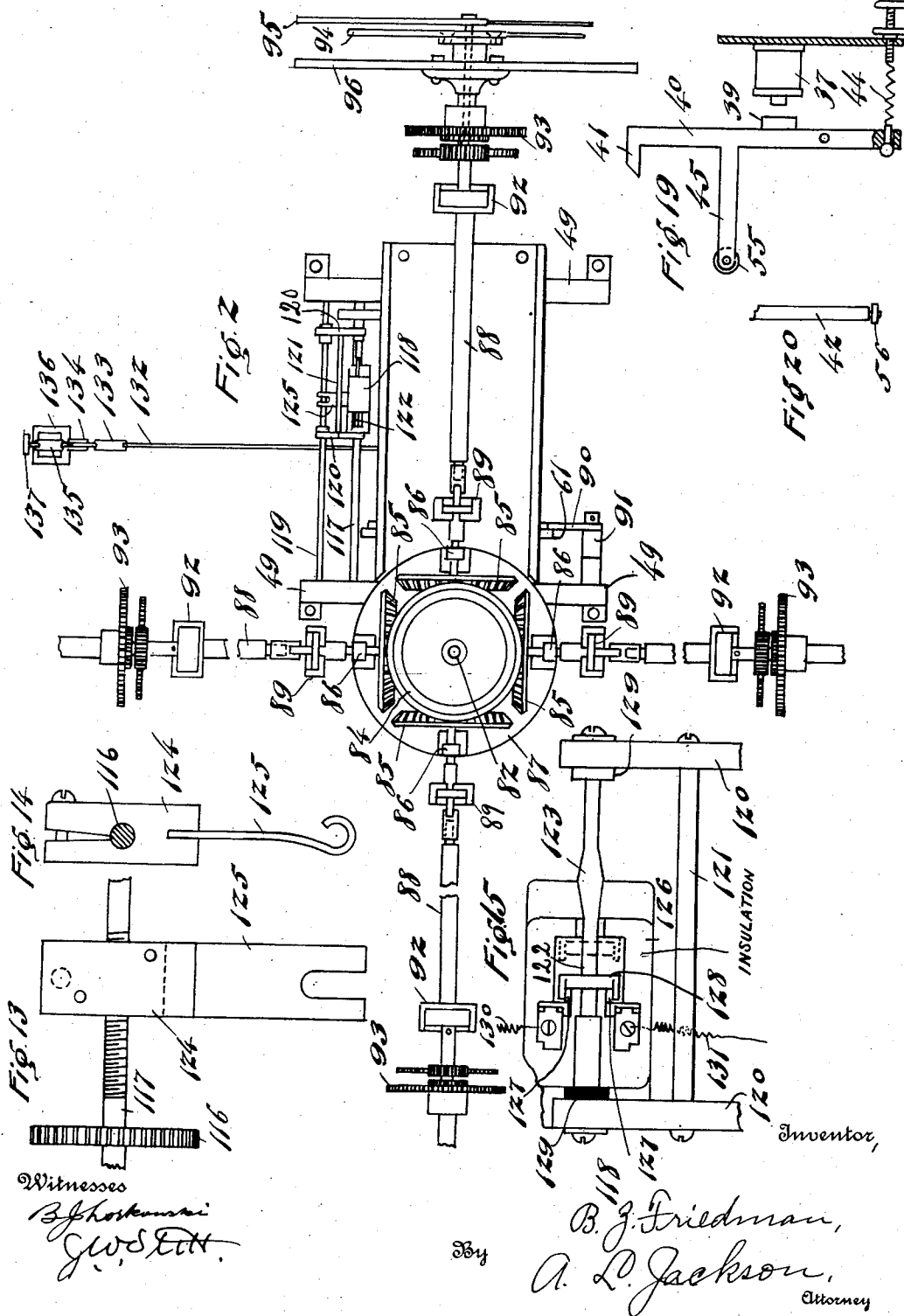
CLOCK.

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1,060,591.

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4 SHEETS—SHEET 2.



CLOCK.

1,060,591.

