Dec. 9, 1947. A. W. HAYDON 2,432,416

CLOCK CONSTRUCTION

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Fig. 1.

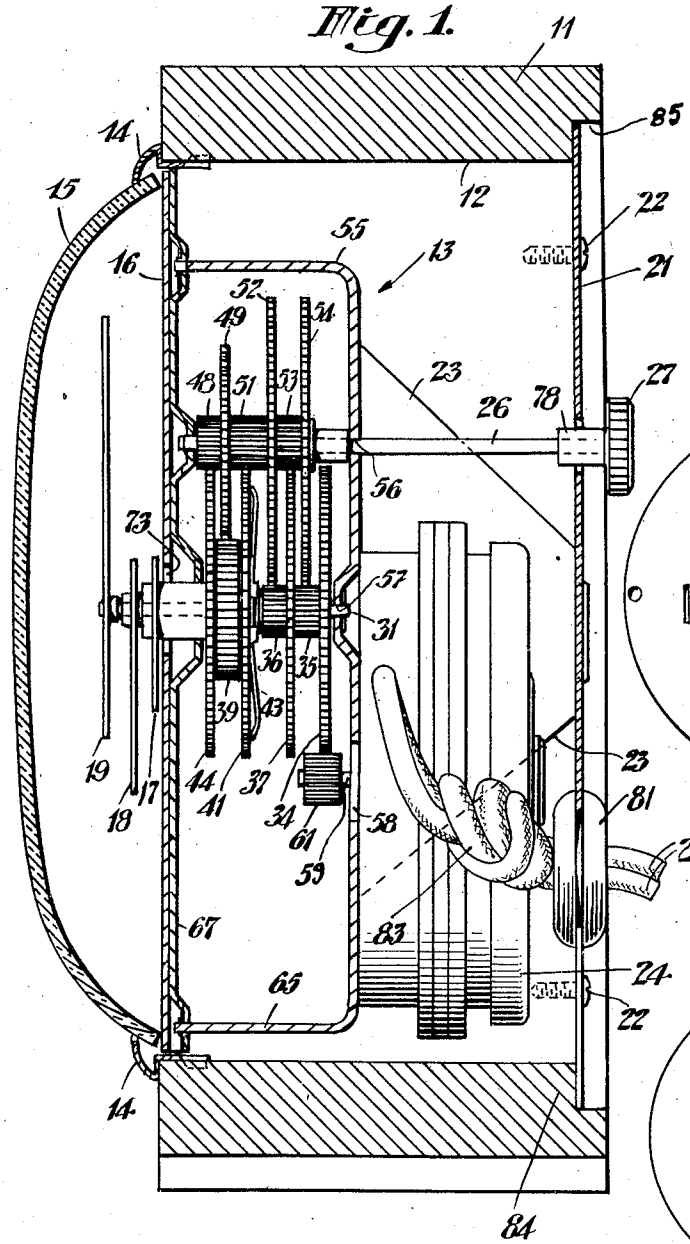



Fig. 7.

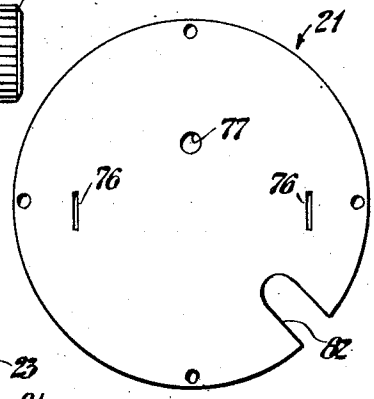
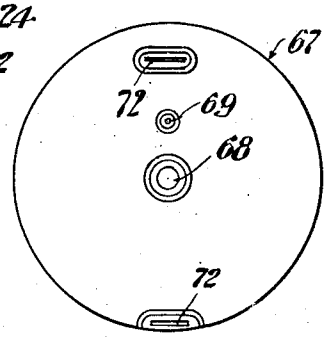



Fig. 8.




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Fig. 2.

