March 19, 1940. R. A. VISSING 2,193,992

ELECTRIC CLOCK AND CONTROL THEREFOR

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Fig. 1.

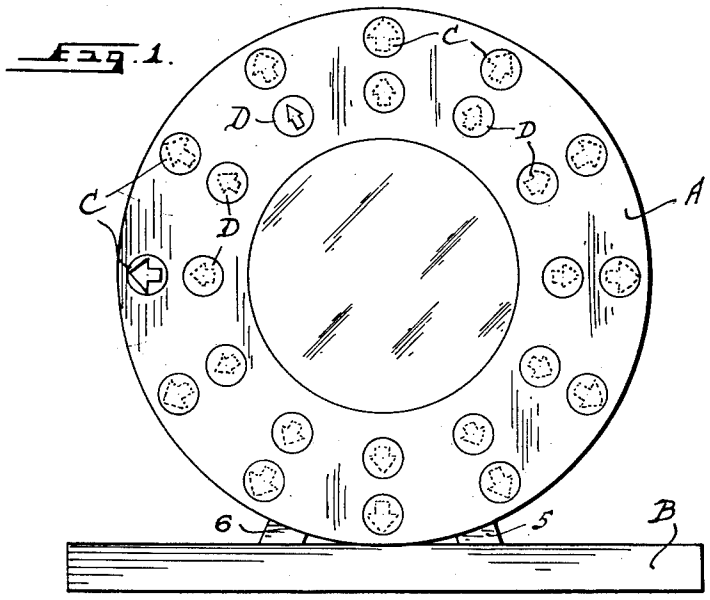


Fig. 2.

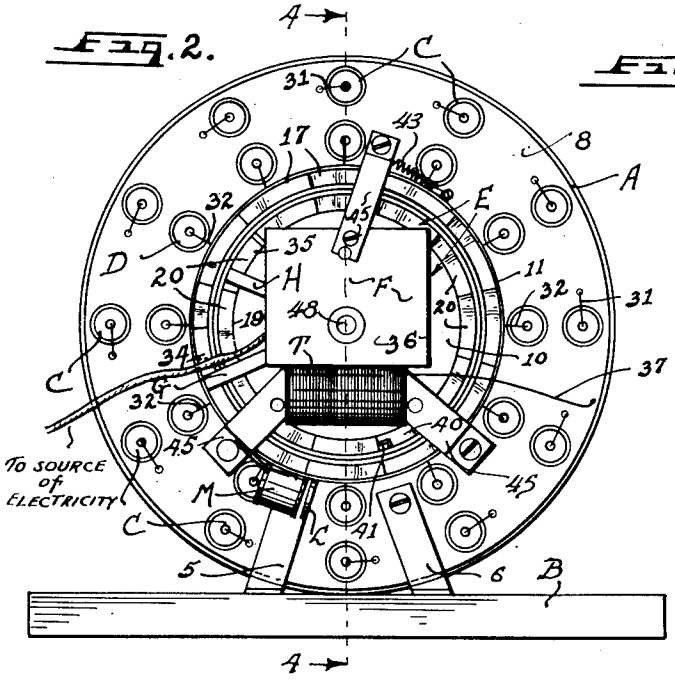
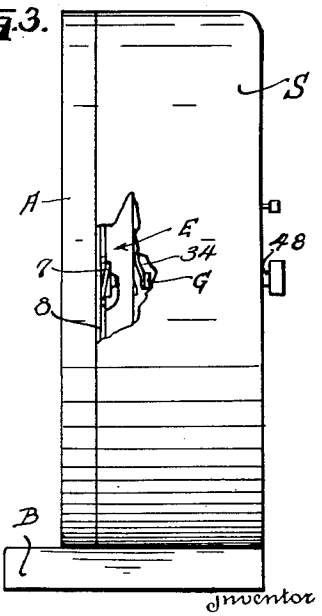


Fig. 3.



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ELECTRIC CLOCK AND CONTROL THEREFOR

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Fig. 4.

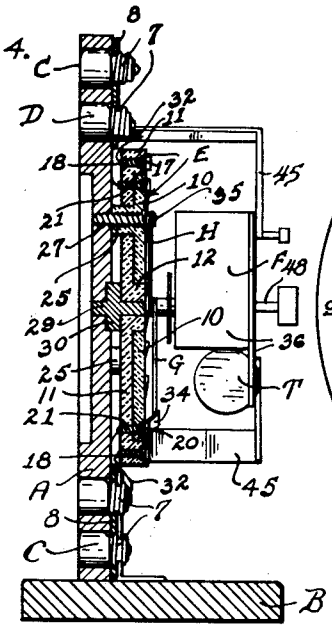


Fig. 8.