4 SHEETS—SHEET 3.



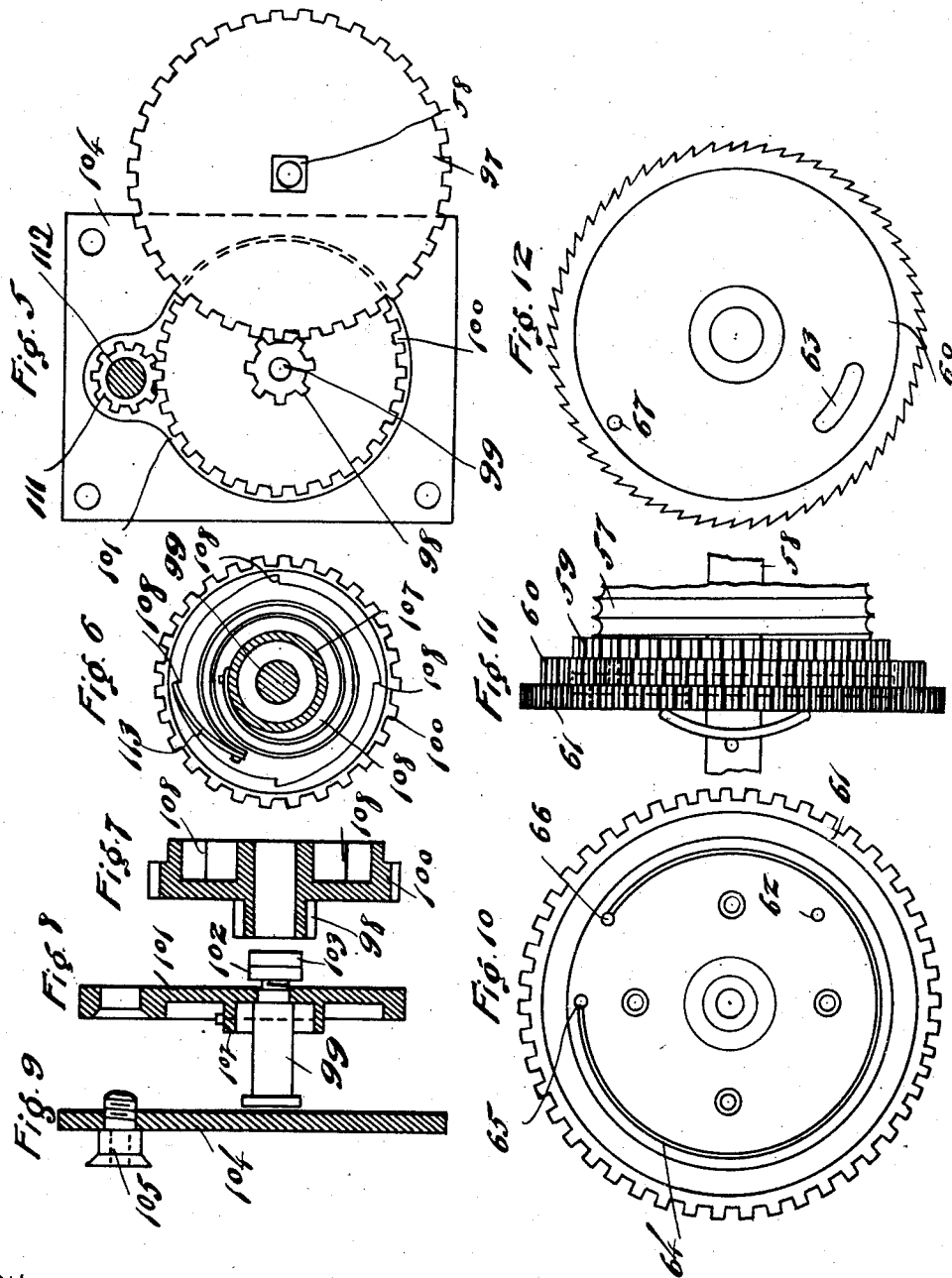
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Patented May 6, 1913.