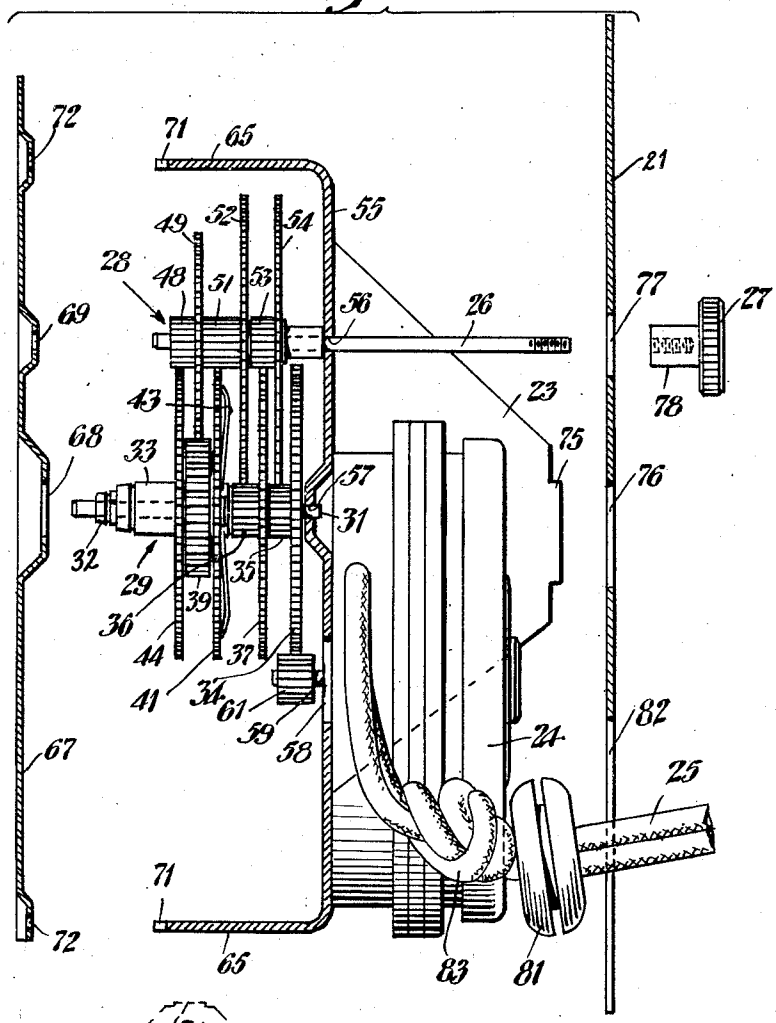



Fig. 5.

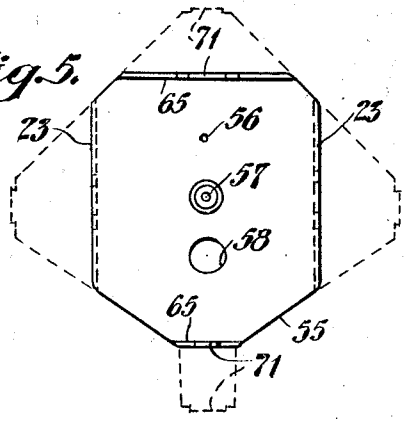
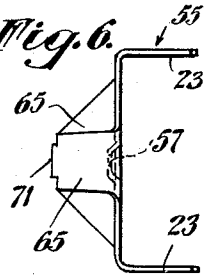



Fig. 6.




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Fig 3.