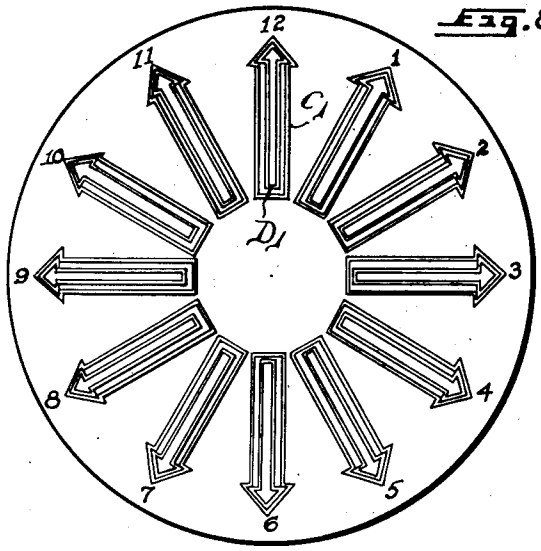


Fig. 5.

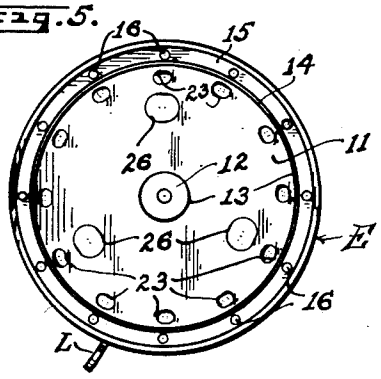


Fig. 7.

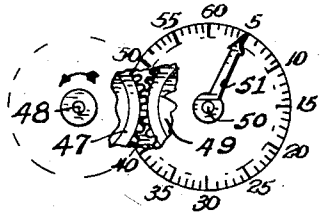


Fig. 12.

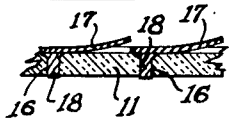
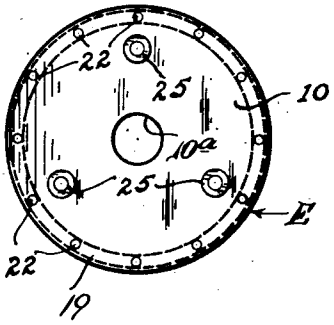


Fig. 6.



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ELECTRIC CLOCK AND CONTROL THEREFOR

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Fig. 9.

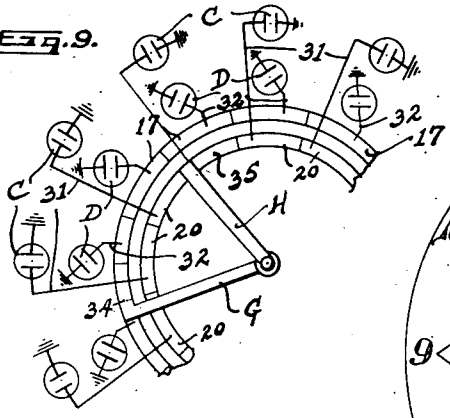


Fig. 8a

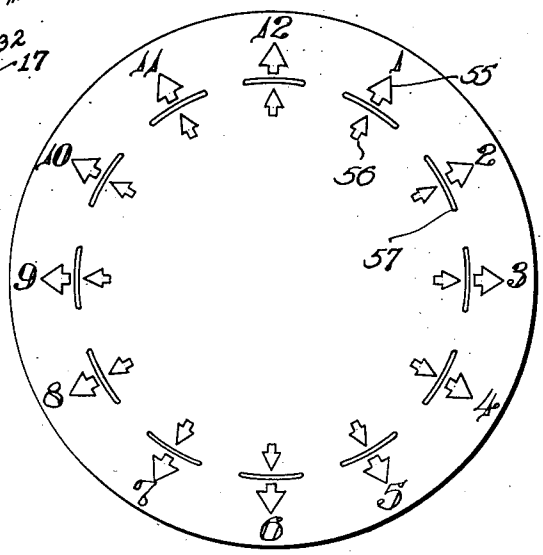
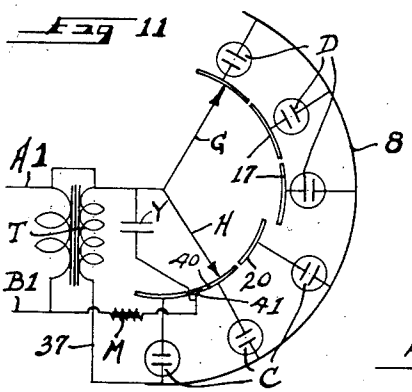


Fig 11



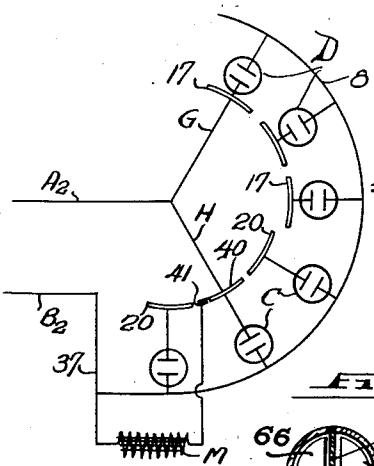


Fig. 10

Fig. 14.

