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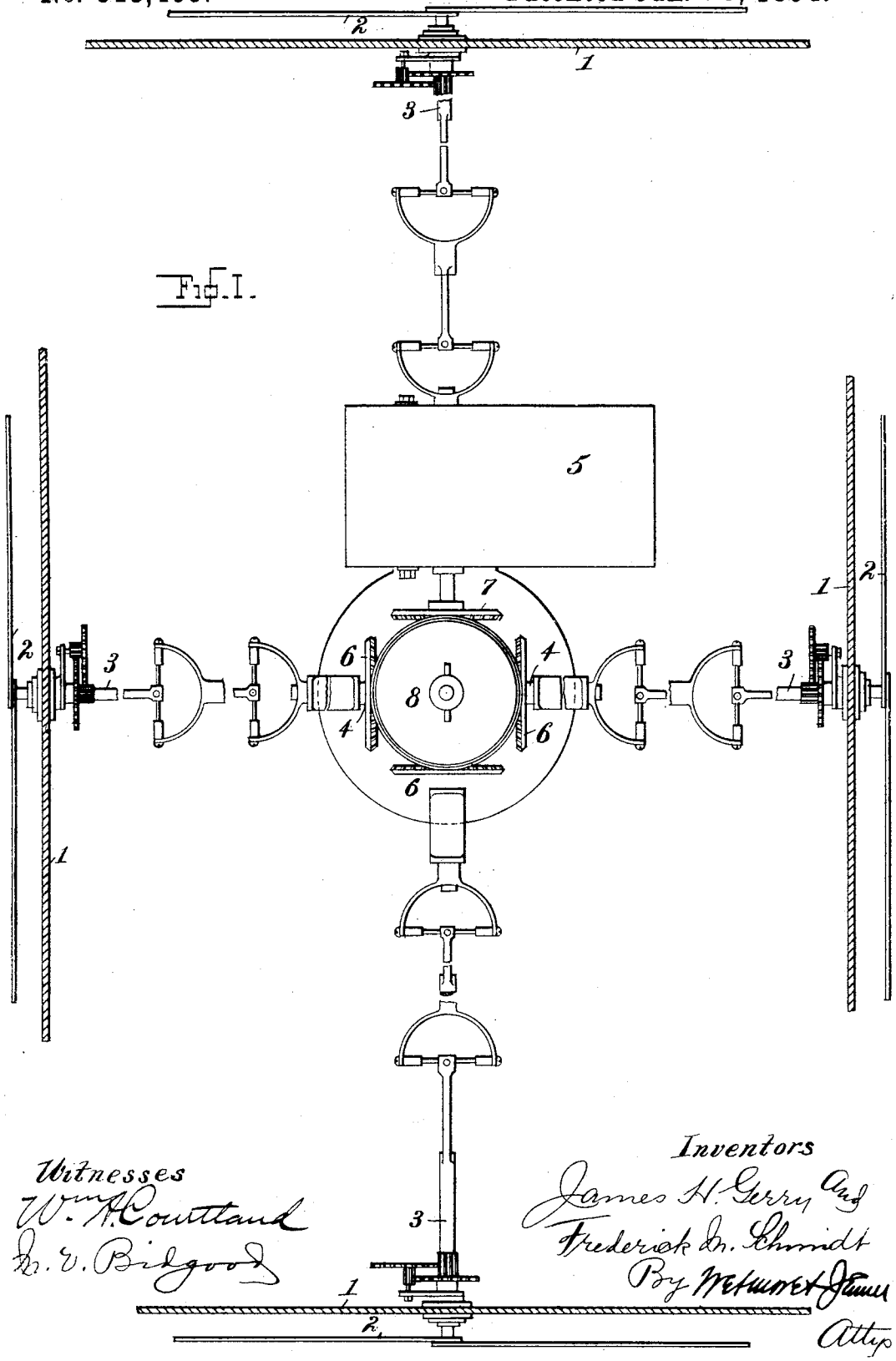
J. H. GERRY & F. M. SCHMIDT.

ELECTRIC CLOCK SYSTEM.

No. 513,469. Patented Jan. 23, 1894.

Fig. 1.



