Dec. 16, 1941. A. W. HAYDON 2,266,198

ELECTRIC CLOCK

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Fig. 1,

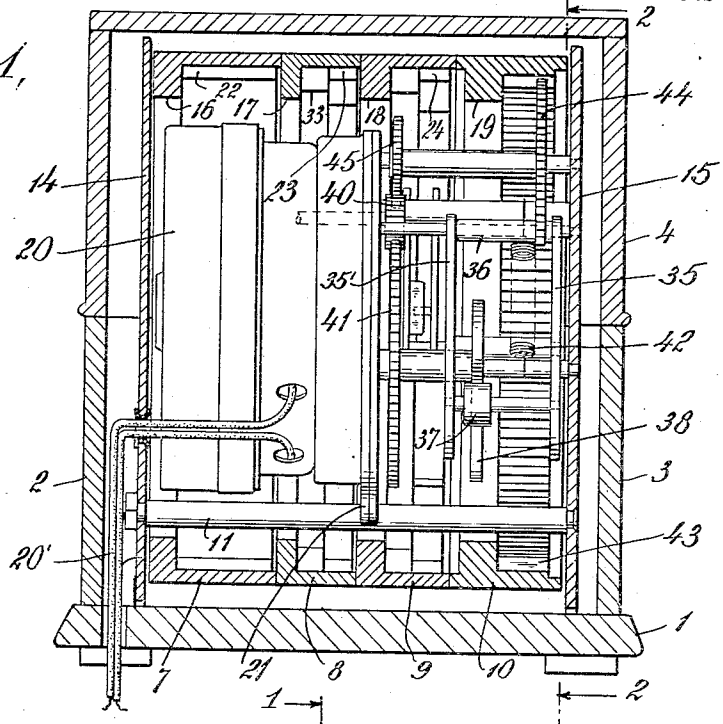
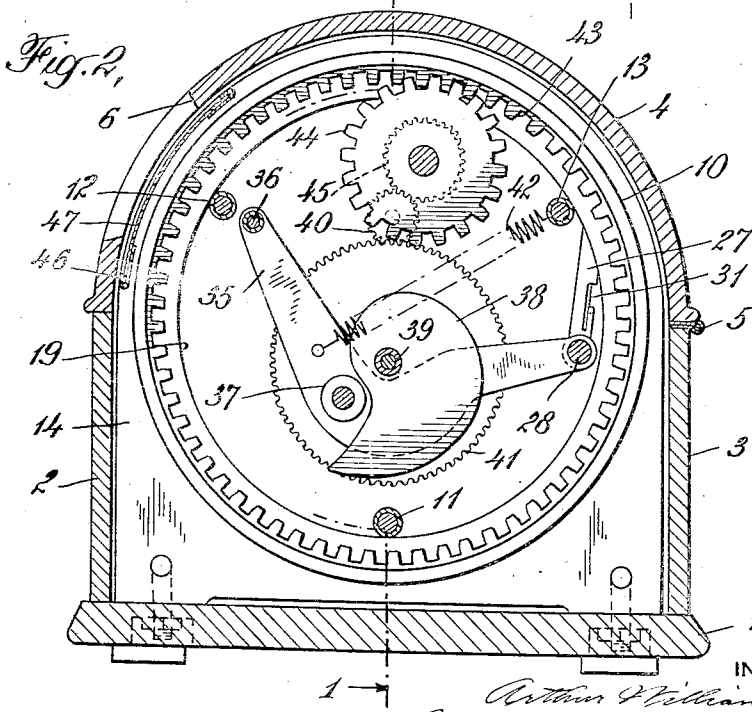