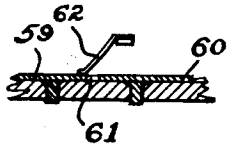


Fig. 15.



Fig 16

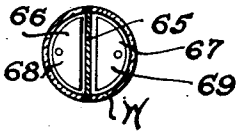


Fig. 13



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UNITED STATES PATENT OFFICE

2,193,992

ELECTRIC CLOCK AND CONTROL THEREFOR

Royal A. Vissing, Reno, Nev.

Application October 5, 1936, Serial No. 104,053

22 Claims. (Cl. 58—50)

This invention relates to electric clocks and controls therefor, and among other objects, aims to provide an electric clock which eliminates moving hands and indicates time by stationary luminous indicia, and hence may be of any size desired. While the invention would be useful with small household clocks or an interconnected series of them, it will probably be more advantageously used with a large advertising clock or a series of them, since the operating and manufacturing economies realized by a construction embodying the invention are greatest in the larger sizes of clocks. A further object is to provide an improved electric clock, or electric clock system, which may employ either incandescent lamps or luminous tubes or a combination of lamps and tubes, of one color or of several colors. A further object is to provide an electric clock or system of clocks which are controlled by a very simple series of circuits. Another object is to provide an electric clock having luminous indicia which can never be misread and will always read approximately accurately, so long as power is supplied from a source of alternating current, the greatest possible error being inconsequential for ordinary social and business purposes. Other objects will in part be obvious and in part will be explained in conjunction with the following description of the embodiment of the invention shown in the accompanying drawings forming a part of this specification.

In said drawings—

Fig. 1 is a front elevation of a small household clock;

Fig. 2 is a rear elevation of the same, the clock case being omitted;

Fig. 3 is a side elevation of the same, showing the clock case partly broken away to reveal the interior;

Fig. 4 is a vertical diametric section on line 4—4 of Fig. 2;

Fig. 5 is an elevation of a part of the commutator;

Fig. 6 is an elevation of another part of the commutator;

Fig. 7 is a detail elevation of the setting mechanism;

Fig. 8 is an elevation of another design of clock face;

Fig. 8A is an elevation of still another design of clock face;

Fig. 9 is a diagram showing how the lamp circuits are controlled through traveling contact members and the commutator;

Fig. 10 is an incomplete wiring diagram as viewed from the rear of the clock showing particularly the automatic means for changing the hour indicia once each hour;

Fig. 11 is an incomplete wiring diagram as viewed from the rear of the clock showing the connections where a transformer is used;

Fig. 12 is a detail, in section, showing part of the commutator;

Fig. 13 is a detail in elevation of one of the commutator segments;

Fig. 14 is a detail in sectional elevation showing the commutator and its contact with the end of one of the traveling contact members;

Fig. 15 is a detail in cross section showing a reflector in use with a luminous tube; and

Fig. 16 is a detail in cross section showing a modified form of luminous tube.

Referring particularly to the drawings, and first to Figs. 1–4 inclusive, the clock shown is of a household type, having a dial or face A, a base B, a case S attached to face A and enclosing the mechanism, a circular series of indicia C (here incandescent lamps) for minute readings and a circular series of indicia D, likewise shown as incandescent lamps, for hour readings. Dial A is shown supported on base B by means of a pair of brackets or legs 5, 6 screwed to the respective parts, and preferably said dial is made of material which is substantially non-conducting. A conducting or contact plate 8 is secured to the back of dial A, and both the dial and plate 8 have registering perforations for the lamps D, C, the inner threaded ends 7 of said lamps making electrical contact with the walls of the perforations in plate 8, while the outer ends of said lamps are preferably flush with the outer surface of the dial, as shown in Fig. 4.

For simplicity of construction, I prefer to employ only twelve minute indicia C, and these are arranged in a circular series outside the hour indicia D; that is to say, there is one hour indicium and one minute indicium arranged every 30° with respect to the center of the clock dial. The minute indicia are so controlled that only one is in circuit at any time, and as the hour indicia are similarly controlled (by mechanism to be described) there will always be one (and only one) hour indicium and one (and only one) minute indicium which are illuminated. There is preferably no difference physically between the indicia C, D; but the positions of the circular series of indicia C outside of the circular series of indicia D, (suggestive of the greater length of the minute-hand of any clock) will automatically and inevitably enable the observer to distinguish

the hour and minute indicia and thus tell the time. Preferably, when incandescent lamps are used for indicia, they are painted or otherwise rendered opaque except for a small area which may be left clear and which may have any preferred design, such as an arrowhead. With this arrangement two arrowheads will always shine, as indicated in full lines in Fig. 1, and the time will be unmistakable.