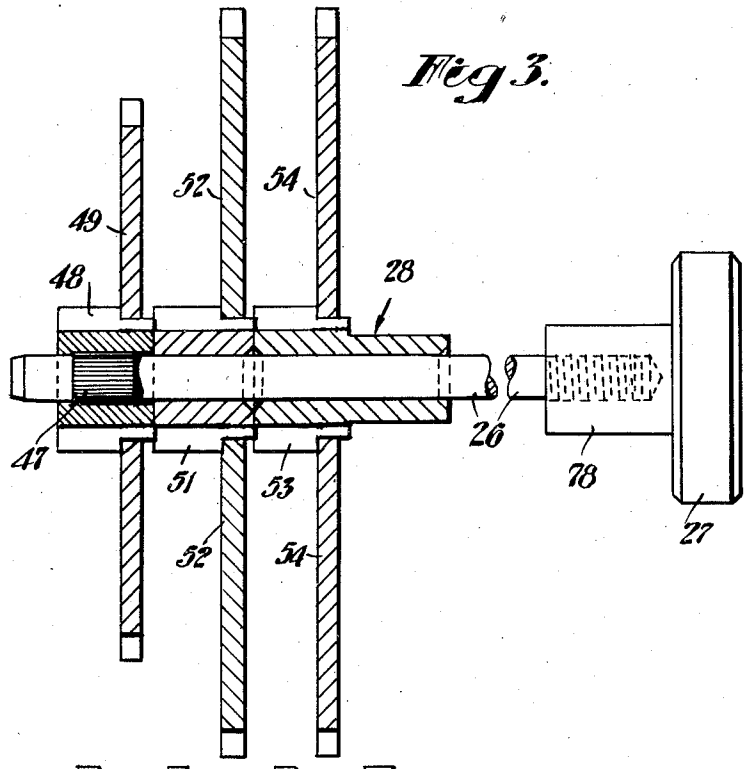
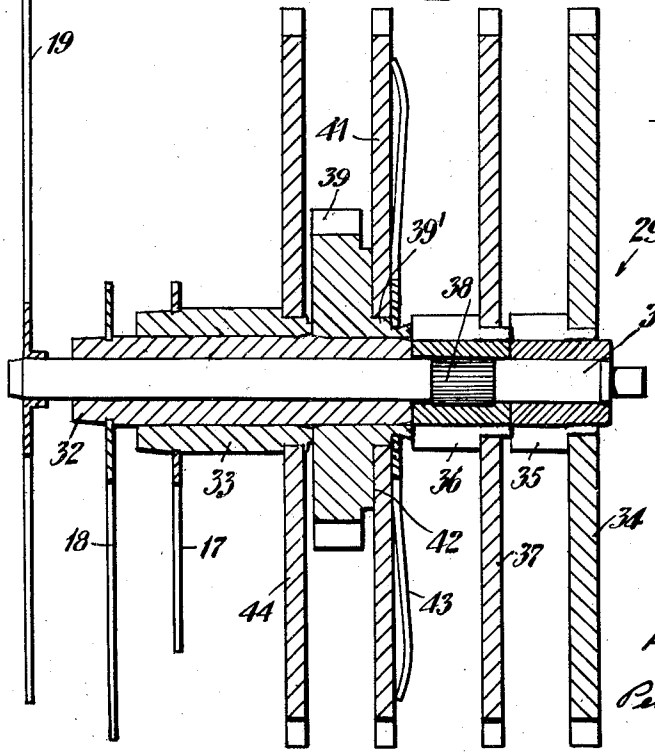



Fig. 4.




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# UNITED STATES PATENT OFFICE

2,432,416

## CLOCK CONSTRUCTION

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Application August 23, 1944, Serial No. 550,701

3 Claims. (Cl. 58—26)

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This invention relates to electric clocks and more particularly to the construction of the clock movement thereof and to the assembly of this clock movement into the clock casing.

Prior clock constructions have required, in addition to the front and rear plates of the movement which have housed the clock gears and their shafts, a dial backing spaced from the movement front plate in order to provide a flat support for the dial. One reason for this has been that the making of the movement and the assembly of the movement into the clock casing have been separate departmental activities. The movement has been designed and made in one department and then transferred to another department where a separate dial back of desired size was mounted on the movement and the movement and dial back assembled into the clock casing. Another reason was that certain of the gears, particularly those gears utilized to set the clock hands, were located ahead of the movement front frame plate, leaving no smooth surface on the movement for supporting the dial and consequently requiring that a dial backing be located ahead of these gears. Beyond this, the gearing arrangements have generally required two or more gear shafts and a separate setting shaft which had to be moved axially to effect engagement of the setting gears for the setting operation. Also, pillars and bolts have been generally used to hold the plates in spaced relationship which makes for a greater number of clock parts. Such prior constructions and their assembly into the clock casing have been complicated and unadapted to conveyor line production.

It is among the objects of the present invention to reduce the number of parts of a clock to its prime elements, standardize the methods of assembly of movement for a line of various clocks, and provide a clock suitable for conveyor line production.

It is another object of the invention to provide an electric clock movement wherein only two shafts and two frame plates are used and wherein the movement front plate will serve as the backing for the dial.

It is another object of the invention to eliminate the need for the usual type of pillars and bolts between front and rear frame plates of the movement and between the movement rear frame plate and the clock casing back plate.

