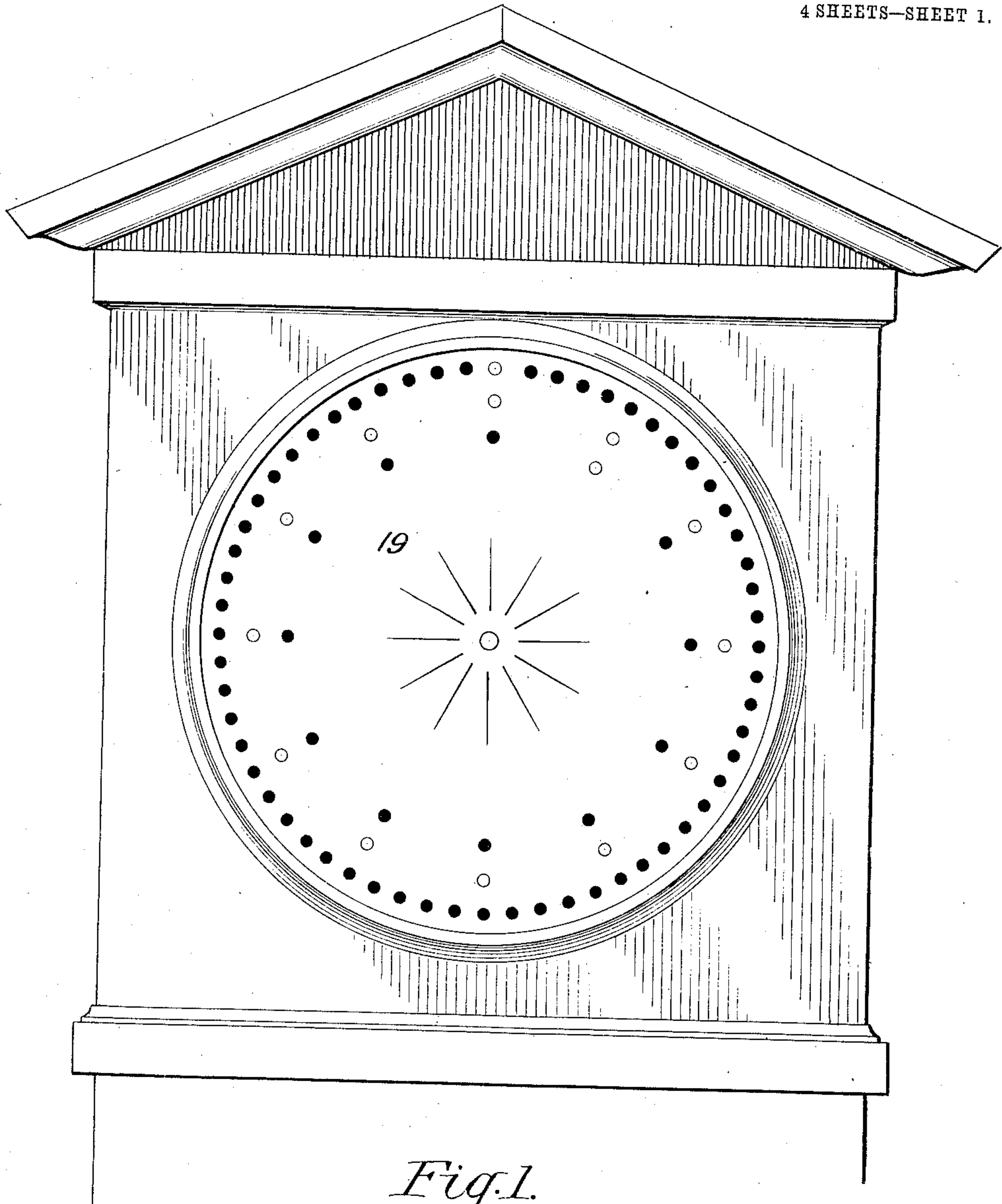


E. E. CLEMENT.  
ELECTRIC CLOCK.  
APPLICATION FILED DEC. 2, 1905.

920,024.

Patented Apr. 27, 1909.  
4 SHEETS—SHEET 1.



*Fig. 1.*

WITNESSES:

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*James A. Mann*

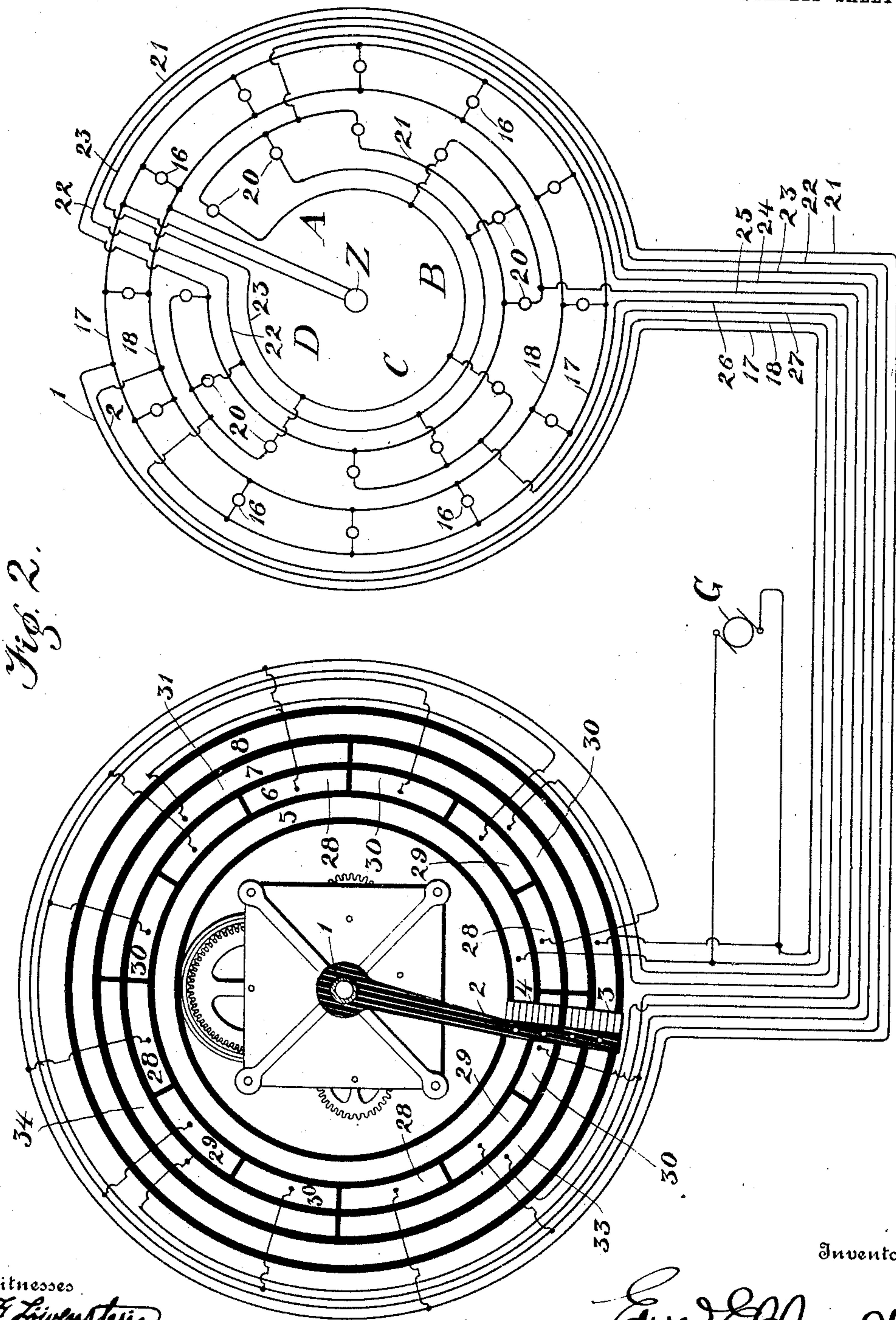
INVENTOR

*Edward Clement*

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Witnesses  
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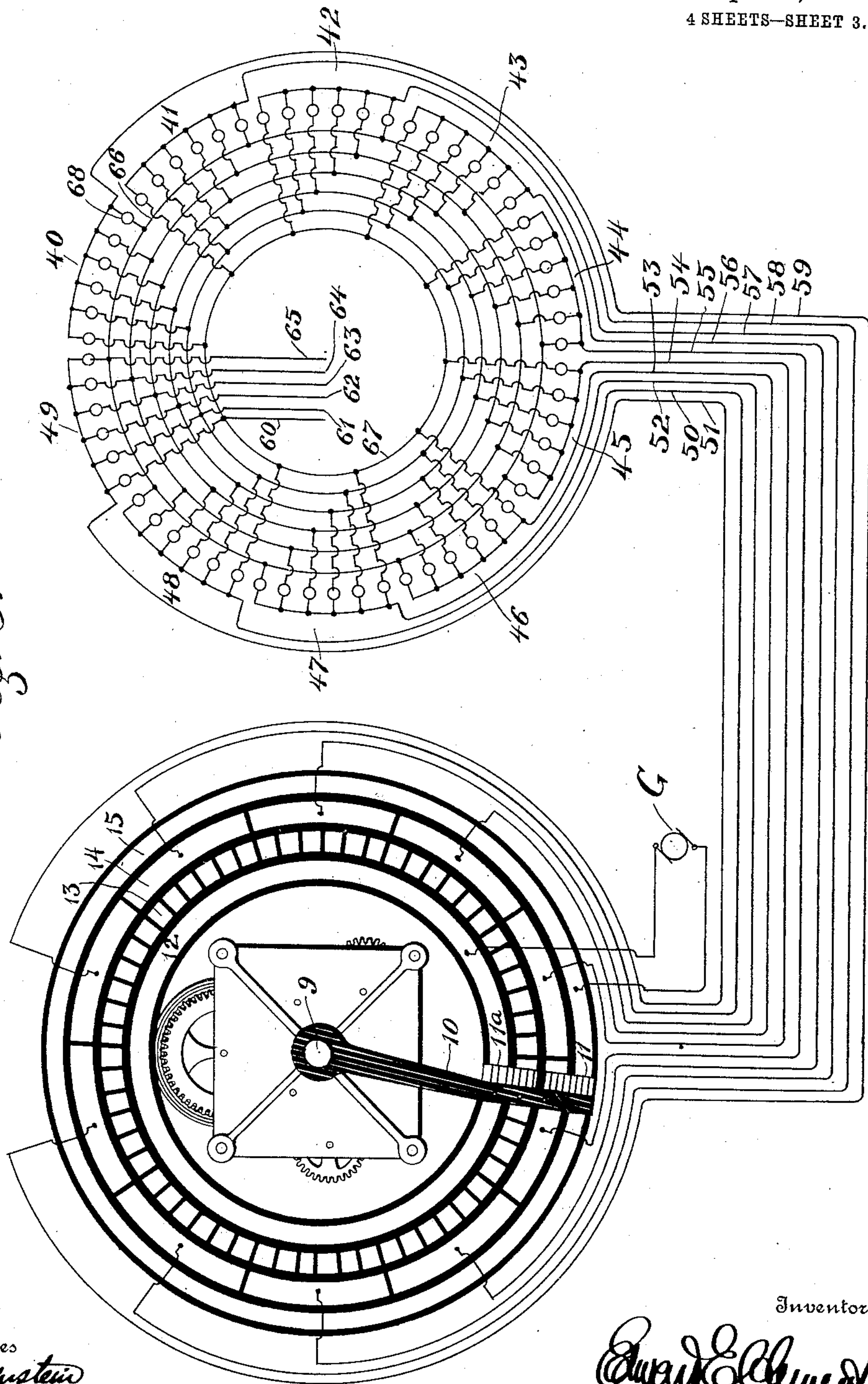
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4 SHEETS—SHEET 3.

Fig. 3.



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4 SHEETS—SHEET 4.