To actuate traveling contact members G, H which close lamp circuits as will be described, a master clock F is provided, said master clock preferably being a standard electric clock having a frame 36 and being directly connected with a source of alternating current, as indicated, so that the master clock keeps perfect time as long as power from the central station does not fail. The hands are removed from the master clock and an arm G is rigidly secured to the hour-hand arbor, while a shorter arm H is rigidly secured to the minute-hand arbor. At the end of arm G, a resilient commutator brush 34 is secured, and at the end of arm H a similar brush 35 is secured, said brushes making contact with segments of a commutator E to be described to close the lamp circuits.

Commutator E and master clock F together form a control unit adapted to control the illumination of indicia on one or more clock faces. In the case of a small household clock, as shown, the master clock and the commutator will be mounted directly behind the face or dial A, with the central arbor of the master clock alined with the center of the dial. Brackets 45 (Figs. 2 and 4) will hold the master clock at the back of plate 8. Said plate is connected to the source of electricity by a wire 37 (Figs. 2 and 10).

Commutator E consists of a minute commutator disk 10 and an hour commutator disk 11, and when the hour indicia-controlling arm G is made longer than arm H, as illustrated, the hour commutator disk 11 will surround disk 10 and will carry disk 10 on a hub 12 (Fig. 5) fitting into aperture 10a in the center of disk 10 (Figs. 4 and 6). An annular recess 13 in the back of disk 11 is large enough to receive disk 10. As shown in Fig. 4, the commutator is mounted on the back of dial A by means of a fixed pin 29 which extends clear through hub 12 and has a boss 30 against which disk 11 is thrust when the parts are assembled. Pin 29 provides an axis for oscillation of hour disk 11 relative to minute disk 10 as will be described. Disk 10 is held against movement by means of screws 27 whose ends engage the back of dial A (Fig. 4) and which are passed through bores in feet 25 (Fig. 6) extending through slots 26 (Fig. 5) in disk 11. Slots 26 are sufficiently elongated to permit oscillation of disk 11 relative to fixed disk 10.

The hour commutator disk 11 has a flange 14 adjacent to its periphery, and an annular groove 15 is formed in said flange, perforations 16 being provided in the bottom of the groove to receive pins 18 for securing commutator segments 17 which are good electrical conductors. See Fig. 12. Preferably said segments are "ramp-shaped", as illustrated, to break circuit suddenly as the brush 34 rides over the segments, thereby to obviate arcing at the contact points. There will be as many segments 17 as there are hour indicia D, since each segment 17 is connected to but one of said indicia, as by a wire 32. The minute commutator disk 10 also has an annular groove 19 near its periphery and commutator segments 20 (like segments 17) are secured in groove 19 by means of pins 21 (Fig. 4) which pass through perforations 22 (Fig. 6) in disk 10 and also through slightly elongated perforations 23 (Fig. 5) in disk 11, the said elongation permitting oscillation of disk 11 relative to disk 10. Each of the indicia C is connected to one of the commutator segments 20 by a wire 31.

Since no traveling hands are employed on the dial, and since for simplicity of construction there are only twelve minute indicia (in the preferred construction), there must be a change in the hour indicia once each hour, and this change must take place practically instantaneously to obviate a period of darkness which would be bewildering to the observer. Furthermore, this change must take place at a moment when there can be no misreading of the time. A little consideration will make it clear that a clock of the type described should change its hour reading sometime between half after each hour and twenty-five minutes to the next hour; and to obviate telling time with a greater error than 2½ minutes, in the preferred construction I arrange that the hour commutator disk be oscillated or angularly shifted relative to the minute commutator disk at exactly 32½ minutes after each hour, thereby to bring the next segment 17 (controlling the hour indicium next in chronological sequence) beneath the brush 34.

The mechanism for angularly shifting disk 11 is shown in Figs. 2, 10, 11 and 13, and comprises an armature L attached to the periphery of disk 11 and placed close to one pole of an electromagnet M mounted on plate 8 and electrically connected thereto. The electromagnet is connected to a contact 41 which is closely adjacent a specially formed minute commutator segment 40, and contact 41, when contacted once each hour by brush 35 on contact arm H, completes a circuit which energizes the electromagnet M, whereupon armature L is attracted toward the electromagnet, thus oscillating the disk 11. There will then be an immediate change in both the hour and the minute indicia; the minute indicium denoting half after the hour becoming dark, and the minute indicium denoting thirty-five minutes past the hour becoming luminous; the illuminated hour indicium changing to the indicium next in chronological sequence. As Figs. 10 and 11 are views from the rear, in these figures arms H and G must be thought of as traveling counter-clockwise. The contact on arm H, which controls the lighting of the minute indicia, will obviously touch contact 41 at the same instant it contacts the adjacent end of specially formed segment 40 (Fig. 13) said end being in the same angular position as contact 41. Thus there is an instantaneous change in illumination of the minute indicia, and a concurrent oscillation of the disk 11 to a sufficient extent to insure the proper hour change. A coil spring 43 (Fig. 2) is provided to return disk 11 to its initial angular position relative to disk 10. Spring 43 obviously must be of such strength as to yield to the superior pull of the electromagnet when momentarily energized as described, and to overcome friction of the engaging parts of disks 10, 11 to pull the latter back to its original position; in short to "reset" the hour disk. As relative movement of disks 10, 11 is depended upon to effect an instantaneous simultaneous change in the hour and minute indicia, it is within the scope of the invention to reverse the parts, making disk 11 stationary and disk 10 oscillatable, with obvious changes in the electrical connec-

tions and construction and arrangement of the contacts etc.