Fig. 2,



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ELECTRIC CLOCK

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Fig. 3,

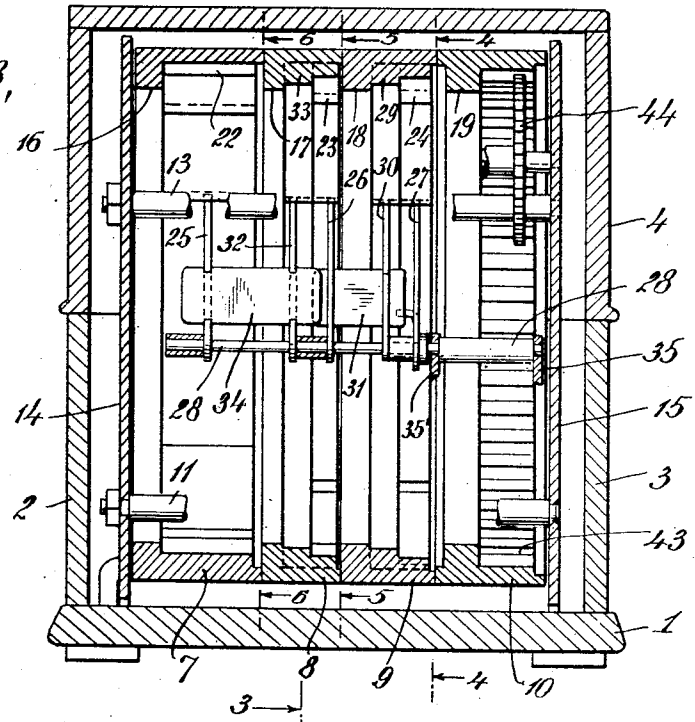
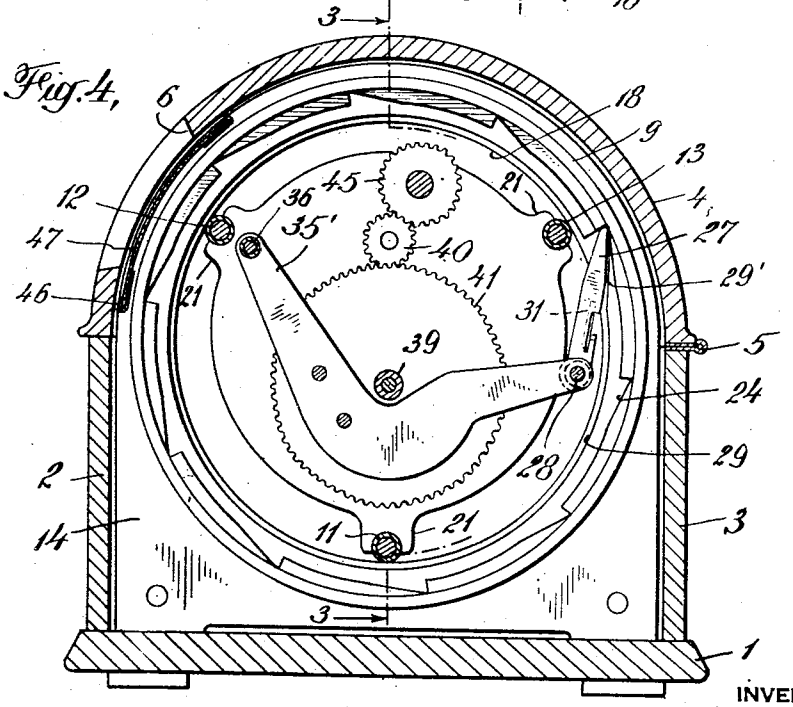


