

E. E. CLEMENT.
ELECTRIC CLOCK.
APPLICATION FILED MAY 25, 1909.

1,096,778.

Patented May 12, 1914.

7 SHEETS—SHEET 1.

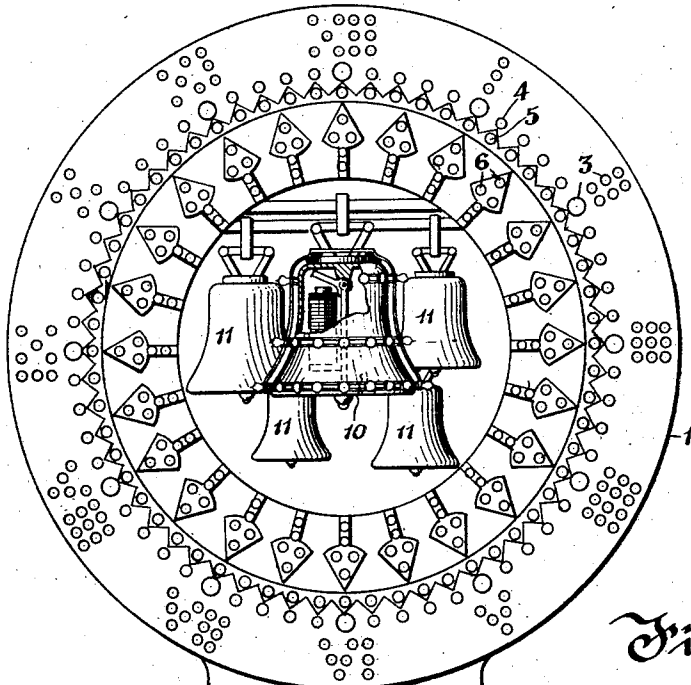


Fig. 1.

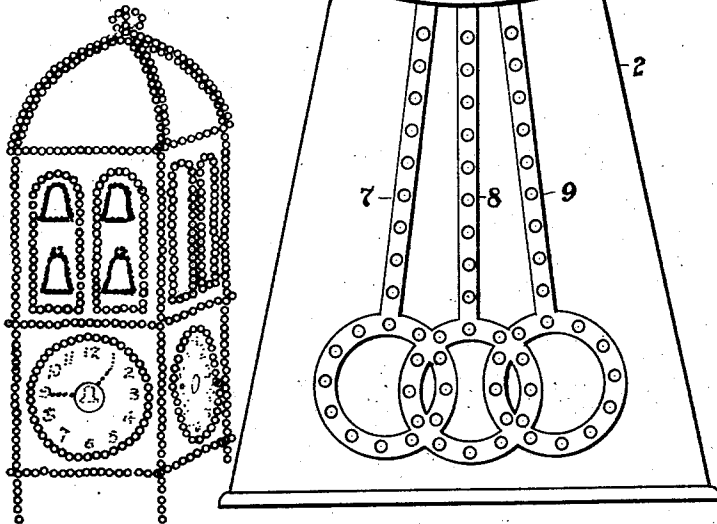


Fig. 16.