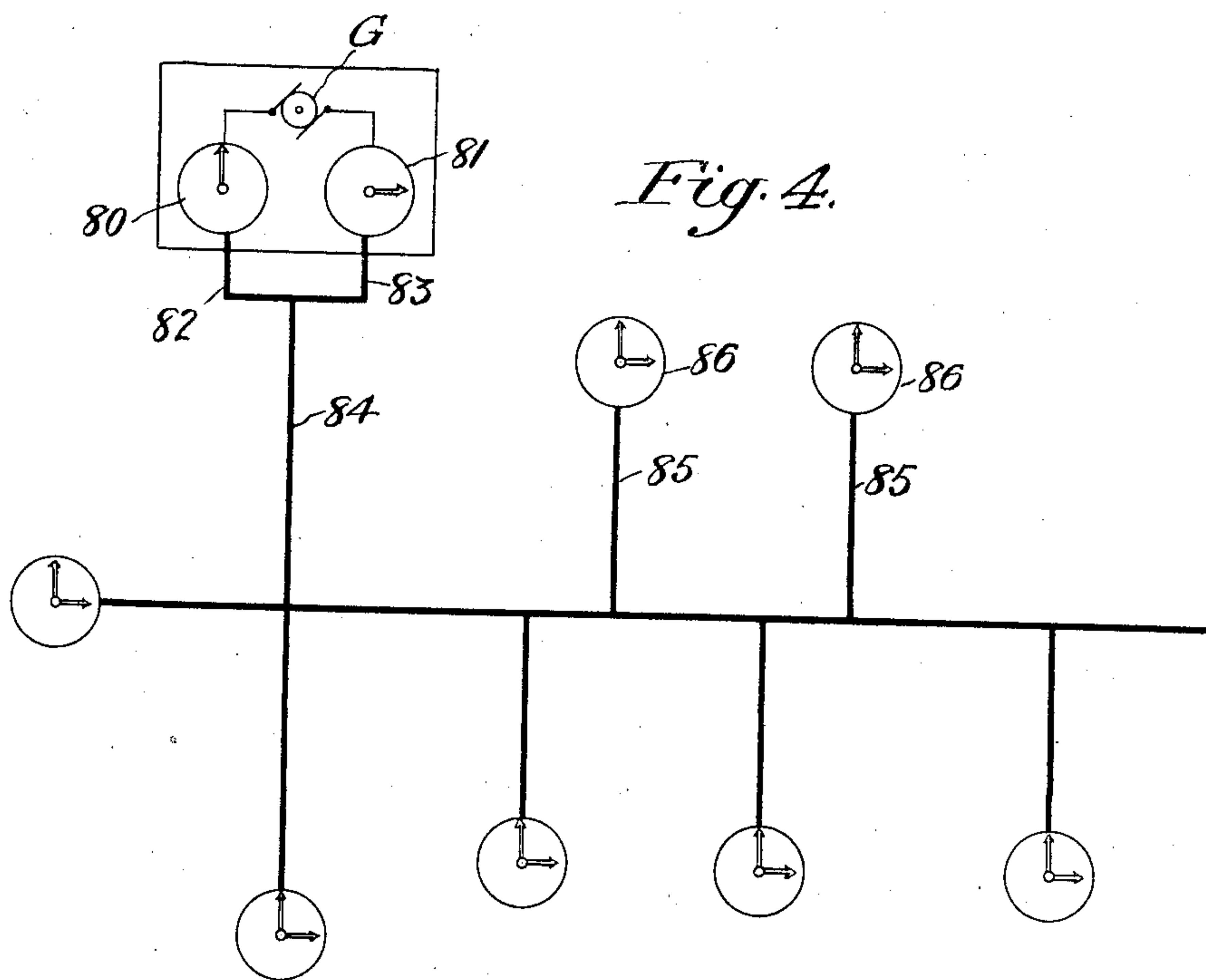


Fig. 5.