As the movement of even the tip of the minute hand of a small clock is very slow, and the movement of the end of an hour hand is but one-twelfth of that of the minute hand, it follows that the employment of brushes 34, 35 riding over ramp-shaped segments, as shown in Fig. 12, or their mechanical equivalent (as for instance the less desirable but operable arrangement of Fig. 14) is highly desirable to effect a jumping from one commutator segment to another. If there were no sudden flipping or jumping of brushes, or an equivalent action, there would be simultaneous lighting of two hour indicia, also of two minute indicia, at certain times of the day, thus causing confusion and making correct time-telling impossible. This very desirable flipping or jumping of brushes is, of course, independent of arm movement, though the tension (potential energy) in the brushes 34, 35 which causes the brushes to flip or jump is created by power (kinetic energy) received from the slowly but steadily moving arms G, H.

In addition to an instantaneous change in the individual hour and minute readings, it becomes necessary to effect, once each hour, a simultaneous change in these readings, by means of relative movement of the commutator disks as previously explained. The reason for this is that it appears to be commercially impossible to construct a small control unit having tolerances so fine as to insure simultaneous contact of the brushes with the succeeding segments, during the life of the unit. Because of this fact, I prefer, as described herein, to arrange so that one brush falls off its segment before the other brush moves off its segment, and the first brush closes a circuit which effects a quick movement of the commutator disk bearing the segment which is beneath said other brush, such quick movement following so promptly after the movement of the first brush as to effect what seems to the observer's eye as a simultaneous change in the indicia controlled through said other brush.

As shown in Fig. 11, a condenser Y may be provided to obviate burning or excessive sparking between brush 35 and contact 41. If luminous tubes are used, or other special high voltage (or low voltage) indicia, a transformer T must be included, either of the step-up or step-down type. Fig. 10 shows the wiring when no transformer is needed, as when lamps of the standard 110 volt type are employed for indicia. In Fig. 10, the input wires are shown at A2 and B2, the latter being connected to the conductor plate 8. In Fig. 11, the input wires are A1 and B1.

Instead of employing ramp-shaped commutator segments to cause a quick break of the circuit, a reversal of the parts as shown in Fig. 14 may be employed. Here the brush 62 is resilient and moves over commutator segments 59, 60 having a space 61 between them. The brush 62 will flip or jump from one segment to the next to obviate arcing or simultaneous connecting of two segments in circuit.

To set the clock, I may provide a gear 47 (Fig. 7) secured to shaft 48 which is rotatable by hand and which carries arm H. Meshing with gear 47 is another gear 49 having the same number of teeth, said gear 49 being fixed on a stub shaft 50 journaled in the master clock frame 36. Shaft 50 carries hand 51 rotatable over a circular scale marked on the back of case or cover S, thus making it possible to read the setting of shaft 48 from the outside of the clock. The same type of setting mechanism (with a different gear ratio) may be used to set the hour contact arm G, if desired, although none is shown.

When the clock is of a commercial type, incandescent lamps will be replaced preferably by neon tubing, as great economies in operating expense will thereby be realized. Any number of dials may then be controlled from a single master clock and commutator control. Relays (not shown) may be placed in circuit with the several commutator segments and the luminous tubes. In Fig. 8 I have shown tubing C^1 and D^1 which when illuminated will very satisfactorily indicate the time. In Fig. 8A, the indicia 55, 56 are in the form of arrowheads, and short spaced arcs 57 between the hour and minute indicia may be illuminated continuously to divide or distinguish the two sets of indicia.

In Fig. 15 a reflector U is shown in back of a luminous tube N. Such a reflector would be mounted in a recess in the dial, and would be useful in an outdoor clock, as it would intensify the illumination of the indicia and give better visibility in daylight hours, also.

In Fig. 16 a unitary luminous tube W has two gas filled chambers 66, 67 separated by a common electrode 65. The other electrodes are indicated at 68 and 69.

In the case of a large clock, there may be 60 minute commutator segments controlling 60 luminous minute indicia, instead of the simpler arrangement described above; or a lesser number of minute indicia may be employed. Obviously many other changes may be made, and the invention is not limited to the forms described and shown.