Witnesses
H. J. Brownstein
James H. Marr

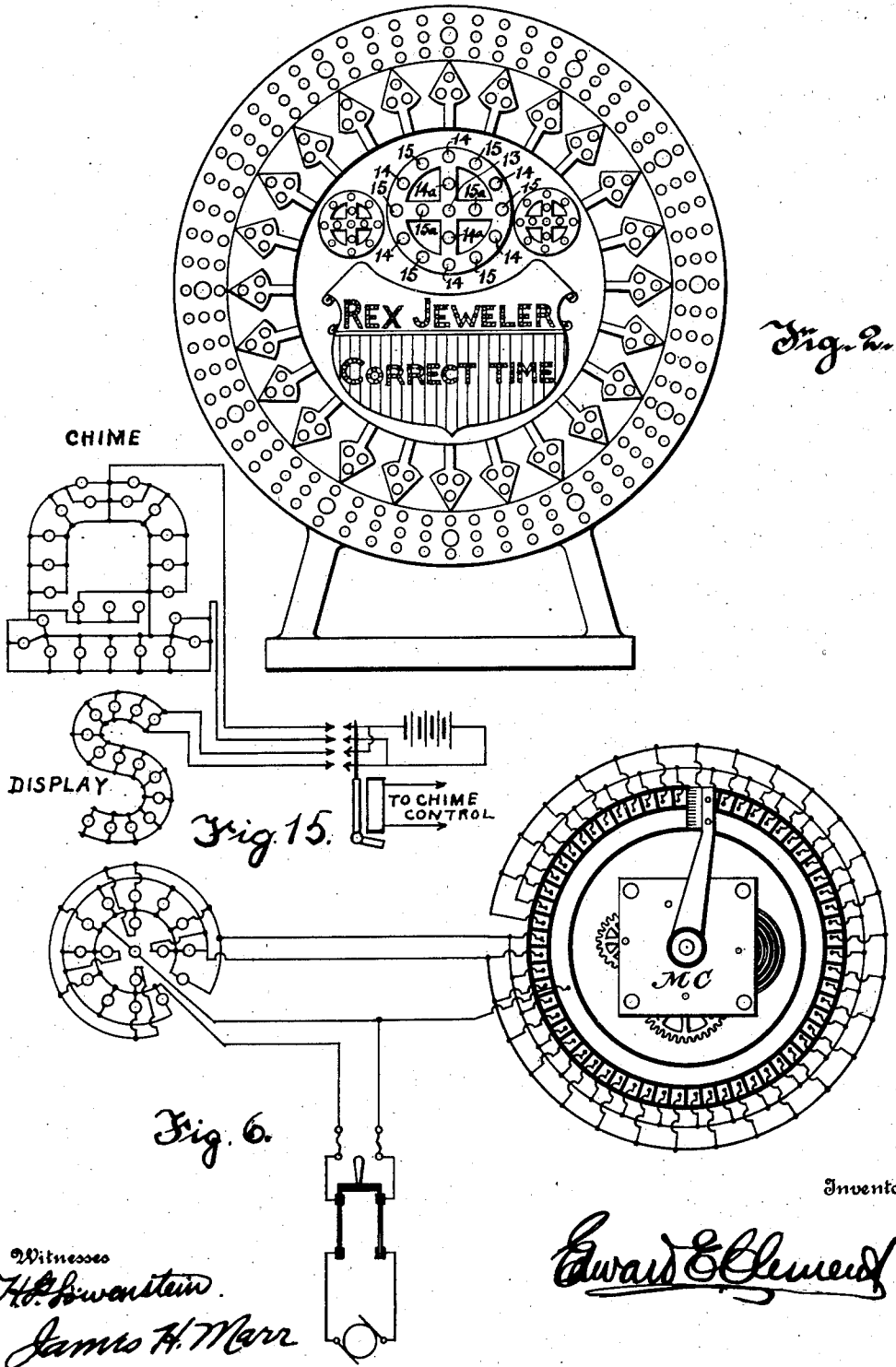
Inventor
Edward E. Clement

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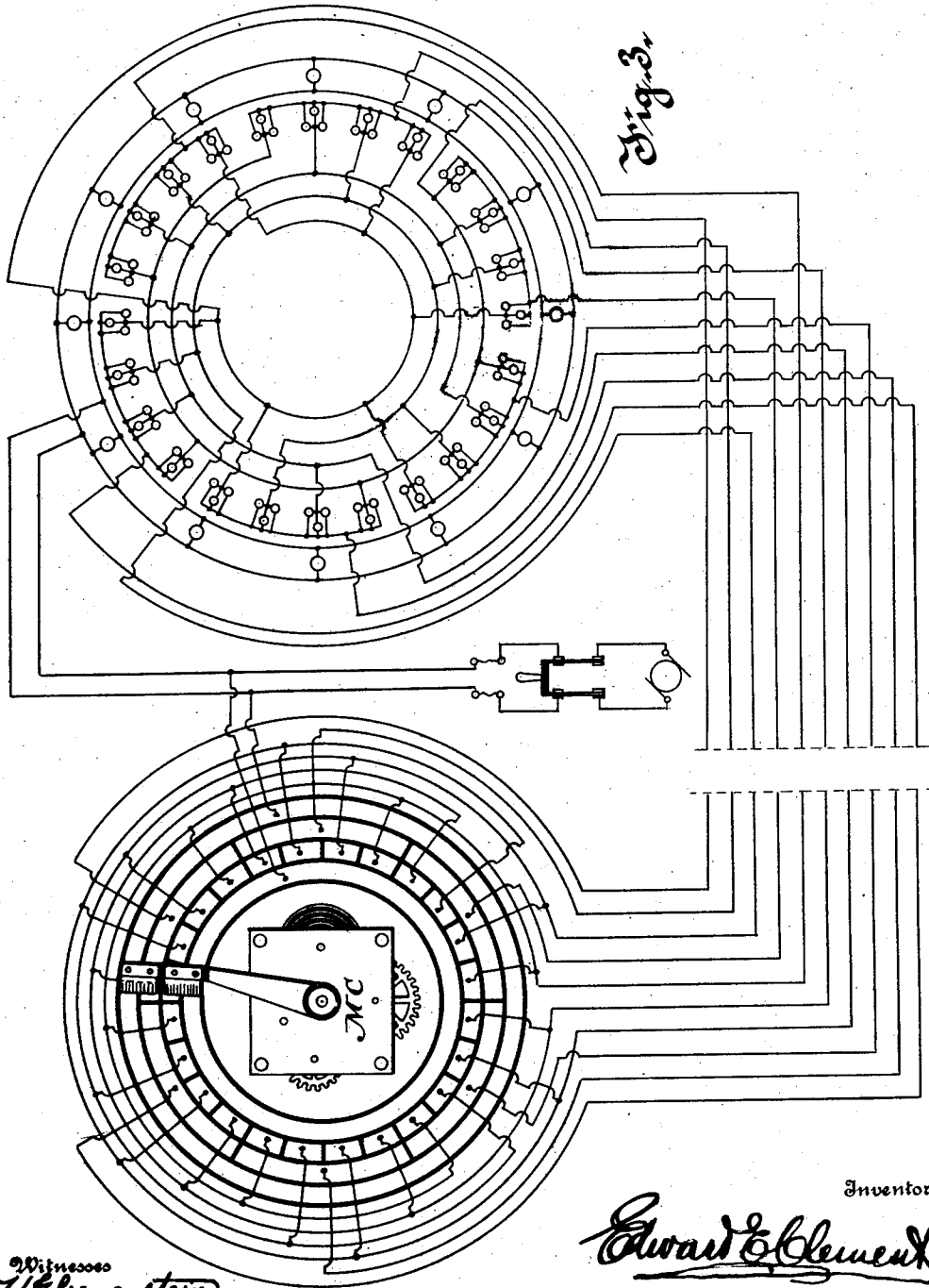


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Witnesses
H. S. Lowenstein
James A. M. Orr

Inventor
Eward Clement

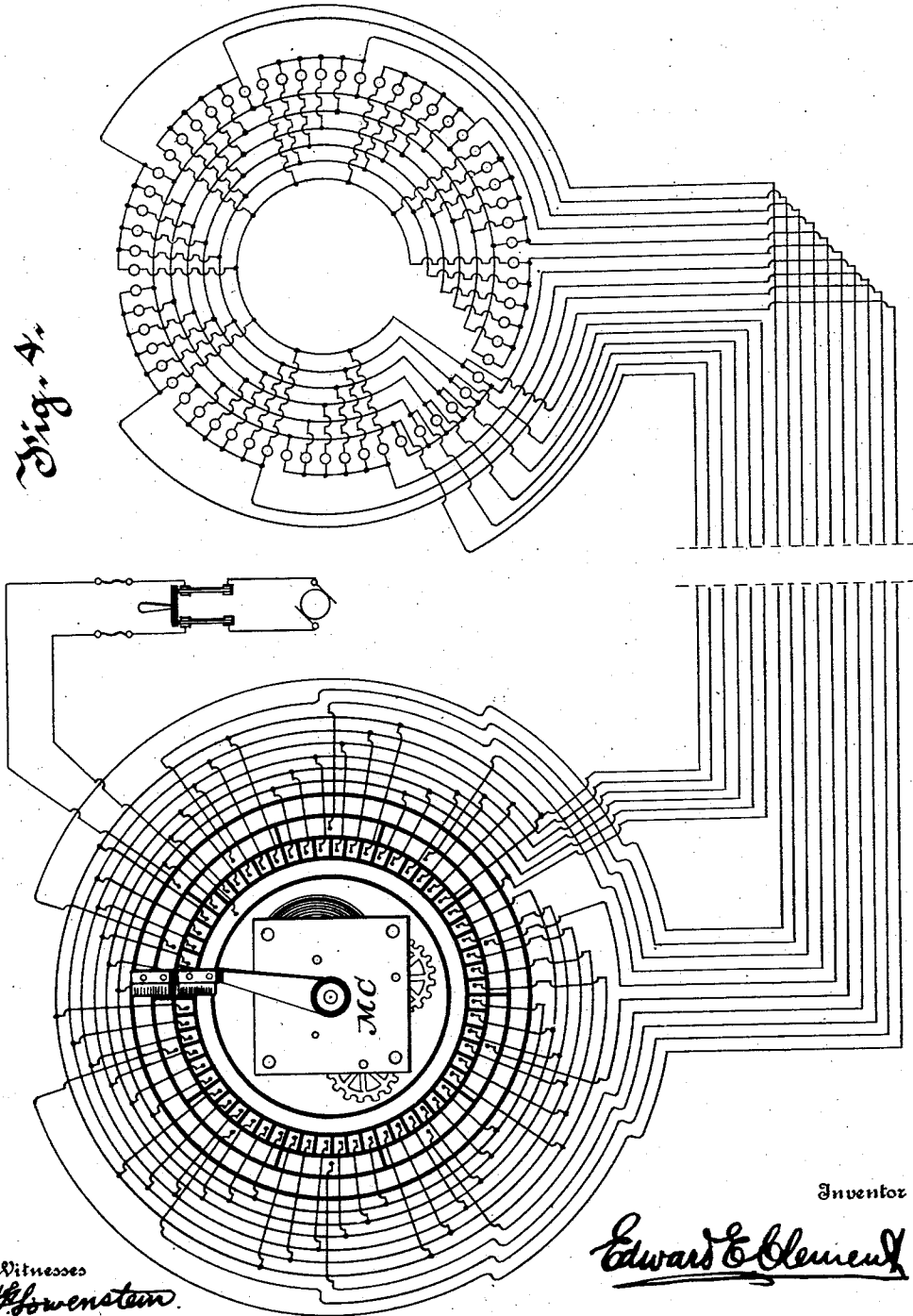
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7 SHEETS—SHEET 4.