Fig. 4,



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ELECTRIC CLOCK

Filed Jan. 25, 1940 3 Sheets-Sheet 3

Fig. 5,

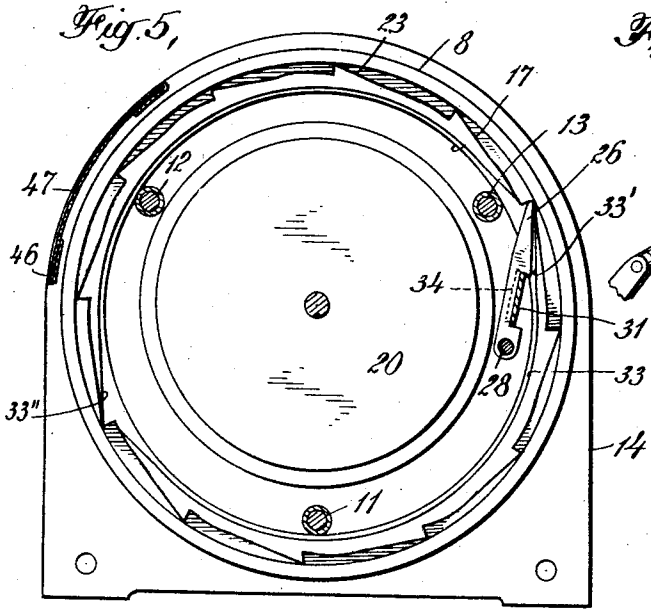


Fig. 7,

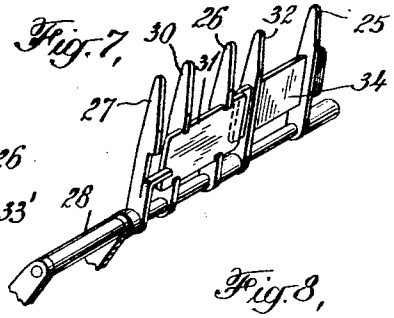


Fig. 8,

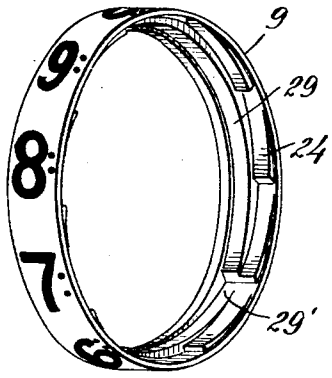


Fig. 6,

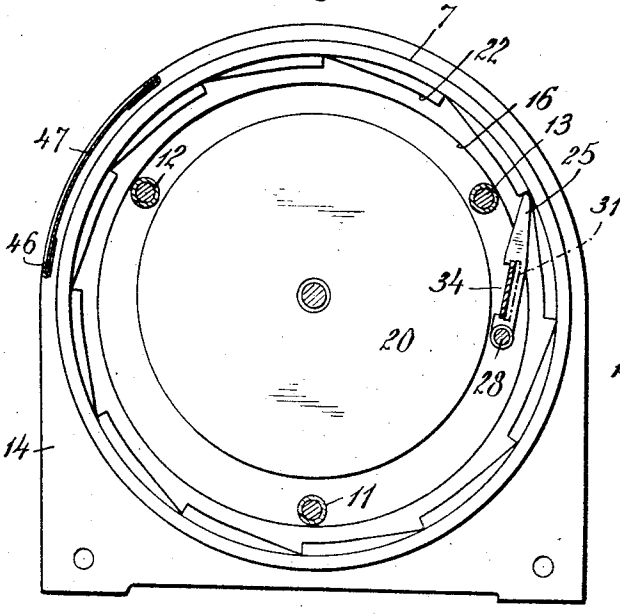
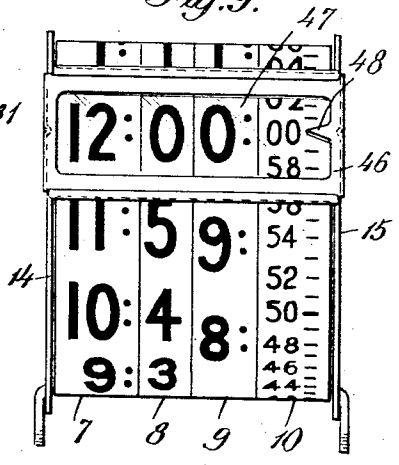


Fig. 9.



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Patented Dec. 16, 1941

2,266,198

UNITED STATES PATENT OFFICE

2,266,198

ELECTRIC CLOCK

Arthur William Haydon, Marion, Conn.

Application January 25, 1940, Serial No. 315,555

12 Claims. (Cl. 58—125)

My invention relates to timing devices and more particularly to motor-driven clocks of the type in which the numerals indicating time are carried by a series of rings or drums.

One of the objects of my invention is to provide a clock of the type mentioned above in which the parts are so constructed and arranged that the numeral bearing rings, the motor and the driving mechanism may all be confined in a small space, with the motor mounted within the rings.

A further object of my invention is to provide a motor-driven clock in which all of the moving parts are arranged so that they rotate or oscillate about axes that are parallel, a feature which greatly facilitates assembly and contributes to the compactness of the mechanism.