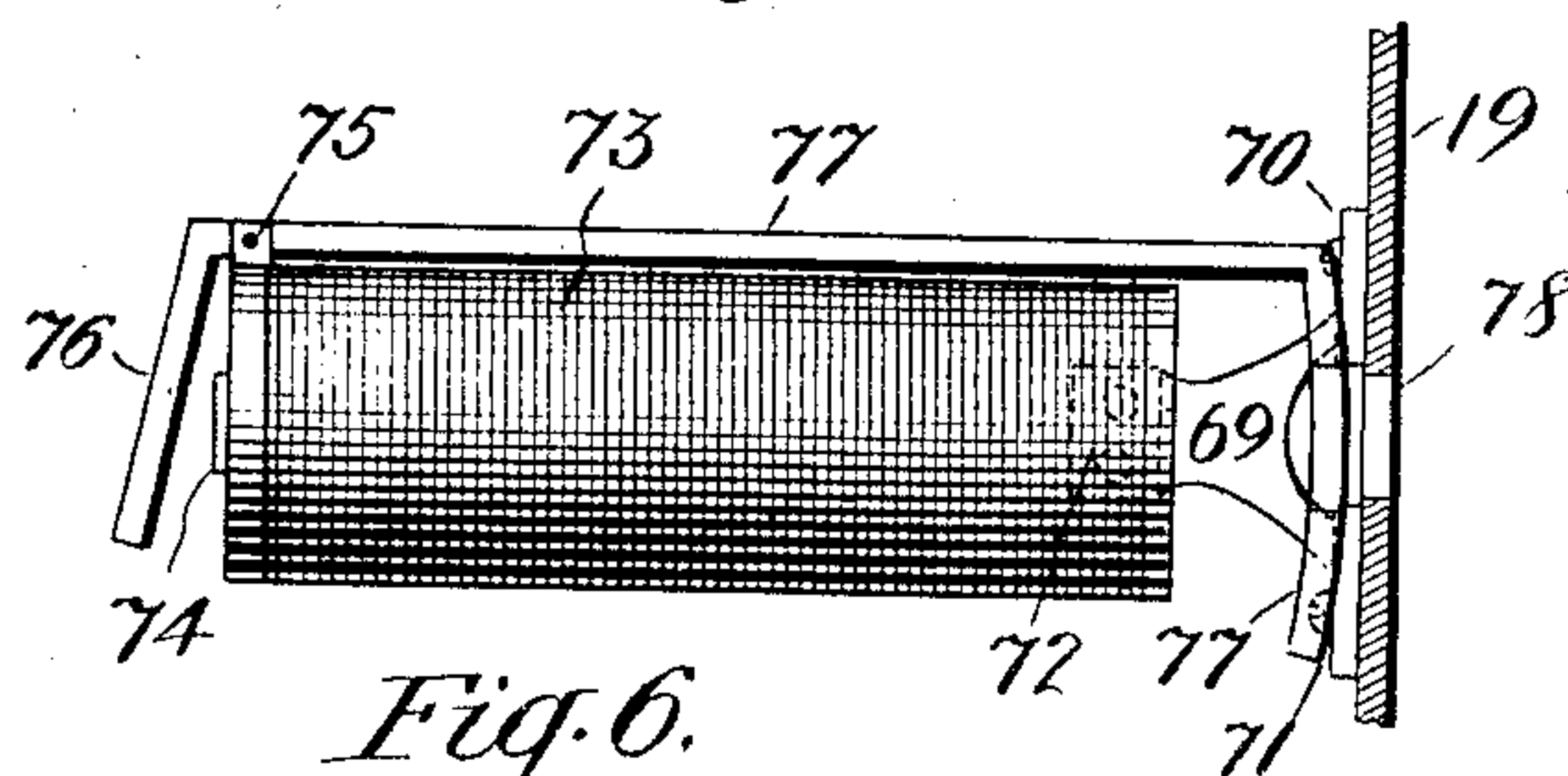
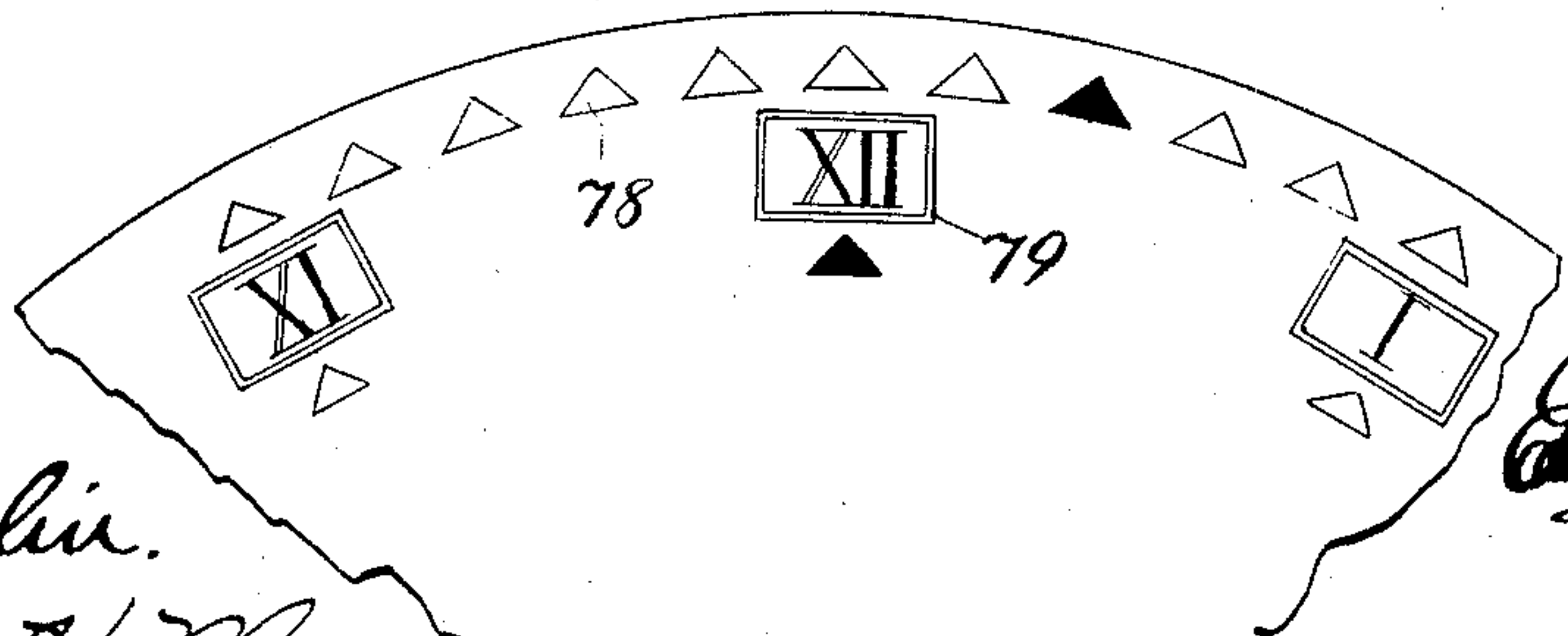


Fig. 6.



Witnesses  
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James A. Mann.

Inventor  
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# UNITED STATES PATENT OFFICE.

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

## ELECTRIC CLOCK.

No. 920,024.

Specification of Letters Patent.

Patented April 27, 1909.

Application filed December 2, 1905. Serial No. 289,977.

*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 clocks, and particularly to electric clocks, that is those which are controlled electrically, the method of driving in the present case being immaterial.

The invention has for its object the production of a controlling system and the apparatus therefor, whereby the use of moving parts upon the dial may be avoided, indications may be perfectly visible at night, and sundry other benefits and advantages may be derived, which will sufficiently appear from the following statement and description.

According to my invention, I provide a master clock whose hour and minute arbors are connected directly to the arms of a stationary commutator, which are provided with electrical bridges connecting the several segments of the commutator, from which the cable passes to the dial or dials upon which the indications are to appear. At night the indications are produced through the agency of electric lights, and by day through the agency of electro-magnets or other suitable means electrically operated. Any number of dials may be controlled from the same cable by the familiar method of multiple connections, if incandescent lamps or their equivalents are used.