Fig. 4.



Inventor

Edward E. Clement

Witnesses

H. Lowenstein

James H. Merr

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7 SHEETS—SHEET 5.

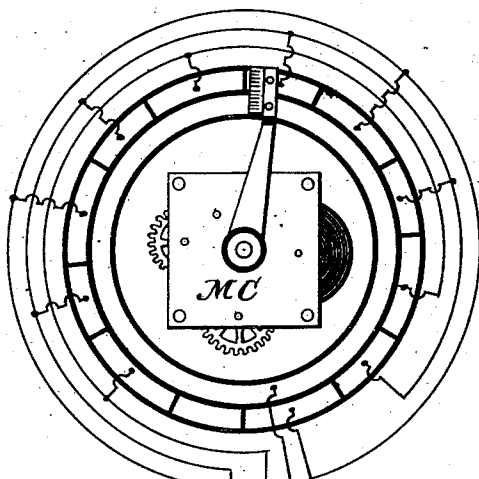


Fig. 5.

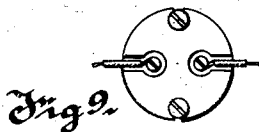


Fig. 9.

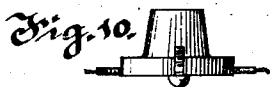


Fig. 10.



Fig. 11.

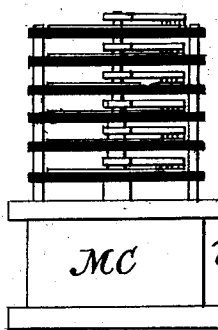
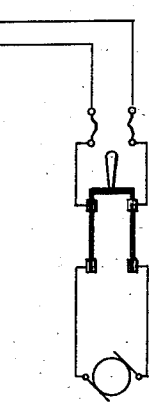
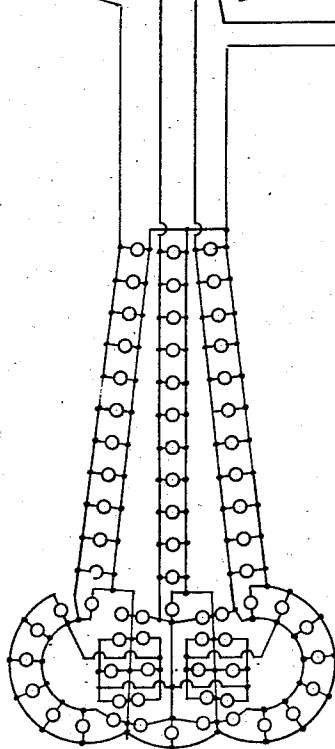


Fig. 12

Inventor

Edward E. Clement

Witnesses
H. H. Lowenstein
James A. Mann

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7 SHEETS—SHEET 6.

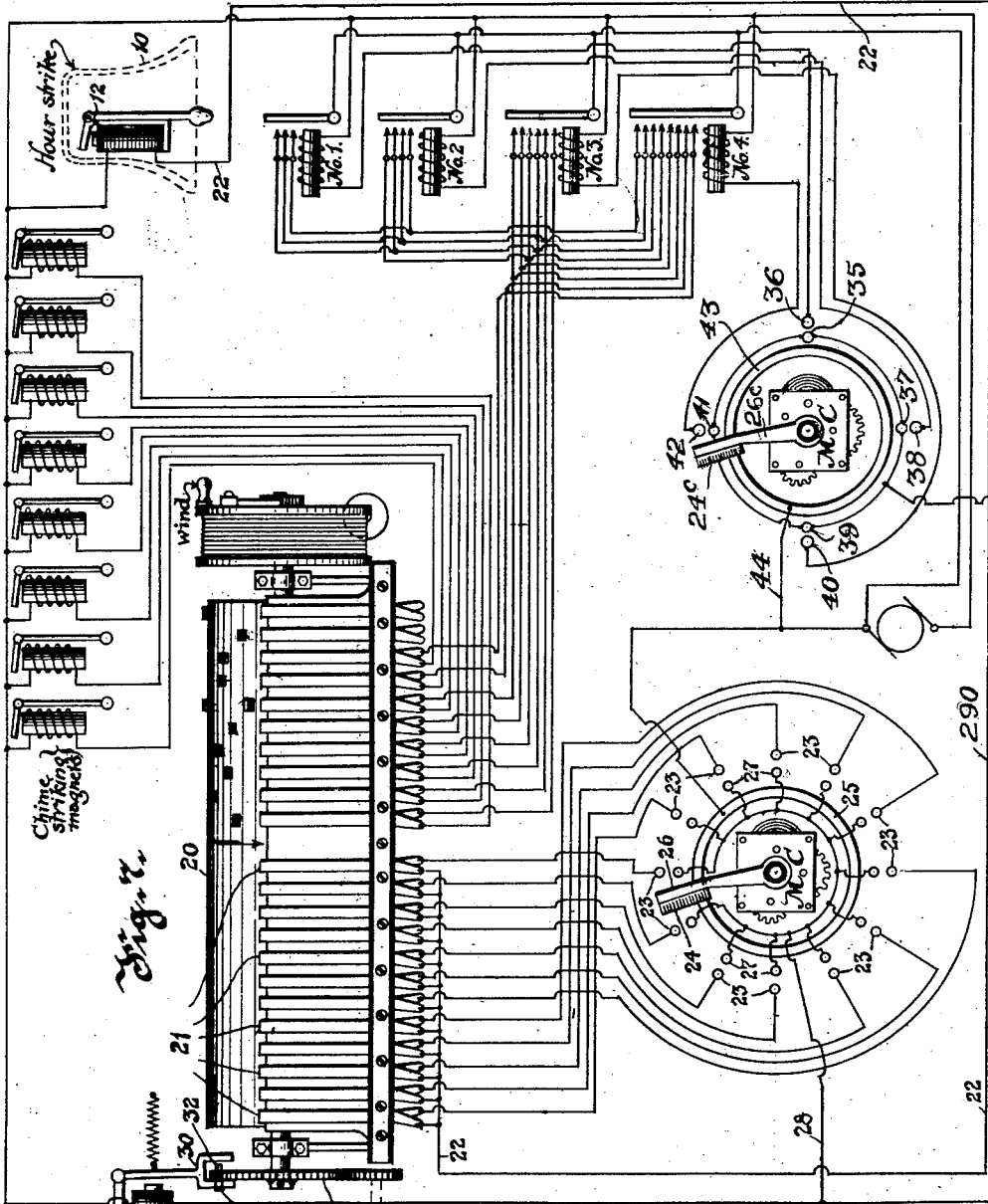


Fig. 7.