Having thus described my invention, I desire to secure by Letters Patent and claim:

1. In a clock of the class described, the combination of a face carrying two rows of gas filled glow tubes in the positions identical to those of the numerals on the face of a clock; a commutator mounted behind said face made of an inner ring and an outer ring of commutator segments made ramp shaped; means to partially rotate said outer ring of segments around the inner ring to instantaneously change the hour reading when each hour period ends; a clock element having hands thereon adapted to rotate back of said commutator; commutator brushes on the hands of said clock element to engage said commutator segments; means to introduce electrical energy to said clock element and thence to said hands and means to connect each glow tube with its respective commutator segment to light two of said tubes simultaneously, one in the outer ring for designating the minutes, and one in the inner ring for designating the hours when said segments are in contact with said brushes.

2. In a large clock for large advertising use, the combination of a small clock unit; a commutator having two rows of ramp shaped segments therein mounted adjacent said unit; a clock element having hands movable adjacent the commutator; brushes mounted on each hand of the clock to contact each segment; magnetic means to partially rotate the outer row of segments at each predetermined hour change; and means to connect each segment of the commutator with a gas filled tube to illuminate said tubes for visibility in telling time.

3. In a clock of the class described, the combination of a face carrying annular rows of gas filled tubes; a clock unit; commutator rings

mounted to control said rows of gas filled tubes; commutator segments mounted in said rings and one of said rings being mounted to partially rotate; means to connect each of said tubes with one of said commutator segments to transmit electrical energy thereto; means to partially rotate said rotatably mounted commutator ring at each hour change to quickly shift the commutator ring; a commutator brush engaging each ring; a source of electrical current; circuits including said commutator segments and gas filled tubes which are closed by said brushes when in contact with said segments; and means to drive said brushes from said clock unit.

4. In a device of the class described, the combination of a face having spaced apart annular rows of luminous tubes positioned for hour- and minute-readings; each of said luminous tubes having an individual circuit so that it may be illuminated independently of all the other tubes; and a commutator mounted back of said face to control the circuits of said luminous tubes for reading of time, said commutator comprising two concentric rows of ramp-shaped commutator segments and a pair of non-conductive discs each of which carries one of the rows of commutator segments, one of said discs being mounted for partial rotation; an electro-magnet mounted adjacent said movable row of segments to rotate said segments when electrical energy has been passed into said magnet; an electric clock element mounted back of said commutator; a source of electrical current driving said clock element and adapted to be connected to said luminous tubes; hands on said clock element; brushes mounted to the ends of said hands to rotate over said ramp-shaped commutator segments to introduce electrical energy thereinto through said clock element; wires connecting each luminous tube with one of said segments to carry said electrical energy thereto; spring means to return the movable row of segments to the original position after each movement thereof; and means on the back of said clock element to set the hands of said clock from the rear side thereof.

5. In a clock of the class described, the combination of a face carrying gas filled glow tubes assuming positions identical to the numerals on the face of a clock; a commutator mounted behind said face having an inner and outer ring of ramp-shaped commutator segments; each commutator segment being electrically connected to a glow tube; means to partially rotate one of the rings of segments around the other ring to simultaneously change the hour- and minute-reading when each hour period ends; an electrically driven clock element having hands thereon adapted to rotate back of said commutator; commutator brushes on the hands of said clock element to engage said commutator segments; means to introduce electrical energy to said clock element to drive the clock and to light the glow tubes through the intermediation of the commutator.

6. An electric clock comprising, in combination, a dial supporting stationary light-emitting hour and minute indicia arranged in circular series to indicate time, with the minute indicia in a circular series outside of the circular series of the hour indicia, so that the two series may be readily differentiated; a master chronometer; a two part commutator, one part having segments electrically connected with the hour indicia, the other part having segments electrically connected with the minute indicia; a traveling brush driven by said master chronometer to complete one of a series of circuits each including one of the minute indicia and the corresponding segment; a second traveling brush driven by the master chronometer at one-twelfth the rate at which the first-named traveling brush is driven, and adapted to complete one of a series of circuits each including one of the hour indicia and the corresponding segment; a source of electricity so connected to the clock as to drive the chronometer and light the indicia in circuit; and means including an electric circuit independent of the other circuits but energized by the same source of electricity and adapted to be closed by the first named traveling brush when the said traveling brush reaches a certain point in its path thereby to change the hour indicia circuit immediately to illuminate the next hour indicium in chronological sequence.

7. An electric clock comprising, in combination, a dial supporting stationary light-emitting indicia arranged to indicate time; a master chronometer; a source of electric current connected to the master chronometer to operate the same; a two part commutator, one part having segments electrically connected with the hour indicia, the other part having segments electrically connected with the minute indicia; a traveling brush driven by said master chronometer to complete one of a series of circuits each including one of the minute indicia and the corresponding segment and the source of electric current; another traveling brush movable over the hour segments to complete one of a series of circuits each including one of the hour indicia and the source of electric current; said two parts of the commutator being relatively movable; one of the minute segments being connected in a circuit including an electro-magnet which causes the hour controlling portion of the commutator to move quickly a sufficient distance to jump the brush thereof over to the next segment; the arrangement being such that the next segment follows in chronological sequence, so that the minute segment effects instantaneously a change of one hour in the hour indicia.