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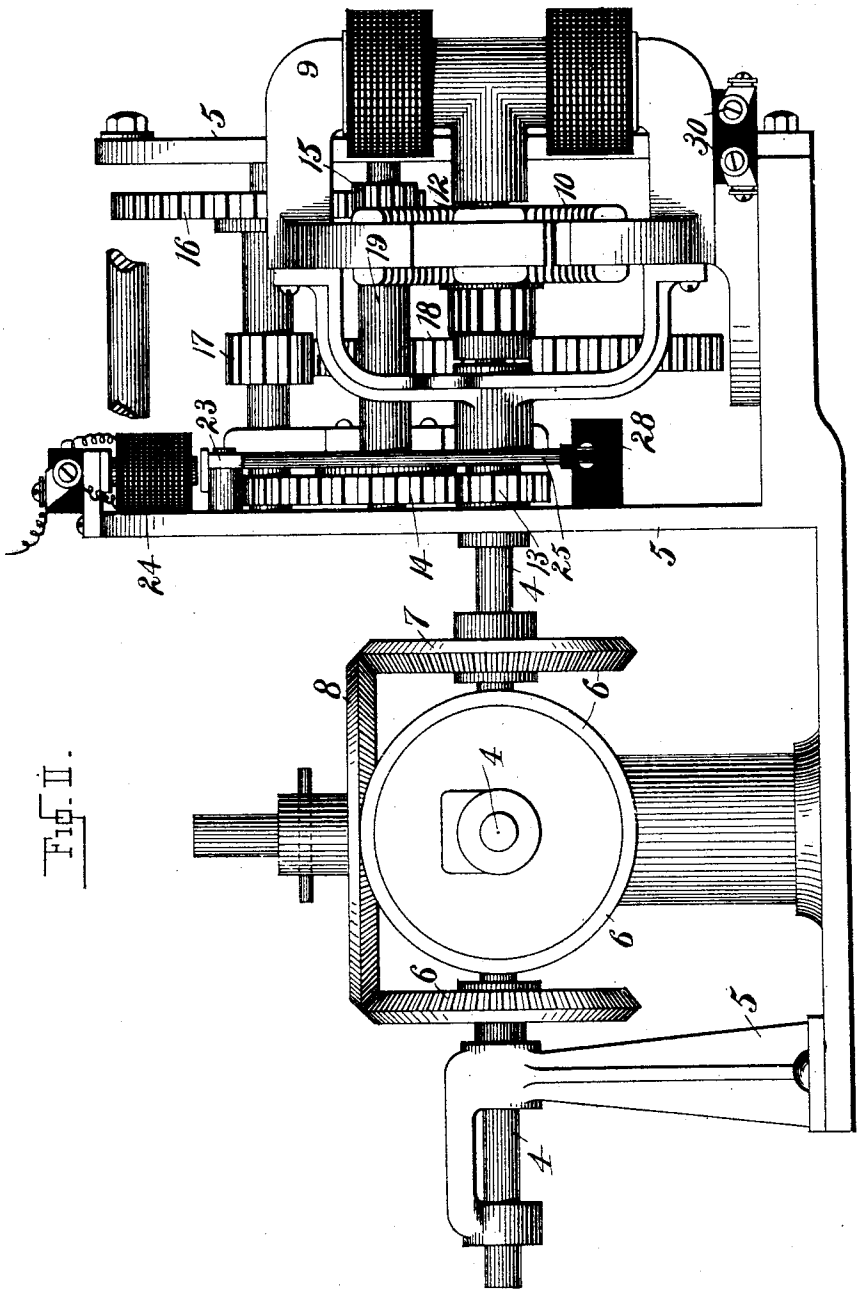

Fig. II.

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Fig. III.