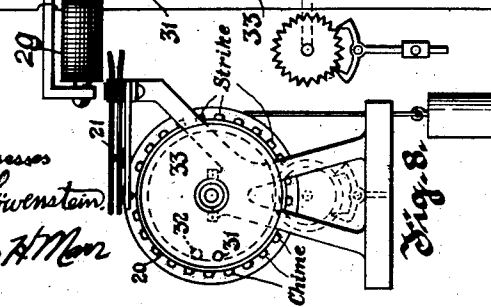


Fig. 8.

Inventor

Eward Clement

Witnesses
H. Lowenstein
James H. Mann

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7 SHEETS—SHEET 7.

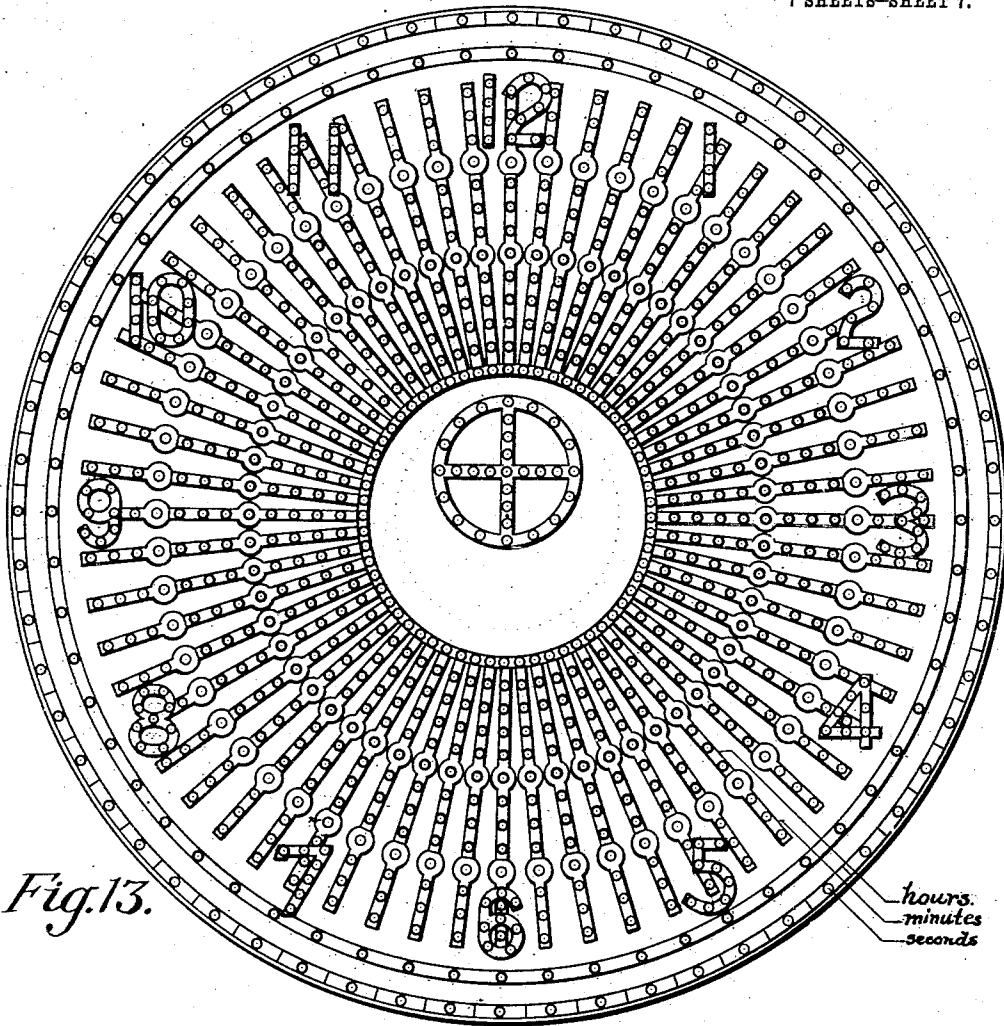


Fig. 13.

hours.
 minutes
 seconds

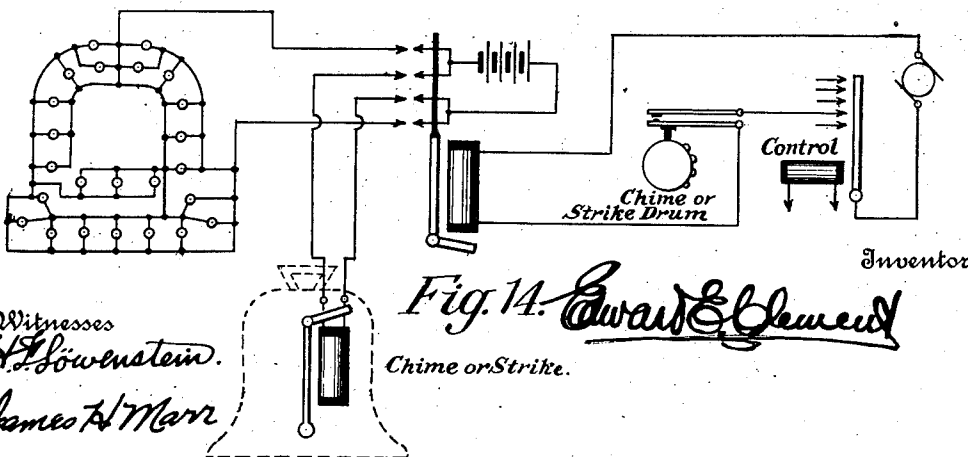


Fig. 14. *Eward E. Clement*

Inventor

Chime or Strike.

Witnesses
H. Lowenstein.
James A. Marr

UNITED STATES PATENT OFFICE.

EDWARD E. CLEMENT, OF WASHINGTON, DISTRICT OF COLUMBIA.

ELECTRIC CLOCK.

1,096,778.

Specification of Letters Patent. Patented May 12, 1914.

Application filed May 25, 1909. Serial No. 498,369.

To all whom it may concern:

Be it known that I, EDWARD E. CLEMENT, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Electric Clocks, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to electric clocks and is in the nature of an improvement on a previous invention for which Letters Patent No. 920,024, dated April 27, 1909, have been granted to me on an application filed December 2, 1905, Serial No. 289,977.