4 SHEETS—SHEET 4.



Witnesses:-
L. J. Stright
J. M. Stright

Inventor,
B. Z. Friedman,
By A. L. Jackson,
Attorney.

UNITED STATES PATENT OFFICE,

BERNHARD Z. FRIEDMAN, OF FORT WORTH, TEXAS.

CLOCK.

1,060,591.

Specification of Letters Patent.

Patented May 6, 1913.

Application filed September 30, 1911. Serial No. 652,134.

To all whom it may concern:

Be it known that I, BERNHARD Z. FRIEDMAN, a citizen of the United States, residing at Fort Worth, in the county of Tarrant and State of Texas, have invented certain new and useful Improvements in Clocks, of which the following is a specification.

This invention relates to electrically controlled self-winding secondary clocks which are connected in series to be timed by a master clock and more particularly to tower clocks; and the object is to provide clocks which will keep perfect time and which will wind themselves periodically and means are provided for preventing the clocks from running down in case of interruption of the electric current which is utilized in winding the clock.

Another advantage is that either tower clocks or office clocks or a combination of tower and office clocks can be operated by the improvements hereinafter set forth, and to which a striking mechanism may be connected and operated.

Other objects and advantages will be fully explained in the following description and the invention will be more particularly pointed out in the claims.

Reference is had to the accompanying drawings which form a part of this application and specification.

Figure 1 is a diagrammatic view, showing a tower clock in side elevation in series with an office clock and both controlled by a master clock which is shown with the front casing removed. Fig. 2 is a plan view of a tower clock. Fig. 3 is a side elevation of a tower clock, being the opposite side of the clock shown in Fig. 1. Fig. 4 is a side elevation, looking toward the left side of Fig. 3. Fig. 5 is a side elevation of the winding gearing or gearing which rotates the winding drum. Fig. 6 is a detail view, being a rear face of the gear wheel which causes the winding, showing the spring which starts and releases the winding gearing. Fig. 7 is a diametrical section of the gear wheel which carries the starting and releasing spring. Fig. 8 is a diametrical section of the hanger which carries the gear-winding-actuating wheel. Fig. 9 is a vertical section of the plate which carries the starting and releasing gearing. Fig. 10 is an interior face view of the main driving wheel of the tower clock. Fig. 11 is a front view of the same together with the coop-

erating ratchet wheel, showing in dotted outline the spring which prevents the clock from stopping during the winding of the clock. Fig. 12 is an interior face view of the ratchet wheel which co-acts with the main driving wheel shown in Fig. 10. Figs. 13 and 14 are a plan view and a side elevation of the connection of the traveling switch with the shaft which moves the switch. Fig. 15 is a plan view of the switch which directs a current of electricity into a motor for winding the clock, the cover of the switch being removed. Fig. 16 is a front elevation of the gearing for operating a secondary clock. Fig. 17 is a detail view of the paying out wheel and coöperating parts. Fig. 18 is a detail view of the ratchet wheel and co-operating parts which co-act with the paying out wheel. Fig. 19 is a detail view of the armature releasing mechanism. Fig. 20 is a detail view of the locking arm which locks the governor.

Similar characters of reference are used to indicate the same parts throughout the several views.

The invention is shown as a complete operating mechanism with a tower clock and another secondary clock in series with a master clock. The master clock is located in a casing 1. The clock is provided with a sixty beat pendulum 2, a weight 3, a minute hand 4, and an hour hand 5. The arbor 6 of the escape wheel is shown projecting through a movement plate 7. This arbor carries the second hand. The make and break contact is controlled from this arbor. A block 8 of insulation is attached to the movement plate 7. A spring bar or strip 9 is attached to the block 8 and is bent under the block and then extended downwardly. A set screw 10 is provided for varying the position of the spring 9. This screw 10 passes through the spring 9 into a block 8 and the spring rests against the head of screw 10 which can be screwed through the spring more or less to hold the spring closer to the block or farther from the block 8. Another spring bar 11 is attached to the opposite side of the block 8 and projects downwardly in close proximity to the spring bar 9. The spring bar 11 carries a bar of insulation 12 so that the contact will not be closed when the cam lever 13 presses the bar 9 against the bar 12. The cam lever 13 is rigid with the seconds hand arbor 6. The spring bar 9 carries the make and break part 14 of the contact clos-

ing devices. The point 14 is screwed into the bar 9 more or less and is fixed in the desired position by a lock-nut 16. The other contact point 15 is attached to the bar 11.