8. The invention according to claim 7, wherein the hour-indicia-controlling part of the commutator is movable on the minute-indicia-controlling part; the circuit including said electro-magnet being broken when the movement of the hour-indicia-controlling part has taken place; and a spring so connected to said movable part as to restore it to its initial position relative to the other part of the commutator whenever the electro-magnet is deenergized.

9. An electric clock comprising, in combination, a dial supporting stationary light-emitting indicia arranged to indicate time; a master chronometer; a source of electricity so connected as to drive the chronometer; a two part commutator, one part having segments electrically connected with the hour indicia, the other part having segments electrically connected with the minute indicia; a pair of contact members movable over the hour and minute segments respectively of the commutator; circuits connecting the segments and light indicia with the source of electricity through said contact members, the arrangement being such that only one hour and one minute indicia are ever illuminated at one time; and a control circuit closed by the contact member which travels over the minute segments at one particular point in its travel, to cause the other contact member to move quickly from the hour segment with which it is con-

nected to the next hour segment in chronological sequence, whereby there is an instantaneous change of one hour in the hour indicia effected by said control circuit.

10. The invention according to claim 9, wherein there are twelve indicia for the hours and also twelve for the minutes, arranged at five minute intervals, there being one segment for each of the hour and minute indicia; a contact electrically connected in said control circuit and so positioned as to effect closing of said control circuit when the contact member which travels over the minute segments reaches it; said contact being so located relative to the other minute segments that it acts at thirty-two and one-half minutes after each hour to change the hour indicia circuit, as described and set forth.

11. An electrical clock system comprising, in combination, a support; fixed electrical indicating devices arranged in circular order of hours and minutes on said support; circuits and circuit connections for the electrical indicating devices; a commutator; a source of electric current; a chronometer driven by said source of electric current; and commutator-contacting members actuated by said chronometer for placing the electrical indicating devices in said circuits, one of said members being actuated indirectly by the other member through an electrical circuit and for instantaneously changing the indicating devices for hour readings from one hour reading to the next in chronological order.

12. An electrical clock system comprising, in combination, a circular series of luminous electrical devices arranged in order of hours and minutes; a master chronometer having an hour and a minute arbor; a source of electrical current driving said chronometer; a commutator comprising a pair of segmental rings the segments of which are conductors connected to the aforesaid luminous electrical devices, one ring having its segments connected respectively to the electrical devices which indicate hours, the other ring having its segments connected respectively to the electrical devices which indicate minutes; a pair of traveling contacts for direct electrical contact with the segmental rings to close the circuits for the hour and minute-indicating electrical devices; one of said traveling contacts being driven synchronously with and by the minute arbor of the master chronometer the other contact being driven synchronously with and by the hour arbor; a special circuit closed by the first named traveling contact; and means actuated upon closing of the special circuit to control relative movement, once each hour, of said other contact, with respect to the segmental ring which controls the hour-indicating devices.

13. The invention according to claim 12, wherein the special circuit has a stationary contact located in a cut-out portion of one of the minute segments, said stationary contact being in the path of the first named traveling contact.

14. The invention according to claim 12, wherein the segmental ring which is connected to the hour-indicating devices is oscillatable relative to the other segmental ring, and the special circuit includes an electro-magnet; a keeper attached to the oscillatory segmental ring so that the latter is moved by the electro-magnet when energized; said special circuit being broken when the aforesaid oscillation is completed in the direction caused by the electro-magnet; and means acting after said special circuit is broken automatically to restore the oscillatory segmental ring to its initial angular position relative to the other segmental ring.

15. The invention according to claim 12, wherein the special circuit has a stationary contact located in a cut-out portion of one of the minute segments, said stationary contact being in the path of the contact which is driven by the minute arbor; the segmental ring which is connected to the hour-indicating devices being oscillatable relative to the other segmental ring; the special circuit including an electro-magnet; a keeper attached to the oscillatory segmental ring so that the latter is moved by the electro-magnet when energized; said special circuit being broken when the aforesaid oscillation is completed in the direction caused by the electro-magnet; and a spring attached to the oscillatory segmental ring and adapted to restore the latter to its initial angular position relative to the other segmental ring, when said electro-magnet is de-energized by the breaking of said special circuit.

16. An electrical clock system comprising, in combination, a stationary dial free of hands on the exposed face thereof, said dial being a non-conductor; fixed luminous electrical indicating devices arranged in circular order of hours and minutes on said dial; a conductor plate back of said dial and serving as a common connection for all of said luminous indicating devices; a commutator having a plurality of segments insulated from each other but connected to the several luminous indicating devices; an electric master clock; a pair of brushes moved by said master clock over said segments; a source of electric current; circuits connecting the source of the electric current to the luminous indicating devices through said segments and brushes, which control the hour and minute-indicating devices respectively; and automatically acting means to jump the brush which controls the hour-indicating devices from one segment to the next in chronological sequence, after the brush which controls the minute-indicating devices has passed the half hour segment.