In my former case I disclosed a system in which a frame or dial served as a support for electric lamps set around in fixed position, and lighted in succession from a clock-driven commutator so that the indications thus produced appear to travel like the hands of an ordinary clock. In the present case I shall set forth a similar arrangement of lamps or fixed indicating devices, lighted from a clock-driven commutator, with the addition of fixed lamps representing a pendulum or balance wheel at different points of its travel, such lamps being lighted from a suitable commutator in successive groups so as to produce the effect of a swinging pendulum or an oscillating balance wheel. In addition to this I preferably provide my clock frame with electrical striking means and chimes, the conducting wires for which pass through the same cable and form a part of the same group of controlling wires as those which supply current to the lamps. The organization of the clock is thus completed.

Referring to the accompanying drawings Figure 1 is a face view of a pendulum clock with chimes and a striker bell. Fig. 2 is a face view of a modification having a balance wheel instead of a pendulum. Figs. 3 and 4 are diagrams of the connections of the traveling hour and the traveling minutes (or seconds) lamps, respectively, (the commutator rings for the minutes and seconds lamps being duplicates). Fig. 5 is a similar diagram of the connections for the pendulum lamps. Fig. 6 is a similar diagram of

the connections for the balance wheel lamps. Fig. 7 is a similar diagram of the connections for the striking and chime mechanism. Fig. 8 is a detail view of parts thereof. Figs. 9, 10 and 11 are bottom, side and part sectional views of lamp sockets and mountings. Fig. 12 is a side view of one arrangement of commutators and clock control. Fig. 13 shows a clock face with electric lights arranged to represent complete hour and minute hands, and the tip of the seconds hand, in different positions. Figs. 14 and 15 are details of the striking and chime connections. Fig. 16 is a perspective view of a multiple dial clock tower represented or outlined by electric lamps arranged in accordance with my invention.

Referring to Fig. 1, 1 is a ring frame supported in any suitable manner, as by a base frame 2. Around the ring frame are located fixed hour lamps 3, which I preferably make of a distinguishing color, as red. Around these lamps is a continuous row of seconds lamps, which are lighted in succession, second by second, from the seconds commutator which will be described in connection with the circuits. Inside of these seconds lamps is a row of minutes lamps, or groups representing minutes hands, and inside of these is a row of hour lamps 6 or groups representing hour hands. Below the ring 1 and mounted upon the frame 2, are several groups of lamps 7, 8 and 9, mounted upon the frame so as to represent a pendulum swinging from side to side below the ring 1, in three different positions. These groups of lamps are lighted in succession, each group in its entirety, and the number of groups may be varied as desired. Within the frame 1 is hung the striking bell 10 which may advantageously be surrounded by the chime bells 11. The striking mechanism I prefer to employ in these bells is shown in Fig. 7, comprising an electromagnet with a bell crank armature lever, the latter having considerable lost motion on its pivot, and normally resting against a shoulder 12 on the armature, whereby the attraction of the latter will throw the clapper out freely and permit it to rebound

with the same freedom until it again strikes the shoulder 12. This arrangement accomplishes two things in that it gives a good sharp clean stroke, and at the same time a long stroke of the clapper, with a short stroke and small air gap for the armature. I preferably outline the bell 10 and may outline the chimes 11, by means of fixed electric lamps, which I show mounted on a wire network or frame hung over the bell in order to relieve the lamps of the destructive effects of vibration when the bell is struck. This frame may be of any suitable material, and may take the place of the bell entirely, the latter being placed elsewhere in the structure as desired.

The operation of the pendulum and the production of its return swinging effect on the eye requires no detailed explanation. In Fig. 2, however, I have shown a balance wheel substituted for the pendulum, the operation of which should be explained. This wheel is outlined by a number of lamps, the center one of which numbered 13, burns steadily, being preferably fed from the same leads as the fixed hour lamps 3. Around the periphery of the balance wheel are two sets of lamps 14 and 15, while there are two cross bars with lamps 14^a and 15^a respectively. The lamps 14 and 14^a are fed through one wire lead and the other set 15 and 15^a are fed through another wire lead, both sets being on a common return on the other side. In order to produce the effect of oscillation the controlling commutator cuts in one set after the other very rapidly, preferably twice a second, being driven in synchronism with the seconds commutator lighting one lamp per second, extinguishing the preceding one at each step. Each time the balance wheel completes an oscillation, the position of the lighted seconds lamp is advanced one point, the lamp in the old position being extinguished as the lamp in the new position is lighted, thus producing a very striking effect of mechanical movement, and so on, while at the end of each minute the lamp then burning goes out and the next one lights, this being repeated for hours in due course. Similarly, portions of the clock train are represented at right and left of the balance wheel. It goes without saying that the striking and chime bells of Fig. 1 may be applied to the balance wheel clock as well as to the pendulum clock.

Turning now to the circuits, Figs. 3 and 4 represent the connections for the hours and minutes or seconds lamps respectively. Of the hours lamps there are twelve or more, arranged in groups, with a common return wire for each group on one side, and common returns for the corresponding lamps in all the groups on the other side. As the

clock-driven commutator travels around, it cuts in one group after the other and simultaneously one unit contact after another, complete chronometric control being thus maintained with a reduced number of wires. In the same manner, the minutes or seconds lamps (which are duplicates of each other in regard to their number and connections) are arranged in groups of convenient size with a common return wire for each group and other common returns for the corresponding lamps in all the groups. As the commutator advances, it closes the circuit to the successive groups, and also to the successive units in each group, so as to maintain chronometric control, also through a number of wires less than that of the lamps. The only difference between the minutes and seconds connections or commutators lies in the fact that the moving parts of the latter are driven just sixty times as fast as the former. In other words, the arm of the seconds commutator must make one complete rotation or cycle of sixty contacts in exactly one minute. Similarly the moving parts of the minutes commutator must make one complete rotation or cycle of sixty contacts in one hour, while the moving part of the hours commutator makes one step per hour or one complete rotation in twelve hours. The commutator which actuates the pendulum in Fig. 1 is represented in Fig. 5, and if this pendulum is to appear to make one complete swing per second, then the moving part of its commutator will make one complete rotation, consisting of three cycles of contacts, in three seconds. This may be arranged, however, in any desired or suitable manner, as the number of contacts and the rate of progression of each commutator is entirely arbitrary provided the proper relative speeds are maintained, and provided also that fundamental synchronism of the lamps with the time movement is maintained.

It is unnecessary to give a detailed description of the circuits of Figs. 3 and 4 herein, as they are already fully and particularly described in my previous patent above referred to.

Thus far I have described my clock as a unit, having a single face or dial. In my prior patent aforesaid I have described and claimed a system in which a number of these clocks are fed and controlled over the same cable. This principle may be well applied in the present case. Thus, a frame work representing a tower will be erected, with several faces, upon each of which an aggregation of lamps will be mounted similar to that in Fig. 1. If bells or chimes are employed they may be hung within the tower which will also be outlined with electric lamps in a manner well understood in the art,

thus producing a complete electric light clock tower and chimes for night use, of an ornamental as well as useful character. This arrangement is clearly illustrated in Fig. 16.