In employing the invention upon a very large scale arc lights might be resorted to, and in such case series connections would be necessary, although I consider the multiple connections preferable.

Around the dial of the clock I preferably arrange twelve lamps to indicate the hours, and these are in one circuit kept constantly supplied with current, so that they all burn. Around the outside of this circle I provide sixty others, each marking a minute division. Around the inside of the circle are twelve other lamps each opposite one of the corresponding hour lamps.

In operation, the particular hour lamp is lighted in the inner circle which corresponds to the current hour, while the minute lamps in the outer circle light successively as time

progresses. The hour lamp changes on the half hour, and this for the obvious reason that at the half hour by the ordinary system of computation the minute divisions cease to be related to the hour that is past and transfer their relations to the hour that approaches. Thus, from 12:30 to 1:30 the inner lamp indicating the hour one would burn, and as the minute lamp indicating 1:30 lighted, the one o'clock lamp would go out and the two o'clock lamp would light in the circle, the time then changing in current phase from half-past one to 29 minutes of two; and as a matter of fact the change corresponding with the effect produced on the eye more nearly than it would if produced upon the even hour.

In wiring the lamps, the permanently lighted or intermediate circle of hour lamps are all in the same circuit permanently closed. For the outer or minute lamps the simplest scheme calls for sixty individual wires and a common return, which may be on one side of the permanent lamp circuit. Similarly the twelve hour lamps call for twelve individual wires and a common return, which again may be the same as one side of the permanent circuit. Thus we would have seventy-four wires passing from the dial through the cable to the commutator controlled by the clock. The minute hand of the clock being connected to the dynamo would pass over sixty segments connected to the sixty minute lamp wires, and the hour hand being also connected to the dynamo would pass over twelve segments connected to the twelve hour lamp wires.

With my invention I am enabled to obviate the above difficulties; and to dispense with a great number of wires, and, at the same time, perform the function sought equally as well.

In case the device is used with electro-magnets and lights, there will be two dials, one within the other, and two cable branches leading from the main; or I might arrange only one dial to be operated by either electro-magnets or by incandescent lights. In the former case, the hour designations will be shown as is usual on ordinary clocks.

In the drawings—Figure 1 is a face view of the clock. Fig. 2 is a diagrammatic view of the hour lamp circuit and the continuously-burning hour lamps showing in plan the hour commutator with a conventional illustration of a master-clock. Fig. 3 is a



similar view showing in diagram the minute lamp circuit and showing in plan the minute commutator, with its operating arm connected to the minute arbor of the master-clock. Fig. 4 is a diagrammatic view of the simplest form of multiple system. Fig. 5 is a side view with the clock dial in section, and showing the position of an electro-magnet, and Fig. 6 is a fragmentary view of the dial as used in Fig. 4.

Referring to Fig. 2 of the drawings, 1 represents a continuously revolving shaft which is driven by the hour arbor of a master clock train, and which carries the arm 2 of insulation provided with contact brushes 3 and 4 adapted to travel over the face of the commutator which is divided into rings 5, 6, 7 and 8, designated hereinafter as the feed, hour, group and return rings, respectively. Rings 5 and 8 have no divisions, and are continuously connected, 5 with some part of 6, and 8 with some part of 7. The ring 6 is divided into twelve parts corresponding to the hours, and the ring 7 is divided into 4 groups of three hours each.

In Fig. 3 the shaft 9 is connected to the minute arbor of the master clock train and carries the arm 10 similar to the arm 2 in all respects, with the exception that its rate of travel is twelve times faster than the hour arm 2. The brushes 11 and 11<sup>a</sup> carried by the arm 10 are adapted to travel over the face of the commutator, which is divided into rings 12, 13, 14 and 15, designated as the feed, minute, group and return rings, respectively. Rings 12 and 15 are identical with rings 5 and 8 of the hour part, but rings 13 and 14 are divided into sixty and ten divisions, respectively, the sixty divisions representing minutes, and the ten divisions groups of six, to which common returns are connected.

In the diagram shown in Fig. 2, there are twelve hour lamps which are indicated at 16, and which are constantly fed with current from the generator G by wires 17 and 18, the latter representing the return conductor. These lamps 16 form the inner circle on the dial 19, and are wired in multiple between the wires 17 and 18, as shown. Arranged in groups of three, and fed with current from wires connected with the commutator, are a series of twelve lamps 20 adapted to light successively as the arm 2 passes over the commutator segments. The third lamp in each group is fed from wire 21, the second in each group from wire 22, and the first from wire 23. Group A is provided with the common return 24, group B the common return 25, group C with common return 26, and group D with the common return 27. The feed wire 21 is connected to the third lamp in each group, and to the third section or division 28 of the ring 6 on the commutator; the feed wire 22 is connected to the second lamp