In general, I prefer to attain the principal objects of my invention by providing what may be characterized as an open mounting or supporting means for the row of numeral bearing rings, thus providing space within the ring supporting means for accommodating the motor and I prefer to arrange the parts so that the driving mechanism interconnecting the motor with the rings is also disposed within the rings. In rotating drum clocks as heretofore constructed the drums or rings are generally mounted on a central shaft. This shaft, and the necessary connections between it and the numeral bearing portions of the drums, occupied so much of the space within the drums that it was very difficult to arrange the drum actuating mechanism within the drums, and, so far as I am aware, no one has heretofore provided a construction affording sufficient space within the drums to accommodate the driving motor. According to my invention this is accomplished by utilizing numeral bearing drums in the form of rings having inner bearing surfaces of large diameter engaging supporting means located close to the inner surface of the rings and spaced a considerable distance from the center of the row of rings. This makes it possible to mount the motor within the numeral bearing rings and inside the support therefor, the motor preferably occupying a part of the space heretofore occupied by the central shaft and other mechanism employed in the construction of rotating drum type clocks.

The numeral bearing rings of my improved clock comprise an "hour" ring and two additional rings, one a "minute" ring bearing the numerals from zero to 9 to indicate minutes, and the other bearing two sets of numerals from zero to 5 indicating "ten minute" intervals. These rings may be provided with internal ratchet teeth, and the mechanism cooperating with the motor and the rings to rotate the same preferably comprises a series of pawls and a pawl carrier arranged to oscillate in the space between the motor and the inner surfaces of the numeral bearing rings. This pawl carrier may be mounted on a rocker member driven by cam mechanism connected to the motor unit. I may also provide an additional numeral bearing ring the numerals of which indicate "seconds," and where this additional ring is employed I provide a gear train between the motor unit and this ring so arranged that the "seconds" ring is driven continuously.

The various objects and features of my invention will be more apparent upon considering the following detailed description of a typical embodiment thereof illustrated in the accompanying drawings in which

Fig. 1 is a longitudinal section view of the clock mechanism taken on line 1—1 of Fig. 2;

Fig. 2 is a transverse section view taken on line 2—2 of Fig. 1;

Fig. 3 is a longitudinal section view taken on line 3—3 of Fig. 4 with parts cut away to better illustrate details of construction of other parts of the mechanism;

Fig. 4 is a transverse section view taken on line 4—4 of Fig. 3;

Fig. 5 is a transverse section view taken on line 5—5 of Fig. 3;

Fig. 6 is a transverse section view taken on line 6—6 of Fig. 3;

Fig. 7 is a perspective view of the oscillating pawl carrier;

Fig. 8 is a perspective view of the "minute" ring and

Fig. 9 is a front elevation of the clock mechanism.

Referring particularly to Figs. 1 to 6 inclusive, the timing mechanism is shown mounted in a suitable case comprising a base 1, front and rear walls 2 and 3 respectively and a cover 4 hinged to the rear wall as shown at 5. The cover 4 is provided with an opening or window 6 through which may be seen a row of numerals carried by a series of drums or rings within the casing, these numerals indicating time. Thus an "hour" ring 7 (see Fig. 9) bears the numerals from 1 to 12 equally spaced around the periphery of the ring, a "ten minute" ring 8 bears the numerals from zero to 5 on one-half of this ring and these numerals are repeated around the remaining portion of the ring. The "minute" ring bears

the numerals from zero to 9, and I may also provide a "seconds" ring 10 bearing numerals indicating seconds. The several rings are arranged in a row so that the set of numerals visible through the opening in the casing indicate the time of day in hours, minutes and seconds. The several rings are progressively driven by mechanism hereinafter described, in such a way that the "seconds" ring makes one revolution per minute, the "minute" ring makes one revolution in 10 minutes, the "ten minute" ring makes one revolution in two hours and the "hour" ring makes one revolution in 12 hours.