I am aware that many non-essential changes may be made in the matters disclosed herein, and therefore I do not wish to be closely confined to the specific forms illustrated and described. These are used for purposes of definition and not of limitation and should be so construed. I contemplate, for example, the substitution of electromagnetic indicating devices for lamps and other changes will readily occur to those skilled in the art.

It is to be understood of course that the commutator elements or other equivalent represented in Figs. 3, 4, 5, 6 and 7 are all driven or controlled by the same master clock. I prefer to mount these in lieu of hands in the ordinary way, but where the current to be handled is considerable and the parts therefore heavy, they may be power driven and simply controlled by the clock. This is a detail which does not affect the character and scope of the invention and therefore need not be described. The clock mechanism is indicated in the figures mentioned by the letters M C which are supposed to designate the same mechanism throughout.

Fig. 7 shows the connections of the striking mechanism, and indicates the related connections of the chiming mechanism. The striking is thus controlled: A drum 20 carries teeth upon its surface in twelve sets, the first set having a single tooth, the second set two teeth, and so on up to twelve. Held upon a frame over the zones of the teeth are twelve pairs of contact springs indicated by the numeral 21. The lower springs are all tied together, and connected by wire 22 to the striking magnet of the hour bell 10. The upper springs are individually connected to the twelve contacts indicated by numeral 23, these being connected by the brush 24 to the generator ring 25, in succession, as the arm 26 is driven around the circle. An additional set of contacts 27 are all wired together and connected by conductor 28 to the controlling magnet 29, provided with an escapement detent 30 engaging back and front pins 31 and 32 on a disk 33 rigidly secured upon the shaft of the drum 20. At the other end of the drum any suitable motor mechanism is connected, shown as a cord and weight. In operation, when the brush 24 bridges the contacts of a particular hour, the magnet 29 becomes energized, and releases the drum so it can make one complete rotation; the brush at the same time connects the proper contacts in circuit with the gong striker, so that

a number of impulses are transmitted to the latter properly corresponding to the hour. Instead of this magnet receiving the impulses directly as indicated in the diagram, a relay may of course be employed, which however is not illustrated, because it is an obvious expedient. In such case the relay would receive the impulses from the drum and in response thereto would open and close the circuit of the gong striker. The drum can only make one complete rotation, because as long as the magnet 29 remains energized, the outer limb of its escapement detent 30 will be in position to engage the pin 32 as shows in Fig. 7; and when it again becomes deenergized, the inner limb will come into position to engage the pin 31. These pins are staggered as indicated in Fig. 8, so that should the drum rotate until the pin 32 engages, subsequent deenergization of the magnet will catch the pin 31 and hold it without permitting any further rotation until the next succeeding energization of the magnet. As a matter of fact this magnet only remains energized while the brush 24 is traveling over the contacts.

For the chime mechanism I employ an extension of the striking drum, having teeth arbitrarily arranged upon its surface, to open and close the chime springs in any desired order. Assuming that we have eight bells in the chime, I provide correspondingly eight pairs of springs, and arrange the teeth on the drum in eight circles so that in one complete rotation thereof all the springs will be worked in succession or together, to produce the desired melody. To control these, special chime contacts are placed on the commutator, either on the minutes disk shown in Fig. 4, or preferably on a special ring of their own, as shown in Fig. 7 connected with the master clock M C. Chimes are usually rung on the quarters, and I will assume that for the first quarter three bells will be rung, for the second four bells, for the third six, and for the hour eight. Four relays are provided, marked in Fig. 7 respectively No. 1, No. 2, No. 3 and No. 4, the first having three contacts connected to the first three springs only, the second having four contacts connected to the first four springs, the third having six contacts connected to the first six springs, and the fourth having eight contacts connected to all the springs. The first three springs are thus connected in parallel to the corresponding contacts in all of the relays; one more goes to three relays, two more to two relays, and two more to one relay only. The chime drum must be actuated at each quarter, and if separate from the striking drum must have its own magnet 29 and other controlling parts. As it is shown in Fig. 7 connected to the strik-

ing drum, the single magnet 29 suffices for both. This magnet must receive current from the starting contact at each quarter, through the wire 290. The arm 26° makes
 5 one complete rotation per hour and its brush 24° in that time passes over the four pairs of contacts 35,—36, 37,—38, 39—40, and 41—42, bridging each pair with the ring 43, which is connected to a battery or generator
 10 through the wire 44. The contact 36 is connected to relay No. 1, 38 to relay No. 2, 40 to relay No. 3, and 42 to relay No. 4, while the contacts 35, 37, 39 and 41 are all wired together and connected to the magnet 29
 15 through the wire 290. It will be understood that the arm 26° makes one complete rotation while the arm 26 is making one-twelfth of a rotation, or the distance between two sets of hour contacts. On the first quarter
 20 number 1 relay is pulled up, the chime drum makes one rotation, and the first four bells are rung, since no others are connected. On the second quarter number 2 relay is pulled up, the others remaining deenergized, and
 25 six chime springs with their six connected bells are brought into circuit to receive predetermined impulses from the drum. With the third quarter number 3 relay is correspondingly pulled up cutting in eight bells, and on the fourth quarter or on the hour
 30 number 4 relay is pulled up cutting in the entire ten bells and giving the full chime as the drum rotates. This would be followed by the rotation of the striking drum, if
 35 separate, or where the striking and the chime drums are made as shown in Fig. 7 in one long drum, the striking teeth are arranged upon its surface so that they come after all the chime teeth are passed, in order
 40 of rotation. It may be added that the hour will not be struck on any quarter except the last, because that is the only time when the brush 24 of the striking arm finds a contact through which to transmit the striking
 45 impulses. On the hour, however, whether the drums be made one or separate, the chimes are sounded first on the bells 11, and then follow the strokes indicating the hour on the bell 10. I believe that this use
 50 of a drum mechanism, with controlling relays as described, is original with me, but as it can be used with any form of clock, electrical or mechanical, in which the starting and selecting contacts are provided at the
 55 proper intervals, I have claimed it in a divisional application filed April 30, 1910, Serial No. 558,622.

An important feature of my chime arrangement is that instead of having the various
 60 springs of the chime drum connected only to individual chime bells, they can also be connected to other pieces or groups of mechanism, electric lights and the like arranged in the form of any suitable figures
 65 so as to produce any desired effects at re-

curing and stated intervals. Thus for example, proper legends formed of electric lamps, and changing from quarter to quarter may be displayed either simultaneously with or in place of the chimes. The
 70 connection of such display lamps for operation simultaneously with the chime or striking bells is clearly illustrated in Fig. 15. In the same way the striking of the hours which I have described may be accom-
 75 panied by the display of legends, advertising figures or the like and I also contemplate using my commutator and connections for producing advertising effects at stated
 80 intervals during the operation of the clock. This is illustrated in Fig. 6 showing the connections to the group of lamps representing the scape wheel governor and the connection of the display group therewith.