According to the present invention all of the gearing for the clock movement is assembled on two shafts and these two shafts and the gears thereon are contained between the front and rear frame plates. The arrangement is such that the movement front frame plate serves as the dial backing. One of these two shafts extends rearwardly through the clock casing back plate and serves as the setting shaft. Axial adjustment of this setting shaft is unnecessary to reset the clock. The gears are kept in mesh at all times and their ratio relationship is such that rotation of the exposed setting knob is merely at the harmless speed of less than one revolution per hour. The gears of the respective shafts are assembled separately and dropped as units into the rear frame plate. The front dial backing plate is fitted over these units and secured to forwardly bent pillar projections of the rear plate. An electric motor is mounted on the rear face of the movement rear plate.

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The movement with the motor is assembled into the clock casing without a separate dial back having to be connected to it. The clock casing has a large movement opening extending therethrough. A clock glass is first dropped into the clock movement opening from the rear of the casing and is retained at the front of the casing by a bezel. After the dial is fitted against the front plate the clock hands are attached to the central shaft assembly, and rearwardly bent projections on the rear plate are secured to the casing back plate. The movement is then dropped into the casing behind the glass and the casing back secured by screws or the like to the clock casing. To the portion of the setting shaft which extends through the casing back, a setting knob is attached. The forwardly and rearwardly bent projections of the rear plate eliminate the necessity for the usual pillars found in most clocks. These projections may be welded or riveted to the front plate and casing back. Inasmuch as the movement frame is braced against lateral movement when in the casing opening by the front plate and dial fitting tightly therein and against the bezel and by the casing, the frame is of lighter gauge material than that used in clocks where the movement has to be self-supporting.

The movement is so designed that by merely using a different size of front plate and casing back, it may be fitted into clock casings having different size opening and dials. The method of assembly in each case will be the same. Generally, in a given line of clocks the different clock casings are of the same depth but, in case of a greater depth, longer, rearwardly bent projections may be provided. A kitchen style clock is shown herein.

For other objects and for better understanding of the invention, reference may be had to the following detailed description of one embodiment of my invention, illustrated in the accompaying drawings in which—

Fig. 1 is a cross-sectional view, in elevation, taken through the movement and casing of the assembled clock;

Fig. 2 is a partially exploded view of the frame

plates, with the shaft assemblies already mounted on the rear plate, and of the casing back;

Fig. 3 is an enlarged cross-sectional view of the setting shaft gear assembly;

Fig. 4 is an enlarged cross-sectional view of the central shaft gear assembly with clock hands thereon;

Fig. 5 is a small plan view of the movement rear plate and a dotted line showing of the blank with unbent pillar projections;

Fig. 6 is a side view of the rear plate of Fig 5;

Fig. 7 is a small plan view of the back plate of the clock casing; and

Fig. 8 is a small plan view of the front frame plate of the movement.

Referring particularly to Fig. 1, there is shown a clock casing 11 which may be of any size or shape and through which there is an opening 12 adapted to receive a clock movement 13. Around the forward end of opening 12 and attached to the casing, is a bezel 14 for supporting a clock glass 15, which is inserted from the rear of the opening 12. Assembled on the movement 13 is a dial 16 and hour, minute and sweep second hands 17, 18 and 19. The movement, with these parts attached, is connected to a casing back or plate 21 which is attached by screws 22 to the clock casing 11. Rearwardly bent projections 23 are provided on the movement for this purpose.

An electric motor 24 is secured to the movement 13, and wires 25 thereof pass outwardly through the casing back 21. The electric motor 24 may be of the construction disclosed in my prior Patent 1,935,208 or 1,996,375 or of any other construction as may be desired, but preferably the dimensions of the motor should be such that the motor does not interfere with a counter or setting shaft 26 projecting through the rear of the clock movement 13. A setting knob 27 is fixed to the end of the shaft 26 and is accessible from the rear of the casing. The motor 24 may be welded or otherwise fixed to the mounting plate in the position illustrated in Fig. 1.