in each group, and to the second section or division 29, and the feed wire 23 connected to the first lamp 20 in each group, and to the first division 30 of the commutator ring 6. The four divisions in ring 7 of the commutator are numbered as follows: 31, 32, 33 and 34, and are connected to the return wires 24, 25, 26 and 27, respectively, which are in turn connected to each group A, B, C and D. Divisions 28, 29 and 30 of ring 6 are separated by suitable insulating material 35, which, between divisions 28 and 30, extends over into ring 7, and forms the divisions 31, 32, 33 and 34. As the brush 4 bridges rings 5 and 6 the current in feed ring 5 is conveyed to that particular division in ring 6, on which the brush 4 is resting. After passing through the lamp 20, which is connected to that particular division,—and it will be remembered that each lamp is connected to one hour division,—it passes by the return conductor connected to the group in which that especial lamp is located, to the generator G by way of the group ring 7 and return ring 8 over brush 3. Connected in multiple with the wires 17 and 18 is the central guiding lamp Z, which is adapted to guide the eye in ascertaining the radial direction from center of the hour and minute indications.

In Fig. 3 I have shown the circuit of the minute lamps. The arrangement of this circuit is identical with that of the hour lamps, with the exception that instead of three groups of lamps containing three each, I have divided the 60 lamps into groups of six lamps each, which are represented by the numerals 40—41—42—43—44—45—46—47—48 and 49, which are fed, respectively, by conductors 52 to 59. There being six lamps in each group of the ten arranged around the clock dial, it is only necessary to have six common returns, and these are represented by the numerals 60 to 65, respectively, the latter leading from the last lamp in each group by way of wire 66, and the first one being connected to the first lamp in each group by wire 67.

In place of the lamps 68 of the minute circuit, shown in Fig. 3, and the lamps 16 of the hour circuit, shown in Fig. 2, I may use the electro-magnets shown in Fig. 5, which are constructed and mounted as follows: A suitable bracket 69, having ears 70, is secured to the near face of the dial 19 by screws 71, or other suitable means, and projects inwardly where it is provided with a mounting end 72, upon which is secured an electro-magnet 73, with its core 74 extending away from the dial 19. Pivoted between lugs 75, upon the top of the magnet, is the armature 76. Lying along the upper face of the magnet 73 is an arm 77 integral with or rigidly secured to the armature 76, and provided at its forward end with a curved and depending portion 77, which is painted or otherwise colored



upon its forward face in two distinct colors. Between the lines X—X the portion 77 is painted white on its face, and between the lower line X and the bottom it is painted black. The white portion between the lines X—X normally rests so that it is seen through the aperture 78 in the front of the dial, but when the magnet is energized, and the armature 76 pulled up, the portion 77 is raised so that the white portion between the line X is not seen, and the black portion is only visible in the opening 78. All of the magnets 73, which are used both for hour and minute indications, are so positioned around the clock dial as to have their armatures return to normal position by gravity, when the current is cut off the respective magnets in succession. The fragmentary view shown in Fig. 6 indicates the dial as provided with 60 openings, 78, of triangular formation for the minutes, and 12 openings arranged inside the minute openings, together with hour indications between the minute and the hour openings.

In Fig. 4 I have shown a system which may be used in connection with this device, and which shows a plurality of clocks connected to and operated by the commutators 80—81, the former of which represents the minute commutator, and the latter of which represents the hour commutator, both being connected to the generator G, and both having leads 82—83 connected to the cable 84, leading from which, at any desired points, are the subscribers' leads 85 connected to the clocks 86.

Where tower clocks are employed, of the present form, using moving parts and illuminated dial faces, it is extremely difficult, and it has been found almost impossible, to light the dial to such brightness that the hour can be told at a distance of more than two miles. With my invention these clocks can be used in the old way for time-keeping in the day, and by surrounding them with a ring having hour and minute lamps thereon, to which a cable is connected, the hour can be told at night by the lights many miles away. With the system shown in Fig. 4 in use an electric power company can supply current to any desired number of clocks around a city.

It is to be understood that I contemplate the use of all ordinary and well known appliances found desirable with my invention. Thus, the numbers of the hours may be marked upon ground glass windows, or other transparencies, which may be used to cover and protect the lamps, in a manner well understood in the art of electric lighting. Such additions, and any modifications, of which I contemplate many, which may be made without departing from the spirit of the invention, are intended to be included within the scope of my claims. I consider myself to be the first to produce a clock of

this type, in which, first, lamps or signals are produced successively around the circle, without any traveling mechanical parts, and, second, combinations of wires are employed by making each wire a common return for a certain group of lamps and then combining the groups so that no two lamps will be connected between the same two wires, except such lamps as are intended to burn at the same time. I wish my claims, therefore, to be given a broad construction.

The word "dial" is used herein as a term of definition and not of limitation. It is intended to include any suitable form of support for the lamps or indicating devices, such for example as the ring described above, the effect of ordinary dial indications being produced by the lamps themselves, regardless of the nature of their supporting means.