It should be understood that the number
 85 of lamps or indicating devices in any group may be increased, diminished or varied in arrangement as desired without departing from the invention thus the hour, minute, and second lamps may be multiplied to rep-
 90 resent complete hands or pointers in different radial positions, instead of using single lamps; the outlines of the hours may be Arabic or Roman numerals, and the pendulum or balance wheel may be composed of
 95 many lamps instead of the few shown. The circuits remain the same for such modifications, as one or more lamps may be lighted from the same wire, simultaneously. Fig. 13 shows a clock face with a multiplied num-
 100 ber of lamps spaced and arranged so as to represent the complete hour and minute hands, and the end of the seconds hand.

In connection with the striking of the hour or the chimes at recurring intervals,
 105 I also contemplate including the lamps which illuminate or outline the bell, or bells, (which lamps may be attached to or associated with the chime bells as well as the hour bell) in the same circuits as the mag-
 110 net strikers of the respective bells. If relays are employed between the drums and the bell strikers, these relays will have one or more sets of contacts for their respective
 115 strikers, and other contacts in circuit with the corresponding lamps. The windings of the relays taking energizing current from the drum contacts will then close the "local" striker and lamp circuits simultaneously. These lamps may have in their circuits, or
 120 the relays may have separate contacts for groups of advertising or display lamps which will thus be flashed when the bells ring. This is clearly indicated in Fig. 15. Such an arrangement is indicated in the detail Fig. 14. It should also be noted that the use of the pendulum figure and the use of the balance wheel figure can be combined to advantage, and in Fig. 2 I have shown
 125 several wheels, which are supposed to be 130

all connected in the circuit of Fig. 6 so as to produce the appearance of wheels turning in the clock. By combining the pendulum of Fig. 1 with these, the balance wheel would represent the scape wheel of a pendulum clock, without other change.

In exposed positions, or where no magnets or gong strikers are desired in proximity to the lamps, the striking and chime bells may be hung below or away from the clock dials, leaving only the wire cages with their lamp outlines of the bells, which being flashed when the latter are sounded, will localize the sound by suggestion from the eye. Such an arrangement is indicated in detail Fig. 14, also.

Fig. 12 shows the commutators as a series of disks. These may be combined to form a drum or may be otherwise arranged if desired.

In the drawings herewith, current is shown as supplied from generators, one of which is indicated in each of Figs. 3, 4, 5, 6 and 7. It is to be understood that I am not restricted to any particular type of generator, but may resort to any well known commercial means of supplying current to the several sections of the commutator, such as direct or alternating current generators, batteries, or the secondary windings of transformers which may replace the several generators in the figures mentioned, their primaries being connected to a common supply circuit carrying alternating current, in a well understood manner.

With the foregoing knowledge of my invention, it will be readily understood that the synchronical relation between the operation of the various time indicating elements, and the governing, striking, and display elements of the system of my invention gives to the system particular value as an advertising agency. The substantial coincidence of display by the several elements mentioned or any pair of them, gives emphasis, which as between any two elements is reciprocal.

While I have shown and described the best embodiment of my invention now known to me, it is of course obvious that this invention like all others is capable of being given many embodiments by those skilled in the art without departing in any wise from its generic spirit. I desire to cover all such modifications in the annexed claims. In these claims I have freely used the terms "synchronous" and "synchronical", but I desire to have it understood that such terms comprehend not absolute synchronism only, but also all substantial synchronism of the elements set forth resulting in the same effect. I have also used the term "commensurately" as respects the relation of the periods of operation of several of the elements of the system. The hereinbefore set

forth operation of the time, governing, striking, and display elements fully supports the use of this term, and the angular arrangement and proportions of the various commutator segments clearly show it.

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

1. A clock system comprising a frame or support, visual indicating devices mounted in a circular figure thereon to represent divisions of time, auxiliary visual devices mounted on the frame and arranged to represent the moving part of a clock mechanism, circuit wires leading to the several visual devices on the frame, and means for actuating the first mentioned indicating devices around the circular figure to indicate different divisions of time, and also for producing the effect of movement by actuating the auxiliary devices in recurring periods and apparently in synchronism with the indication of said visual indicating devices, whereby the indication of the latter appears to be produced by virtue of the movement of the former.

2. A clock system comprising a frame or support, fixed electric lamps mounted in a circular figure thereon to represent divisions of time, auxiliary lamps mounted on the frame in groups arranged to represent the moving part of a clock mechanism, circuit wires leading to the several lamps on the frame, a source of current, a master clock, and means controlled by said clock for supplying current from said source to the circular series of lamps so as to indicate the time continuously, and to synchronously supply current to the groups of lamps at recurring intervals whereby the indications of said circle of lamps appear to be produced by virtue of movement of the represented part of the clock mechanism.

3. A clock system comprising a frame or support carrying electric lights in circular series indicating divisions of time, a plurality of groups of auxiliary lamps arranged on the frame to represent a moving part of a clock mechanism at different points in its swing, a source of current for the lamps, switching means adapted to cut in the time indicating lamps in succession around the frame, and associated switching means constantly actuated in synchronism with the first mentioned switching means to light the different groups of auxiliary lamps successively in periodic relation with the cutting in of the time indicating lamps, whereby the cutting in of said lamps appears to be produced by virtue of the movement of the represented part of the clock mechanism.

4. A clock system comprising a frame or support, electric lamps fixed thereon in a circular series to represent hours, minutes

and seconds, a source of current and a clock controlled commutating device for connecting the same so as to light the hours lamps, the minutes lamps and the seconds lamps at proper intervals, maintaining each lamp or group of lamps lighted for only the interval which it represents, and then extinguishing it when lighting the next, and a plurality of groups of auxiliary lamps representing a periodically moving governing element, with a controlling switching device therefor, means to operate said switching and commutating devices, so as to produce the appearance of direct governing relation of said governing element to said time indicating lamps.

5. A clock system comprising hour, minutes and seconds lamps arranged in a circular series around a support, a plurality of connected groups of lamps arranged to represent the moving part of a clock governing the escape mechanism thereof, means for lighting the seconds lamps at successive seconds' intervals, and associated means for lighting and extinguishing the groups of auxiliary lamps in periodic relation with the lighting of the seconds lamps aforesaid whereby the lighting of the seconds lamps appears to take place by virtue of control exercised by the represented moving part of the clock.

6. A clock system comprising a frame or support, a series of electric lamps arranged thereon to indicate divisions of time, a source of current, circuit wires, a clock controlled commutating means supplying current from said source through said wires to said lamps in chronological order, auxiliary lamps in groups representing different positions of a vibrating governor for the clock movement, and connections therefrom to synchronously operated commutating means such that the groups will be lighted at recurring intervals in synchronism with said time indicating lamps to produce the effect of continuous vibration of said governor concurrently with the steady progression of the lighted time indicating lamps.