Referring now particularly to Figs. 3 and 4, there is shown, respectively, a setting or countershaft assembly 28 and a central shaft assembly 29. The shaft assembly 29 includes a central shaft 31 having fixed thereto sweep second hand 19, and a pinion 36. A gear 37 is fixed to pinion 36. A sleeve 32 carrying the minute hand 18 and a pinion 39 is rotatably mounted on the shaft 31. Another sleeve 33 carrying the hour hand 17 and a gear 44 is, in turn, rotatably mounted on sleeve 32. Loosely mounted on the rearward end of shaft 31 is a pinion 35 with a gear 34 fixed thereto. The pinion 36 with the gear 37 thereon may be fixed to the shaft by pressing it onto a knurled portion of the shaft, as shown at 38, or in any other suitable manner. The pinion 39 has a shoulder 39' on which a gear 41 is rotatably mounted but normally held in firm frictional engagement with the face 42 of the gear 39 by means of a spider spring 43 carried by the shoulder 39'.

Fixed to the forward end of the setting shaft 26, as indicated at 47, is a pinion 48 with a gear 49 secured thereto, Fig. 3. Another pinion 51 with a gear 52 fixed thereon is loosely mounted on setting shaft 26, and a third pinion 53 with a gear 54 fixed thereon is also loosely mounted on the shaft 26. In both assemblies the small pinion and gear carried thereby may be splined together.

The central and setting shaft gear assemblies



are separately assembled, and are assembled as units into the rear frame plate 55, on the back of which electric motor 24 is mounted, so that the ends of shafts 31 and 26 enter openings therein, Fig. 2. The setting shaft 26 extends through opening 56 while the central shaft 31 is dropped into a central opening 57. All gears are brought into mesh. Motor shaft bearing 58 in a large opening in rear plate 55 locates the motor therein. Drive shaft 59 extending through bearing 58 carries a pinion 61 which meshes with and drives the gear 34 on the central shaft.

Pinion 35 will then drive central shaft 31 through gear 54 and pinion 53 on the setting shaft 26, and gear 37 and pinion 36. The reduction in speed effected by this gearing is such as to rotate shaft 31 and the sweep second hand 19 one revolution per minute.

Pinion 36, in turn, drives gear 52 and pinion 51, and the latter, in turn, drives the frictionally retained gear 41 and large pinion 39 on minute sleeve 32. As the sleeve 32 rotates, minute hand 18 is driven. Large pinion 39 drives gear 49 and pinion 48 to slowly rotate setting shaft 26, and pinion 48 thereon, in turn, drives the gear 44 and sleeve 33 to thereby effect rotation of hour hand 17.

In order to obtain a smooth setting arrangement, a low gear ratio of less than two to one is provided between gear 49 and the large pinion 39 so that one revolution of the setting knob 27 will make only slightly more than one revolution of the minute hand. The gear ratio between the pinion 48 and gear 44, which through sleeve 33 drives hour hand 17, is such that the product of this ratio and the ratio between pinion 39 and the gear 49 is one to twelve to provide thereby the proper ratio between the hour and minute hands. For example, pinion 48 may have 8 teeth, gear 44—64 teeth, pinion 39—16 teeth and gear 49—24 teeth, whereupon the product will be

$$\frac{8}{64}\times\frac{16}{24} \text{ or } \frac{1}{12}$$

Because pinion 39 and plate gear 41 are only frictionally held together, as effected by spring 43, the setting of the minute and hour hands is done without rotating the main reduction gears. Because of the low ratio of the gears, the setting knob 27 makes less than one revolution per hour while the clock is running, which is unnoticed and unharmful.

The small pinion gears on both shafts have the same number of teeth (8) and pitch, and are made from the same pinion wire. Also, the large gears 34, 54, 52 are of the same pitch and number of teeth (60) and the large gears 37, 41 and 44 are the same pitch and number of teeth (64). The motor pinion is run at 450 revolutions per minute.

The rear plate 55 has forwardly bent projections 65 as well as the rearwardly bent projections 23, Figs. 5, 6. A front frame plate 67 is fitted on the forward projections 65 to complete the movement frame. With the shaft assemblies properly in place on the rear frame 55, the front frame plate 67 is dropped into place over the gear assemblies and projections 65 to form a front bearing plate. Sleeve 33 is received in a central opening 68 while setting shaft 26 is received in small opening 69. On each of the projections 65 are projecting tongues 71, Fig. 2, adapted to extend through slots 72 in front frame plate 67 and be upset or welded to fix front frame plate securely upon the projections 65.

When the movement is finally ready to be placed into the clock casing, thin dial 16 is placed against the front plate 67. The clock hands are added to the central shaft assembly. Central shaft assembly 29 will extend through an opening 73 in the dial. The front frame plate 67 thus serves as the dial back for the dial 16.