5 The tension of the bar 9 and the length of contact can be varied by the screw 10. The cam lever or hand 13 will make a contact every minute. If it is desired to make the contact every thirty seconds a lever with

10 two arms can be mounted on the arbor 6 similar to the lever 13. The action of making and breaking contact will be as follows: The lever 13 revolves about the arbor 6 and will come against the spring bar 9 first and

15 press this bar against the bar 12, but will soon pass the bar 9 and then it will press against bar 12. Simultaneously the bar 9 will spring back to its normal position and bring the point 14 against the point 15.

20 This is made possible because the lever 13 is pressing the bar 11 toward the point 14. It is intended that when the bar 9 comes back to normal position the contact is made at that instant. On one oscillation of the

25 pendulum, the lever 13 releases the bar 9 and the contact is made. On the next oscillation of the pendulum, the lever 13 releases the bar 12 and the contact is broken. The spring bar 11 is electrically connected to the

30 battery 17 by a wire 18. The other pole of the battery 17 is electrically connected to the electro-magnet 19 by a wire 20. The spring bar 9 is electrically connected to the other pole of the magnet 19 by a wire 21. Means

35 are provided for manual breaking of the current which is passing through the wire 21. The wire 21 is intercepted and one end connected to a block 22 and the other end connected to a block 23. Connection is made

40 through the blocks 22 and 23 by a removable plug 24. The object of the plug 24 is to regulate the time of secondary clocks or tower clocks. If these clocks are too fast, they can be stopped by withdrawing the

45 plug 24, thus interrupting the operating current. This plug can be withdrawn and held long enough to regulate the time and then inserted again. Provision is made for moving up the secondary clocks. A wire 25 is

50 connected to the wire 21 and to a push button 26 and the push button 26 is connected to the wire 18 by a wire 27. The circuit can be closed by the button 26 instead of through the operation of the lever 13. If the clock is

55 making one contact to a minute, every push on the button 26 will move the secondary clocks up a minute.

The operation of the secondary clocks is accomplished as follows: Whenever the contact is closed by the master clock, the magnet 19 is energized and an armature 28 closes a circuit for the secondary clocks. The connection is made as follows: A battery 29 is electrically connected to a bar 30 by a wire

60 31 which is insulated from the magnet 19.

The armature closes the connection with the bar 30. The pivotal connection 32 of the armature is also insulated from the magnet 19. A leading out wire 33 is connected to the armature 28 and goes to the first secondary clock 34. Means are provided for breaking the circuit for the secondary clocks. An arm 35 is made rigid with the clock casing 1 and a spring 36 is attached to the armature 28 and to the arm 35. The magnet 19 when energized will overcome the spring 36 and as soon as the magnet 19 is deenergized, the spring 36 will draw the armature 28 out of contact with the bar 30 and thus break the current. This will make a current

70 run through the secondary clocks every time a contact is closed by the master clock and the current through the secondary clocks will be broken as soon as the master clock breaks the contact.

38' indicates the wire which is connected with battery 29 and coöperates with the wire 33 to complete the circuit.

A small secondary clock 34 is placed within the master clock casing 1 for convenience in comparing the time of the secondary clocks with the master clock. It will have the same time as the other secondary clocks and the tower clock. If it has not the correct time, it and the other secondary clocks

85 can be corrected as above indicated.