7. A clock system comprising a frame or support, a dial thereon, groups of electric lamps carried on said dial in circular arrangement to represent divisions of time, an auxiliary group of lamps carried on said frame, associated with said dial, and outlining the form of a bell, a source of current, clock controlled commutating means for supplying current therefrom to the groups of lamps on the dial in proper chronological order, a bell, an electromagnetic striker therefor, means associated with said commutating means to energize said striker, and contacts in the circuit of the auxiliary group of lamps, closed simultaneously with the striking of the bell, whereby predetermined divisions of time are specially visual-

ized by the main and auxiliary groups of lamps on the frame and dial, acting in conjunction, synchronously with the striking of the bell.

8. A clock system comprising a frame or support, a plurality of dials thereon, groups of electric lamps carried on each dial in circular arrangement to represent divisions of time, an auxiliary group of lamps carried on said frame and outlining the form of a bell, the arrangement of the dials and said auxiliary group of lamps being such as to suggest a bell within a tower, a source of current, clock controlled commutating means for supplying current therefrom to the corresponding lamps on the different dials simultaneously and in proper chronological order, and means associated with said commutating means to supply current from the source to said auxiliary group of lamps at predetermined divisions of time, whereby the indications of such divisions are specially visualized.

9. An electric clock system comprising a frame or support, clock controlled electric lights carried thereon to indicate time, a source of current, connections therefrom to the time indicating lamps, a group of auxiliary lamps also carried on the support and associated with the time indicating lamps, synchronously controlled commutating means connected to the source and to said auxiliary lamps, and adapted to flash the said lamps a determinate number of times for each recurring interval whereby the hours or fractions thereof will receive special visualization by the main and auxiliary lamps acting in conjunction.

10. A clock system comprising a frame or support, fixed electric lamps thereon in series representing divisions of time, auxiliary lamps representing a scape wheel governor in different positions, an electromagnetically actuated striking device, a source of current, and a clock controlled commutating means governing all of said lamps and said striking device, and arranged to light the fixed and the auxiliary lamps and actuate the striking device in synchronical relation, whereby the fixed electric lamps appear to be lighted by reason of the apparent oscillations of the represented scape wheel governor, and the striking device appears to be actuated by reason of the lighting of the fixed electric lamps.

11. A clock system comprising a supporting frame with groups of electric lamps fixed thereon and arranged to represent the hands of a mechanical clock in various indicating positions, additional groups of electric lamps thereon arranged to represent a moving part of the clock mechanism in various positions, commutating means with a master clock controlling the same, and circuit connections between the commutating

means and the lamps, whereby the lamps of the different groups are lighted in chronological order and in synchronical relation.

12. A clock system comprising a support, electric lamps fixed thereon in figures representing the moving parts of a clock, auxiliary lamps also fixed thereon in figures to represent chimes or striking means, other auxiliary lamps associated therewith for special signal or display purposes, a master clock, switching means governed thereby, circuit connections from said switching means to the time indicating lamps, circuit connections from the switching means to the auxiliary and display lamps, said switching means adapted to close the time indicating, auxiliary, and display circuits in chronological order and at commensurately related intervals, whereby the lighting of the display lamps is at intervals emphasized by the lighting of the auxiliary and chime lamps, and both auxiliary and chime lamps emphasize the indications of the time indicating lamps.

13. A clock system comprising a support, means carried thereon to indicate the time of day, electric lights fixed thereon to represent the moving mechanical parts of a clock, auxiliary lamps also fixed thereon for display purposes, a master clock, switching means governed by said clock, and circuit connections from said switching means to the fixed and the auxiliary lamps, and arranged to light said fixed and the auxiliary lamps in chronological order and at periods commensurately related to each other and to the indications of the time indicating means.

14. A clock system comprising a support, a set of electric lamps arranged thereon to indicate divisions of time, an auxiliary set of lamps arranged thereon and outlining the figure of a bell, a master clock, commutating means driven thereby and connections from the commutating means to the time indicating and auxiliary lamps arranged to light the lamps of the first set in chronological order and simultaneously light lamps of both sets at determinate periods, whereby the striking of the bell is visualized simultaneously with the indication of determinate periods of time and appears to take place by virtue of control exercised by the time indicating devices.

15. A clock system comprising a support, electric lamps fixed thereon to indicate the various divisions of time, auxiliary lamps arranged thereon for display, a master clock, commutating means controlled in its movements thereby, and circuit connections from the same to the time indicating and auxiliary lamps arranged to effect the lighting of the same in the same chronological order, the time indicating lamps in succession to indicate passage of time and the display lamps

at intervals commensurately related to the intervals of succession of the time indicating lamps, whereby the lighting of the display lamps appears to take place by virtue of control exercised by the time indicating devices.

16. A clock system comprising a support, electric lights fixed thereon at points indicating divisions of time, an electromagnetically controlled striking mechanism, a master clock, commutating means controlled in its movements thereby and in turn controlling both said time indicating lamps and said striking mechanism, said control being effected through connections arranged to cause the illumination of said time indicating lamps in succession indicating the time of day and to operate said striking mechanism at intervals simultaneously with the said time indicating lamps.

17. A clock system comprising a support, electric lights fixed thereon to represent a moving part of the clock mechanism in several of its positions, said lamps being arranged in corresponding groups, an additional group of electric lamps arranged to represent a striking bell in outline, a master clock with switching means governed thereby, and circuit connections from the same to the aforementioned groups of lamps arranged to effect simultaneous illumination of the same at predetermined times of day, and additionally to effect successive lighting of the lamps of the first named groups at shorter intervals than the intervals of simultaneous lighting of the lamps of all the groups.

18. A clock system comprising a support, electric lights fixed thereon in groups representing several positions of a moving part of a clock mechanism, a master clock, time announcing devices controlled thereby and switching means connected with said groups of electric lamps and operated by said clock synchronously with said time announcing mechanism whereby the announcement of the time appears to take place by virtue of control of the announcing mechanism by the represented moving part of the clock.

19. A clock system comprising a support, time indicating means carried on said support, striking mechanism, a master clock controlling said time indicating means and additionally said striking mechanism to strike audibly the hours of the day, and an electric lamp on said support having a local circuit, a source of power, and switching means in said local circuit operated by said clock mechanism synchronously with the striking of the hours of the day, whereby said lamp is flashed to visualize the striking of the hour independently of variations in said source of power.

20. A clock system comprising a support,

an hour striking mechanism, a master clock controlling the same to strike audibly the time of day, electric lamps arranged on said support for display purposes, a source of
5 current, and commutating means controlled by said master clock adapted to connect said source with said lamps synchronously with the striking of the hour of the day by said mechanism whereby the coincidence of the

strokes of the hour and the illumination of 10 the display lamps is unmistakable.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD E. CLEMENT.

Witnesses:

THOMAS DURANT,
JAMES H. MARR.