17. In a clock of the class described, the combination of a face carrying two spaced apart concentric annular rows of electric light elements arranged in circular order of hours and minutes; a two-part commutator mounted behind said face having two rings of ramp-shaped segments set in the separate parts of said commutator, one part being mounted to partially rotate; two rotatable hands; commutator brushes mounted on the ends of said hands; a master clock driving one of said rotatable hands; a source of electric current; the source of electric current being connected to the master clock to run the same; means to connect each light element with one of said commutator segments to electrically energize each light element when the corresponding commutator brush passes over said commutator segment; manually operable means to set the minute arbor of the master clock; and means actuated by power derived from said source of electric current to shift said partially rotatable commutator part quickly relative to the other part of the commutator to effect a one hour change in chronological sequence in the light elements which indicate the hour.

18. In a clock of the class described, the combination of a face carrying rows of luminous tubes arranged to indicate time; commutator rings mounted behind said face; commutator segments mounted on said commutator rings, one of said commutator rings being mounted to par-

tially rotate; circuits electrically connecting each of said tubes with one of said commutator segments; a source of eelctrical current; a master clock connected to and continuously driven by said source of electrical current; a pair of commutator-segment-engaging brushes electrically connected with and driven by said source of electrical current to contact respectively different segments of said commutator rings thereby to close the circuits of a pair of said tubes; means to partially rotate said partially rotatable ring; said last named means being actuated by said source of electrical current once each hour; and means acting automatically to restore the partially rotatable ring to its initial angular position relative to the other ring, after said partial rotation has taken place.

19. An electrical clock system comprising, in combination, a source of electricity; a master clock driven by said source of electricity; a brush driven by the minute arbor of the master clock at the rate of 360° per hour; a second brush moved each hour through an arc of 30°; two circular series of indicia and a support therefor; one of said series indicating hours, the other indicating minutes; two sets of contacts for said brushes; one set of contacts being electrically connected individually to the series of hour indicia, the other set of contacts being electrically connected individually to the series of minute indicia; the brush which is driven by the minute arbor passing over the set of contacts which are connected to the minute indicia; resilient means to cause the second brush to instantaneously move from one contact to the adjoining contact; and a control circuit closed by the first brush and actuating the second brush once each hour to advance the hour reading of the hour indicia in chronological sequence.

20. In combination with a dial or face providing a support, two circular series of twelve hour indicia and twelve minute indicia on said dial, the series of minute indicia being outside of and concentric with the hour indicia, there being one minute indicium in the same angular position as each hour indicium; a source of alternating electric current; a motor driven synchronously by said source of electric current; a rotary brush driven by said motor at the rate of 360° per hour; individual circuits for said indicia; each circuit for the minute indicia being adapted to be closed by the rotary brush as it travels; the arrangement being such that half way between every five minute interval the circuit of one minute indicium is opened and the circuit of the next minute indicium in chronological sequence is closed; and means actuated upon movement of said brush for a predetermined time interval beyond the half hour point instantaneously to change the hour indicia circuits to indicate the next hour in chronological sequence.

21. A time indicating device comprising, in combination, an electrically driven master clock; a source of electricity with which the master clock is connected; hour and minute indicia; a commutator having two series of insulated segments, one of the series of segments being electrically connected with the minute indicia so that when any one segment of that series is put in circuit with the source of electricity, an indicium is put in the same circuit to indicate a certain minute reading; the other series of segments being electrically connected with the hour indicia so that when any one segment of said other series is put in circuit with the source of electricity, an hour indicium is put in the same circuit to indicate a certain hour reading; means driven by the master clock to put one segment at a time of the first series in said circuit, said means being so constructed and arranged as to be instantaneously disconnected from one segment and connected to the next segment in chronological sequence, whereby there is always one and only one minute indicium indicating time; and means controlled by the master clock but actuated by the source of electricity to put one segment at a time of the second series in said circuit, said last-named means being so constructed and arranged as to be instantaneously disconnected from one segment of the second series and connected to the next segment of that series in chronological sequence, whereby there is always one and only one hour indicium indicating time.

22. An electrical clock system comprising, in combination, a support; fixed electrical hour and minute indicating devices arranged on said support in such a way as to make possible the telling of time; a source of electricity; circuits for the electrical indicating devices; two series of conducting segments, the segments of one series being electrically connected individually with those indicating devices which are adapted to give minute readings, and the segments of the second series being electrically connected individually with those indicating devices which are adapted to give hour readings; a chronometer driven by said source of electricity; and a pair of contacts driven by said chronometer respectively over said two series of segments and adapted each to close a circuit including one of the indicating devices; one of said contacts being actuated indirectly by said other contact, through energy supplied from the source of electricity, for simultaneously changing the indicating devices once each hour.

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