The tower clock is illustrated in Figs. 1, 2, 3, and 4. The wire 33 connects to one pole of the magnetic coil composed of coils 37 and 38 on the approach to the tower clock and is intercepted and connected to the other pole as the wire leaves the tower clock. With a sixty beat master clock there is a make and break of the circuit through the coils 37 and 38 every sixty seconds. Whenever these coils are energized, they attract an armature 39 which is carried by a pivoted post or trigger 40. The trigger 40 has a hook 41 which engages a trip arm 42 which is rigid with the shaft 43. The arm 42 is held stationary until the armature 39 draws the hook 41 out of engagement with the arm 42. As soon as this is done, the arm 42, being held under tension, will commence to revolve and the shaft 43 will release a

100 train of gearing which will commence to run. The current through coils 37 and 38 is broken instantly and a spring 44 moves the armature 39 away from the coils 37 and 38, but the trigger 40 cannot go back to normal position because an arm 45 integral with the trigger bears against the crown 46 of a cog wheel 47 and this crown prevents the hook 41 from engaging the arm 42 until the crown 46 revolves far enough to bring the cut-out in the crown opposite the arm 45, as shown in Fig. 1. When this cut-out comes opposite the arm 45, the arm will fall into the cut-out and assume its normal position and engage the arm 42 and thus stop

110 115 120 125 130

the train of gearing. This operation of the train of gearing will cause a movement of the minute hand one minute space on the dial of the clock. The trigger 40 is pivotally mounted in arms 48 which are rigid with the frame 49. A screw 50 passes through the trigger 40 and rests against a rigid stud 51 to limit or regulate the movement of the trigger 40 and consequently the armature 39 back toward the coils 37 and 38. The screw can be screwed more or less through the trigger 40 for this purpose. Means are also provided to prevent the trigger from falling too far toward the crown 46. A post 54 is attached rigidly to the frame 49, and carries a horizontal arm 53. (See Figs. 1 and 3.) A screw 52 is mounted in the arm 53 and can be screwed more or less through the arm 53 to bear against the trigger 40. The arm 45 is provided with an antifriction roller 55 which bears against the crown 46. The arm 42 is provided with an antifriction roller 56 (see Fig. 20) which bears against the hook 41 of trigger 40.

The driving mechanism of the tower clock is actuated by a weight controlled drum 57 which is rigid with a shaft 58. A ratchet wheel 59 is rigid with the drum 57. A ratchet wheel 60 and the main driving wheel 61 are loosely mounted on the shaft 58. The main drive wheel 61 and the ratchet wheel 60 move with each other by reason of the pin 62 which is rigid in the wheel 61 and which projects into the slot 63 in wheel 60. A spring 64 is attached at one end by a pin 65 to wheel 61 and at the other end attached to the wheel 60 by a pin 66 which is inserted in a hole 67 in wheel 60. The object of this spring 64 is to keep the wheel 61 going when the drum 57 is being turned backward for winding purposes. Tension for the spring 64 is obtained by reason of the weight pulling on the drum 57 and ratchet wheel 59. The pin 62 will in such case project into the slot 63 and limit the movement of the wheels relative to each other and thus prevent the wheel 60 from turning far enough to break the spring 64. The wheel 60 is locked to the wheel 59 by a pawl 68 which is pivotally mounted on the face of the wheel 60 and by a spring 69 which is also attached to the face of the wheel 60 and presses on the pawl 68. Consequently when the drum 57 is turning it will drive the wheel 60 and also the wheel 61 which must move with the wheel 60. When the drum is being turned backward for winding, the pawl 68 will ride over the teeth of wheel 59. While this winding is going on the spring 64 will keep the wheel 61 going for operating the clock. When the wheel 61 is driving, it drives the pinion 70 which is rigid with shaft 71 and consequently drives cog wheel 72 which is rigid with shaft 71. Cog 72 drives pinion 73