Casing back is then fitted to rearwardly bent projections 23 so that projecting tongues 75 thereof are extended through slots 76 and setting shaft 26 extended through opening 77. The tongues are upset or welded to the back 21. Knob 27 is connected to the setting shaft 26 and its hub portion 78 extends loosely into large opening 77. A rubber grommet 81 containing the wires 25 is slid into open ended slot 82 of the casing back. The wires 25 are preferably knotted as indicated at 83 to prevent the wires from being pulled through the grommet and loosened from the motor.

After the clock glass 15 is placed against the bezel 14, this new assembly is dropped into the casing opening 12 and the back secured to the casing by putting screws 22 in casing shoulder portion 84 and tightening the back against casing 11. By this construction, the movement and the attached parts are carried by the casing back and thus can readily be made free of the clock casing by simply removing the casing back. By merely changing the size of the front plate a different size dial may be supported and the movement thereby readily adapted for a clock with a larger face. Also, by varying the length of the bent back projections 23 the movement is altered for a clock casing of different depth. By fitting the back 21 into a recess 85 of the casing 11 and likewise locating the front plate 67 snugly in the bezel 14 or directly against the opening 12, the entire clock movement assembly is held rigid by support from the casing 11, thereby allowing the use of relatively light gauge metal for the frame 55. It will be noted that the front plate is coextensive with the thin dial 16 to provide adequate support therefor throughout the entire rear surface thereof.

It should now be apparent that there has been provided a clock movement in which only two shafts are utilized, one of which serves as a setting shaft, and in which all of the gears are included between two frame plates. It should also be apparent that an arrangement has been provided wherein the front frame plate serves as the dial back for the dial and the pillars are integral parts of one of the movement plates.

While various changes may be made in the details of construction, it shall be understood that such changes shall be within the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. A clock movement comprising a rear frame plate, a front plate, means for securing the front plate to the rear plate to provide a frame, a motor mounted on the rear of the frame and having a drive shaft extending through the frame, a central shaft supported in the frame and extending between said plates, minute and hour hands and driving sleeves and reduction gears carried by said central shaft, a single countershaft journalled in the frame and extending between said plates, reduction gears on said countershaft cooperating with the gears on the central shaft to complete driving connections with the sleeves of the central shaft, a pinion on the motor shaft engaging a gear on the central shaft, said countershaft extending through said frame at one side of said motor whereby the projecting end of the countershaft can be turned by hand to set the clock.



2. In a clock, a clock casing having an opening therethrough, a bezel in the front of the opening, a clock glass insertable from the rear of the opening and adapted to bear against the bezel, a casing back adapted to close the rear of the clock opening, a clock movement adapted to fit the opening and to support a dial, said movement including a rear frame plate, central and setting shaft assemblies fitted into the rear plate, a motor carried by the rear frame for driving the shaft assemblies, a front plate secured to the rear plate in front of the assemblies, a dial fitted flatly against the front plate, said central shaft assembly extending through the front plate and the dial, clock hands secured to the central shaft assembly in front of the dial, said movement with the related parts thereof connected to the casing back to be supported thereon, said setting shaft extending through the rear frame plate and through the casing back to be accessible at the rear of the clock, and means for securing the casing back to the clock casing to support the movement and the related parts within the clock opening and in rear of the clock glass.

3. A clock mechanism comprising a pair of frame plates held in spaced relationship with one another, a motor mounted on one of the plates and having a drive shaft extending through one of the plates, a central shaft supported in the plates, minute and hour hands and driving sleeves and reduction gears carried by the central shaft, a single countershaft journalled in the plates, reduction gears on the countershaft cooperating with the gears and the central shaft to drive the sleeves thereof, a pinion on the motor drive shaft engaging a gear on one of the other shafts, said countershaft having an extension adapted to be manually turned to effect the setting of the minute and hour hands, and setting gears including a pinion keyed to the countershaft, a gear on the hour hand sleeve meshed with the pinion, a large pinion on the minute hand sleeve, a gear adapted to be turned by the countershaft and meshed with the large pinion, one of said reduction gears on the central shaft being normally frictionally retained against the large pinion but remaining stationary as the countershaft is turned to set the minute and hour hands.

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