The numeral bearing rings of my improved timing mechanism are loosely mounted for rotation independently of each other, on a common open support which I have illustrated in the form of three rods 11, 12 and 13 mounted in end plates 14 and 15. The numeral bearing rings 7, 8, 9 and 10 have inner bearing surfaces 16, 17, 18 and 19, respectively, adapted to engage the stationary supporting members 11, 12 and 13. With this type of mounting for the numeral bearing rings it is convenient to make each ring in the form of a relatively thin band having an inner bearing surface of relatively large diameter, adapted to be engaged by the supporting means at a plurality of spaced points, and the supporting elements may be spaced from each other in such a way as to provide a relatively large space within the rings for accommodating the driving mechanism and a motor unit for progressively rotating the rings as desired.

In the embodiment of my invention illustrated in the accompanying drawings an electric motor 20 (preferably, although not necessarily, a self-starting synchronous motor) is mounted within a row of numeral bearing rings. This motor and a suitable gear train unit may be provided with a casing having lugs 21 engaging the supports 11, 12 and 13 so that the motor is rigidly mounted between these supports. The electric motor 20 may be of any suitable type. The synchronous motors described in my prior Patents, 1,935,208; 1,977,184; 1,977,185; 1,996,375, and 2,049,261 are appropriate for this purpose and, in general, any electric motor of compact design may be employed, the motor being mounted within the row of numeral bearing rings.

The "hour" ring, the "ten minute" ring and the "minute" ring may be driven progressively by ratchet and pawl mechanism. Thus these three rings may be provided with internal ratchet teeth as shown at 22, 23 and 24 and pawls 25, 26 and 27, mounted on a pawl carrier in the form of a shaft 28, are arranged to engage these ratchet teeth. The pawl carrier 28, actuated by cam mechanism hereinafter described, oscillates once each minute, and the arrangement of the parts is such that the pawl 27 engages each succeeding ratchet tooth on the "minute" ring 9 whereby this ring is intermittently advanced so as to make one revolution in 10 minutes. This "minute" ring 9 has a cam surface 29 cooperating with a cam follower 30 mounted on the pawl carrier 28 and this cam follower 30 is connected to the pawl 26 by a bar 31 so that the pawl 26 engages a ratchet tooth 23 of the "ten minute" ring 8 only when the cam follower 30 engages the low part of the cam surface 29, i. e. that portion of the cam surface 29 shown at 29' in Fig. 8. In like manner, a cam follower 32 engages a cam surface 33 on the "ten minute" ring 8 and is connected to the pawl 25 by a bar 34 so that the pawl 25 engages a ratchet tooth 22 on the hour ring 7 only when the cam follower 32 engages either one of two low portions 33', 33'' of the cam surface 33 on the "ten minute" ring. The bars 31 and 34 overlap to provide an interlock between the pawls 25 and 26, thus insuring that the periodic advancement of the "hour" ring 7 will coincide with a corresponding movement of the "ten minute" ring 8.

The mechanism for oscillating the pawl carrier 28 comprises a rocker member consisting of a pair of arm 35 and 35' mounted on a shaft 36 and carrying a cam follower 37 engaging cam 38 on a cam shaft 39. The cam shaft 39 is driven by the driving pinion 40 of the motor unit, this pinion engaging a gear 41 on the cam shaft 39. The cam 38 is driven at one revolution per minute and the cam is preferably so designed that the cam follower 37 rises slowly throughout nearly an entire revolution of the cam shaft 39, the follower being normally held against the cam by the spring 42 secured to the support 13. As the follower 37 passes beyond the high point of the cam 38, the spring 42 contracts to advance the pawl carrier 28 and thus the spring supplies the energy which is required to rapidly advance the pawls 25, 26 and 27. This arrangement of the parts is very desirable for it makes it possible to use a small motor having only sufficient power to gradually expand the spring 42 as the cam 38 rotates through nearly a complete revolution, the motor is never required to deliver a considerable amount of energy to the driving mechanism over a brief period of time.

Where a "seconds" ring is employed, as shown at 10, I prefer to provide this ring with internal gear teeth and to employ a gear train for establishing a driving connection between the motor pinion 40 and the "seconds" ring. This driving connection is best illustrated in Fig. 2 wherein the internal gear teeth on the "seconds" ring 10 are shown at 43 and the intermediate gears meshing with these gear teeth and with the driving pinion 40 are shown at 44 and 45. This gear train drives the "seconds" ring at a speed of one revolution per minute.