which is rigid with shaft 74. Shaft 74 drives cog wheel 47. Cog 47 drives pinion 75 which is rigid with shaft 43. It may be said that this train of gearing just described stands motionless approximately fifty-seven seconds during each minute, being locked against movement as above described and released when the master clock closes the circuit. When the train of gearing is released, it moves approximately three seconds. During the running of the gearing the pinion 75 will turn or revolve eight times, geared as illustrated in the drawing. Means are provided to relieve the jar of the arm 42 coming against the hook 41. Wings 76 are attached to collars 77 which are loosely mounted on the shaft 43. (See Figs. 1 and 3.) A spring 78 is attached to one of the wings and is bent behind the shaft 43 in a reduced portion of the shaft and then presses against the other wing. The wings cannot move axially on the shaft 43 because the spring 78 rests in the reduced portion and the shoulders on the shaft at each side of the spring prevent the movement of the wings. When the shaft 43 is revolving the spring 78 will bear on the shaft 43 with sufficient friction to make the wings revolve with the shaft and thus tend to prevent too fast a revolution of the shaft and thus make the arm 42 come against the hook 41 with less force than if the wings were not on the shaft. When the shaft stops the wings will revolve a few times by centrifugal force until the centrifugal force gradually dies. A gravity pawl 90 engages wheel 60 and prevents this wheel and wheel 61 from turning backward during the winding of the clock and thus conserves the tension of spring 64 for driving purposes during the winding. A bearing 91 for pawl 90 is attached to frame 49.

The power of the gearing last above described is transmitted to the gearing for moving the hands of the clock by the gear wheel 61. A bevel gear wheel 79 is rigidly connected with the gear wheel 61 by posts or arms 80 which are rigidly attached to both gear wheels. Gear wheel 79 drives a bevel gear wheel 81 which is rigidly attached to the shaft 82. A bearing 83 is provided for the shaft 82. The tower clock is shown provided with means for operating four sets of hands. A bevel gear wheel 84 is rigid with shaft 82 and meshes with four bevel gear wheels 85 which are journaled in bearings 86 which are attached to a platform 87 which constitutes a part of frame 49. The gear wheels 85 drive or revolve four arms 88. These arms constitute shafts for moving the minute and hour hands about the dials. Shaft couplings 89 connect the arms 88 with the shafts of the wheels 85. Shaft couplings or universal joints 92 connect the arms 88 with the hour

and minute hand gearing 93. Hour hands 94 and minute hands 95 are provided for pointing out the time on the dials 96.

Means are provided for winding the drum 57. A cog wheel 97 is rigid with the main driving shaft 58 and drives a pinion 98 which is loosely mounted on shaft 99 which constitutes a pivot bolt for mounting the wheel 100 and pinion 98 on the hanger 101. The bolt 99 is held in place by double nuts 102 and 103. The hanger 101 is pivotally mounted on a plate 104 by a bolt 105. The wheel 100 has an internal ratchet and a coil spring 106 is attached at the inner end to the hub 107 of the hanger 101 and this spring is adapted to engage the teeth 108 of this internal ratchet. The winding operation is accomplished by means of a motor 109 which is provided with a shaft 110 and this shaft drives a pinion 111 which is provided with a shaft 112 which is rigidly connected with the shaft 110. The shaft 112 has a reduced portion or pivot which is journaled in the attaching bolt 105. The motor drives pinion 111 which drives cog wheel 100. Cog wheel 100 drives pinion 98, being rigid or integral therewith, and pinion 98 drives cog wheel 97 which drives shaft 58 and drum 57 for winding the weight. The pinion 98 stands normally disengaged from the wheel 97. When the motor is energized and commences to run, the pinion 111 will drive the cog wheel 100 and pinion 98 and this operation will wind the spring 106 which will gather tension as the turning of the wheel 100 continues. The continual turning of the cog wheel 100 will soon cause tension enough in the spring 106 to force the hanger 101 to swing on its pivot and bring the pinion 98 in mesh with wheel 97. This operation will start the winding of the clock. The turning of the wheel 100 long enough to wind the clock would wind the spring 106 enough to break it. For this reason the spring is so constructed that it will slip off of the teeth 108, the spring going backward one tooth at a time. This will continue until the clock is wound when the circuit which is causing the motor 109 to run will be broken, as hereinafter described, and the motor will stop running. The spring 106 will have enough tension to run the motor a few revolutions backward. This operation will disengage the pinion 98 from the cog wheel 97. The pinion 98 is thus automatically engaged and disengaged from the cog wheel 97 which accomplishes the winding of the clock drum. A hook 113 is attached to the spring 106 for engaging the teeth 108.