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

1. In an electrical clock, the combination with a support, of indicating devices arranged thereon in groups representing hours, indicating devices arranged in groups representing minutes, a set of common feeds for corresponding devices in all the groups, a common return for each group, and means for operating each device in chronometric order.

2. In an electrical clock, the combination with a dial or support, of time indicating lamps arranged around said dial in groups to represent hours and minutes, a plurality of feed conductors connected each to a separated group of said lamps, a common return for corresponding individual lamps in a plurality of groups, and means apart from the clock connected to said conductors for supplying current thereto in combinations of feed and return conductors, such as to light the lamps in proper chronometric sequence.

3. In a clock, the combination with a support, of electrical indicating devices arranged thereon in groups, a lead for each group, and a set of returns, one for each set of corresponding devices in all the groups whereby the number of conductors is rendered less than the number of indicating devices.

4. In a clock, the combination with a support, of indicating devices arranged thereon in groups, a common feed conductor for each group, a set of common returns, one for each set of corresponding devices in all the groups, means for operating each device in chronometric order, other indicating devices on said support, and means for continuously operating said last mentioned devices.

5. In an electric clock, the combination with a dial or support, indicating devices arranged thereon, means apart from the dial for operating said indicating devices in chronometric order, a plurality of group indicating devices arranged around the dial and adapted to show hour points, means for



continuously operating them, and a centrally disposed indicating device for radial guidance.

6. An electrical clock system comprising the following instrumentalities: a support, electrical indicating devices arranged in a circular figure thereon in the relative order of hours and of minutes, conducting wires less in number than the indicating devices, connected thereto in predetermined combinations, a master chronometer, a commutator device driven thereby, and connections from said wires and the commutator segments such that as the commutator contacts travel over the segments they will establish at each moment of time the proper combination to produce a corresponding indication on the clock face.

7. An electrical clock system comprising the following instrumentalities: a support, a circular series of electrical indicating devices arranged thereon in order of hours and of minutes, a plurality of conducting wires connected thereto, a source of current, a master chronometer, and a commutator having segments corresponding to the indicating devices in the order of hours and also of minutes, said conducting wires being connected to said commutator in such predetermined combinations that at any given moment the position of the commutator contacts on its segments will effect the proper circuit connections to automatically display the corresponding indication on the clock face.

8. An electrical clock system comprising the following instrumentalities: a support, a plurality of electric lamps arranged in a circular figure around the support, in the relative order of hours and of minutes, a master chronometer mechanically separate therefrom, a source of current supply for the lamps, and a commutator device having feed rings connected to said source, and segments connected through suitable conductors to said lamps, together with traveling contacts adapted to bridge the feed rings and segments, and means whereby said contacts are driven from the master chronometer so that at any given instant they will make the proper connections to feed current through the wires leading to the lamps in the hour and minute set corresponding to that instant of time.

9. An electrical clock system comprising the following instrumentalities: a support with electrical indicating devices, circuit wires leading therefrom, a source of current therefor, a master chronometer, and a commutator driven thereby for supplying current in proper sequence through said wires to said lamps, said commutator having a continuous inner feed ring connected to the source of current, separated segments sur-

rounding the same, and continuously traveling means bridging the two so as to connect the segments in sequence to the ring.

10. In an electrical clock system, supporting means, electrical devices indicating by their position hours and minutes, circuit wires and a source of current therefor, a master chronometer, and a commutator comprising separated segments corresponding to the indicating devices, associated common terminals connected to the source of current, and contacts driven by the commutator so as to connect the segments and the common terminals to supply current at each instant to the appropriate hour and minute lamps respectively.

11. In an electrical clock system, a circular series of electrical lamps arranged in order of hours and of minutes, for radial reading from a center, a master chronometer, a source of current, and a commutator comprising a pair of feed rings connected to the source of current, a plurality of hour segments and of minute segments connected to the hour and minute lamps and a pair of traveling contacts for bridging the hour and minute segments respectively, carried on a pair of hour and minute hands driven by the said chronometer.

12. In an electrical clock system, a plurality of dials or supports, each having electrical indicating devices arranged around its face in the order of hours and of minutes, a plurality of wires less than the total number of indicating devices on any one dial, a master chronometer and a commutator driven thereby, together with a source of current adapted to be applied by the commutator to said wires in varying predetermined combinations corresponding to the successive moments of time, and connections from the indicating devices on all the dials to the said wires such that the variations in current supply effected by the commutator will operate them simultaneously and in proper order to show the time.

13. An electrical clock system, a support without moving parts, fixed electrical indicating devices arranged in circular order of hours and of minutes on said support, circuit connections therefor, a commutator and a source of current supply, and a chronometer driving the commutator to feed current through said circuit connections to successive combinations of signal devices to properly indicate the time.

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

EDWARD E. CLEMENT.

Witnesses:

JOS. L. WRIGHT;  
JAMES H. MARR.