In the apparatus illustrated in the accompanying drawings all of the rotating or oscillating parts have axes extending parallel to each other. This arrangement is desirable for it greatly facilitates the assembly of the apparatus. The shaft for the cam 38, the gears 44 and 45, and the rocker member 35, 35' are mounted parallel to each other, in the end of the motor unit housing and in the end plate 15. There is sufficient space between the motor unit 20 and the rings 7, 8, 9 and 10 to accommodate the pawl carrier 28 which intermittently advances the pawls 25, 26 and 27, whereby the rings 7, 8 and 9 are progressively advanced.

When the clock is in operation with electric current supplied to the motor 20 through the leads 20', the "seconds" ring 10 is driven through the gear train 44, 45 at the rate of one revolution per minute. At the expiration of each minute, the cam 38 releases the rocker member 35, 35' and the spring 42 advances this member to cause the pawl 27 to advance the "minute" ring 9 one step. When this occurs at the expiration of 10 minutes the cam follower 30 permits the pawl 26 to engage a ratchet tooth on the "ten minute" ring 8 to advance this ring one step, and the pawl 27 simultaneously advances

the "minute" ring 9 to its zero position. In like manner, at the expiration of one hour, the cam follower 32 permits the pawl 25 to engage a ratchet tooth on the "hour" ring 7 to advance this ring one step, and at this moment the pawls 26 and 27 advance the "ten minute" ring 8 and the "minute" ring 9.

The setting of the clock may be readily accomplished by lifting the cover 4 and advancing the rings 7, 8, 9 and 10 by hand until the desired setting is obtained. If desired, a frame 46 may be mounted on the end plates 14 and 15, registering with the opening 6 in the cover 4. This frame carries a pane of transparent material 47 and it is provided with an index 48 in close proximity to the "seconds" ring 10.

It is to be understood that my invention is not limited to the particular embodiment herein described in detail. For example, the "seconds" ring 10 and the driving connection therefor may be omitted if the device is intended for uses where it is merely necessary to observe the time in minutes and hours, and other modifications, changes or omissions may be made without departing from the scope of my invention as defined in the appended claims.

I claim:

1. A device of the type described, comprising a row of rings bearing numerals, supporting means within said row of rings, the said rings being loosely mounted on said supporting means for rotation independently of each other, a motor mounted within said supporting means, and driving means cooperating with said motor and said rings whereby the rings are progressively rotated said supporting means being common to all of said rings.

2. A device of the type described, comprising a row of rings bearing numerals, stationary supporting means within said row of rings, the said rings being loosely mounted on said supporting means for rotation independently of each other, a motor mounted within said supporting means, and driving means mounted within said supporting means and cooperating with said motor and said rings, whereby the rings are progressively rotated.

3. A device of the type described, comprising a row of rings bearing numerals and each having an inner bearing surface, a plurality of supports within said row of rings, engaging the bearing surfaces thereof, a motor mounted on said supports and disposed within said row of rings, and driving means cooperating with said motor and said rings whereby the rings are progressively rotated.

4. A device of the type described, comprising a pair of bearing plates, a plurality of supports carried by said plates, a row of numeral bearing rings loosely mounted on said supports between said plates, a motor mounted on said supports between said bearing plates and driving means cooperating with said motor and said rings whereby the rings are progressively rotated.

5. A device of the type described, comprising a row of rings bearing numerals, supporting means within said row of rings, said rings being loosely mounted on said supporting means for rotation independently of each other, a motor disposed within said row of rings, a cam driven by said motor, a rocker member mounted within said rings, a cam follower carried by said rocker member and cooperating with said cam, and means cooperating with said rocker member and said rings whereby the rings are progressively rotated.