The gear winding will not commence until the motor 109 is connected with a supply source of electricity. This is done automatically by a traveling switch which is operated from the main driving shaft 58.

A cog wheel 114 is mounted on shaft 58. This cog wheel 114 drives a pinion 115. This pinion drives a cog wheel 116 which is rigid with the shaft 117. This shaft is a screw-threaded shaft, as shown in Fig. 13, and is continually driven by power transmitted from the main driving shaft 58. The traveling switch is operated by this screw threaded shaft.

118 indicates the switch.

A rod 119 is mounted in the frame 49. Bars 120 are rigid with the rod 119. The arms 120 are provided with a brace 121. The arms 120 carry the trip 122 which is held rigidly in place and this trip consists of a swell or enlarged place 123 in the rod 122 which is rigid in the arms 120. The switch 118 is mounted on and attached to a block 124 which is slotted and perforated to receive the screw shaft 117. A bar 125 is attached to the block 124 and engages the rod 119 loosely so that the bar will slide on the rod. Contacts 127 are mounted on a block of porcelain 126. A movable spring contact 128 is perforated and mounted in a cavity in the block 126 and receives the rod 122 in a perforation. The perforation in the movable contact is large enough for the rod 122 to pass without touching the contact but not large enough to pass the swell 123 without touching it. Insulation 129 is provided to prevent the switch from coming in contact with the arms 120.

The drawings, Fig. 15, show the contact made for operation. The switch travels as the shaft 117 revolves. When the contact is not made the spring contact 128 stands in the position of the dotted outline. As soon as the switch has traveled far enough for the swell 123 to pass through the movable contact, the spring will throw the contact from the dotted outline position and close a circuit. This operation takes place as soon as the highest point of the swell passes through the movable contact. This operation will start the motor 109 and the winding of the clock commences. As soon as the winding operation commences the shaft 58 is turned in the opposite direction. This reverses the train of gearing which drives the shaft 117, consequently the switch will commence to travel in the opposite direction. The swell will again pass through the movable contact which operation will cause the contact to spring to the position of the dotted outline and break the current through motor. The clock is wound by this time. The motor will stop. The shaft 117 is threaded so that the clock will be wound every twelve hours, that is, the shaft is threaded so that the switch will travel far enough in twelve hours to make the contact for winding the clock. The threads on the shaft are extended still farther and if there should be no current or power, the contact

will remain in place and the switch will continue to travel so that the clock will run 14 hours longer. If during this time, the power should come in the contact, the clock would be wound. If there should be no current during the twenty-four hours, any suitable alarm may be set off by the weight to give notice that the clock is running down with no current for re-winding the clock.

A wire 130 is connected to the switch 118 and to the motor 109. The other wire 131 is connected to the switch 118 and runs to the power house and then to the motor 109. A cable 132 for winding on the drum 57 runs under a pulley wheel 133, then over a pulley wheel 134, then under a pulley 135 to which is suspended a weight 136, and then extended up to a stationary bar 137 and attached thereto.

The escapement mechanism for operating the secondary or office clocks is illustrated in Figs. 16, 17, and 18. The escapement wheel 138 is mounted on a shaft 139 and is operated by a magnet 140 and by a bar 141 which carries an armature 141' which carries pins 142 and 143 and a ratchet wheel 144 is loosely mounted on the shaft 139. The magnet 140 is energized by the make and break mechanism of the master clock. When the magnet is energized, the armature 141 is drawn toward the magnet. It turns the ratchet wheel 144 one tooth and this creates tension of the spring in the barrel 145 of the ratchet wheel 144. The spring will cause the escapement wheel 138 to turn. At the same time the lever 141 will raise the pin 143 out of engagement with the wheel 138, allowing this wheel to turn, and will place the pin 142 into engagement with the wheel 138. The wheel 138 will turn the distance of one tooth with each releasing of the wheel by pin 143 and each engaging of the wheel by pin 142. When the master clock breaks the circuit, the spring 146 will draw the armature away from the magnet 140 and the armature lever will rest against the regulating screw 147. This will lift pin 142 out of engagement with wheel 138 and place the pin 143 in engagement with that wheel. When the armature lever 141 is drawn toward the magnet the spring-pressed dog 148 turns the wheel 144 and the spring dog 149 will lock the wheel 144 against backward turning. The turning of the escapement wheel 138 and of the ratchet winding wheel 144 is done at the same time. When the escapement wheel 138 turns the pinion 150 which is rigid therewith turns also. The pinion 150 drives a cog wheel 151. The cog wheel 151 drives the shaft 152 to which is attached hour and minute hands and the hand wheels which are common to all clocks.

Having fully described my invention, what I claim as new and desire to secure by

1. In a clock, the combination of a train of gearing, a drum and a weight for operating said gearing, and means for winding said drum consisting of an electric motor provided with gearing, a winding gearing operatively connected with said drum, the gearing of said motor being normally disconnected from said winding gearing, a tension spring in said motor gearing for automatically causing said motor gearing to engage said winding gearing for driving the winding gearing, and a traveling switch actuated by said train of gearing for periodically operating said motor.

2. In a clock, the combination of a train of gearing, a drum and a weight for operating said gearing, a winding gearing operatively connected with said drum, an electric motor provided with gearing normally disconnected from said winding gearing but adapted to engage said winding gearing when the motor is running, and a traveling switch operated by said train of gearing adapted to close a circuit in said motor periodically for operating the motor.

3. In a clock, the combination of a train of gearing, a drum and weight for operating said gearing, a winding gearing operatively connected with said drum, an electric motor provided with gearing normally disconnected from said winding gearing, and means carried by said motor gearing for automatically causing the motor gearing to engage the winding gearing when the motor is running and for automatically disengaging the motor gearing from said winding gearing when the motor stops driving the winding gearing.

4. In a clock, the combination of a train of gearing, a drum and a weight for operating said gearing, a winding gearing operatively connected with said drum, an electric motor provided with gearing normally disconnected from said winding gearing, said motor gearing including a cog wheel provided with an interior ratchet, a hanger for said motor gearing, and a tension spring countersunk in the meeting faces of said cog wheel and said hanger with one end attached to the hanger and the other end adapted to engage said rack for automatically causing said motor gearing to engage said winding gearing when the motor is running and to disengage said motor gearing from the winding gearing when the motor stops running.

5. In a clock, the combination of a train of gearing, a drum and a weight for operating said gearing, a winding gearing operatively connected with said drum, an electric motor provided with gearing normally disconnected from said winding gearing, means carried by said motor gearing for automatically causing the motor gearing to engage the winding gearing when the motor is running and to disengage said winding gearing

when the motor stops, a screw threaded shaft operatively connected with said winding gearing and said train of gearing, a traveling switch operatively connected with said screw threaded shaft for operating said motor periodically, and a tripping device in the path of said switch for closing the contact in said switch when the switch is driven by said train of gearing and for breaking the contact when said switch is being driven by said winding gearing.

6. In a clock, the combination of a train of gearing, a drum and a weight for operating said gearing, a winding gearing operatively connected with said drum and with said train of gearing, means for operating said winding gearing, a screw threaded shaft operatively connected with said winding gearing and with said train of gearing, a traveling switch operatively connected with said screw threaded shaft, and a tripping device in the path of said switch for closing the contact in said switch when being driven by said train of gearing and for breaking the contact in said switch when the switch is being driven by said winding gearing

whereby said switch operates said winding operating means periodically.

7. In a clock, the combination of a train of gearing, a drum and a weight for operating said gearing, a winding gearing operatively connected with said drum, an electric motor provided with gearing normally disconnected from said winding gearing, means carried by said motor gearing for automatically causing the motor gearing to engage said winding gearing when the motor is running and to disengage said motor gearing from the winding gearing when the motor stops, a screw threaded shaft operatively connected with said train of gearing and with said winding gearing, and a traveling switch operatively connected with said screw threaded shaft for operating said motor periodically.

In testimony whereof, I set my hand in the presence of two witnesses, this 27th day of September, 1911.

BERNHARD Z. FRIEDMAN.

Witnesses:

A. L. JACKSON,
J. W. STITT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."