6. A device of the type described, comprising a row of three numeral bearing rings each having internal ratchet teeth and an inner bearing surface and two of the rings having inner cam surfaces, supporting means within said row of rings engaging the bearing surfaces thereof, a motor, a cam driven by said motor, a rocker member mounted within said row of rings, a cam follower carried by said rocker member and engaging the motor-driven cam, a shaft carried by said rocker member, pawls mounted on said shaft and arranged to engage the ratchet teeth of the said rings, cam followers mounted on said shaft and engaging the cam surfaces of the said rings, and means for interlocking the pawls and cam followers carried by said shaft whereby the rings are progressively rotated.

7. A device of the type described, comprising a row of numeral bearing rings including an "hour" ring, a "ten minute" ring and a "minute" ring, each of said rings having internal ratchet teeth and an inner bearing surface and the "ten minute" and "minute" rings each having an inner cam surface, supporting means within said row of rings engaging the bearing surfaces thereof, a motor, a rocker member mounted within said row of rings, a shaft carried by said rocker member, pawls mounted on said shaft and arranged to engage the ratchet teeth of said rings, cam followers mounted on said shaft and engaging the cam surfaces of said "ten minute" and "minute" rings, means cooperating with said motor and said rocker member for causing said shaft to oscillate, and means for interlocking the pawls and cam followers carried by said shaft whereby the rings are progressively rotated.

8. A device of the type described, comprising a row of rings bearing numerals, supporting means within said row of rings, said rings being loosely mounted on said supporting means for rotation independently of each other, a motor disposed within said row of rings, a gear train interconnecting said motor and one of said rings whereby the same is driven continuously and means cooperating with said motor and the other rings whereby said other rings are intermittently advanced.

9. A device of the type described, comprising a row of numeral bearing rings including an "hour" ring, a "ten minute" ring, a "minute" ring and a "seconds" ring, each of said rings having an inner bearing surface, the "seconds" ring having internal gear teeth, the "hour" ring, the "ten minute" ring and the "minute" ring each having internal ratchet teeth and the "ten minute" and "minute" rings each having an inner cam surface, supporting means within said row of rings engaging the bearing surfaces thereof, a motor carried by said supporting means and disposed within said row of rings, a rocker member mounted within said row of rings, a shaft carried by said rocker member, pawls mounted on said shaft and adapted to engage the ratchet teeth of said rings, cam followers mounted on said shaft and engaging the cam surfaces of said "ten minute" and "minute" rings, means cooperating with said motor and said rocker member for causing said shaft to oscillate, means for interlocking the pawls and cam followers carried by said shaft whereby the "hour" ring, the "ten minute" ring and the "minute" ring are intermittently advanced, and means cooperating with

said motor and said "seconds" ring whereby the "seconds" ring is rotated continuously.

10. A device of the type described, comprising a row of rings bearing numerals, supporting means within said row of rings, said rings being loosely mounted on said supporting means for rotation independently of each other, a motor, means for mounting said motor within said row of rings with its axis extending in the same direction as the axis of the row of rings, driving means within said row of rings comprising an oscillating member driven by said motor and arranged to advance said rings progressively, and a support for said oscillating member arranged so that it oscillates about an axis parallel to the motor axis.

11. A device of the type described, comprising a row of numeral bearing rings, means within said rings for supporting the same, a motor within said supporting means, means for mounting said motor with its axis extending in the same direction as the axis of said row of rings, driving means cooperating with said motor and with certain of said rings whereby they are intermittently advanced, said driving means comprising an oscillating member and means for supporting the same whereby it oscillates about an axis parallel to the motor axis; and a gear train cooperating with said motor and one of said rings whereby the same is driven continuously, the gears of said gear train having axes parallel to the axis of said motor.

12. A device of the type described, comprising a row of numeral bearing rings having inner bearing surfaces and ratchet teeth, supporting means within said row of rings and engaging the bearing surfaces thereof, a motor mounted within said supporting means in spaced relation to the bearing surfaces of said rings, and driving means cooperating with said motor and said rings whereby the rings are progressively advanced, said driving means comprising pawls adapted to engage the ratchet teeth of said rings, an oscillating pawl carrier supporting said pawls, a rocker member supporting said pawl carrier, a cam follower on said rocker member, and a cam connected to said motor, the rocker member being arranged so that the pawl carrier oscillates in the space between the motor and the bearing surfaces of said rings.

ARTHUR WILLIAM HAYDON.