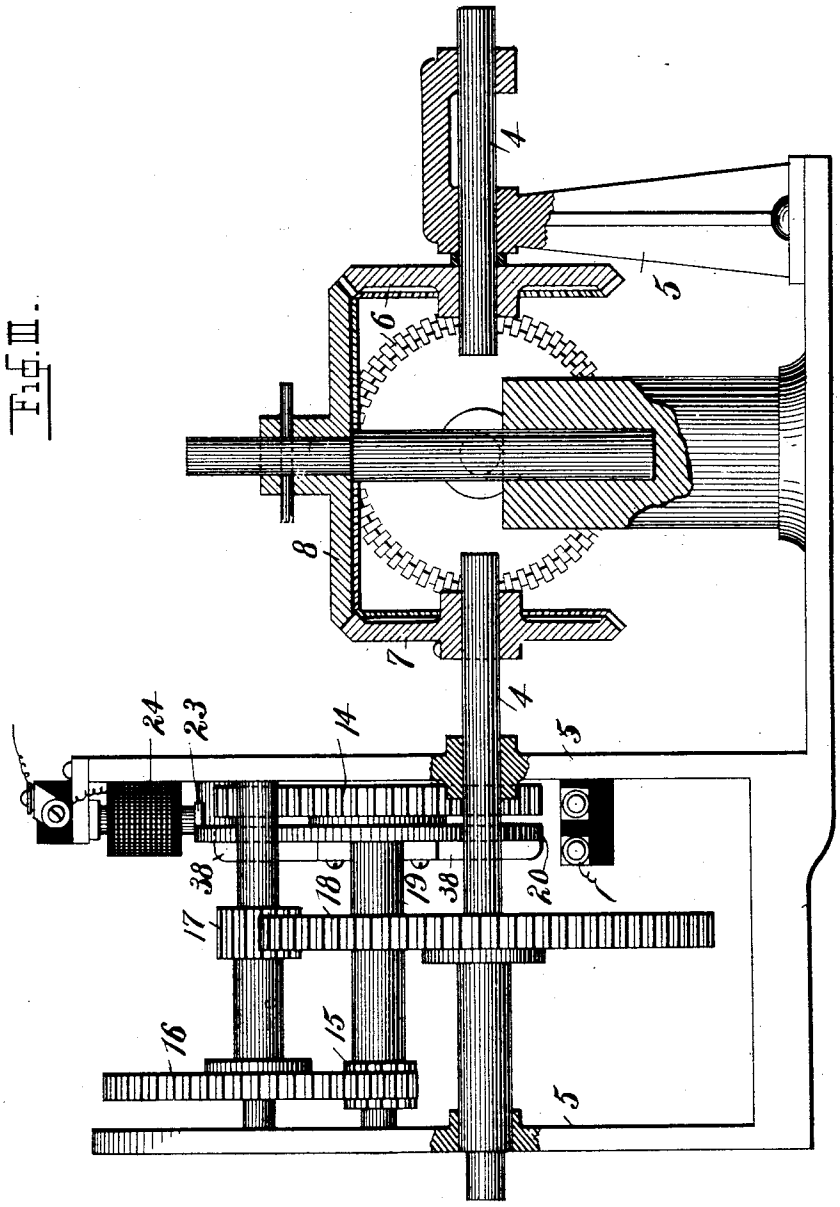

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Fig. IV.

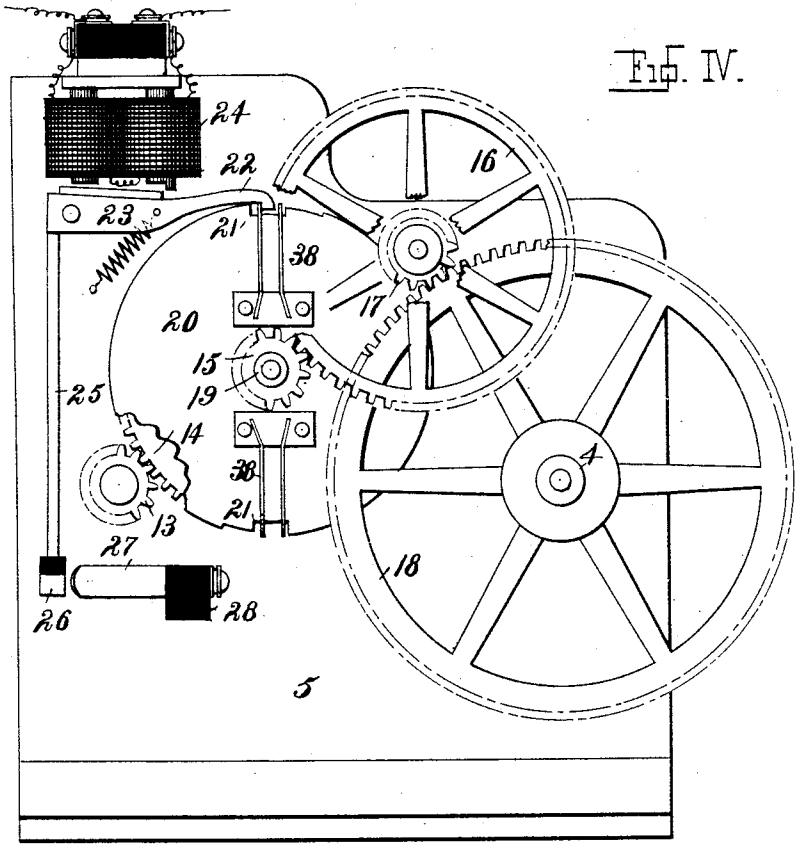


Fig. VI.

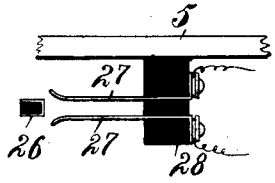
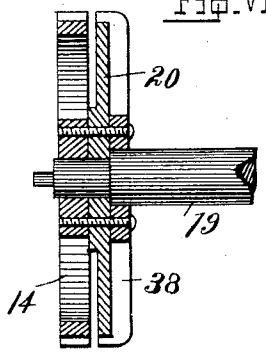


Fig. VII.



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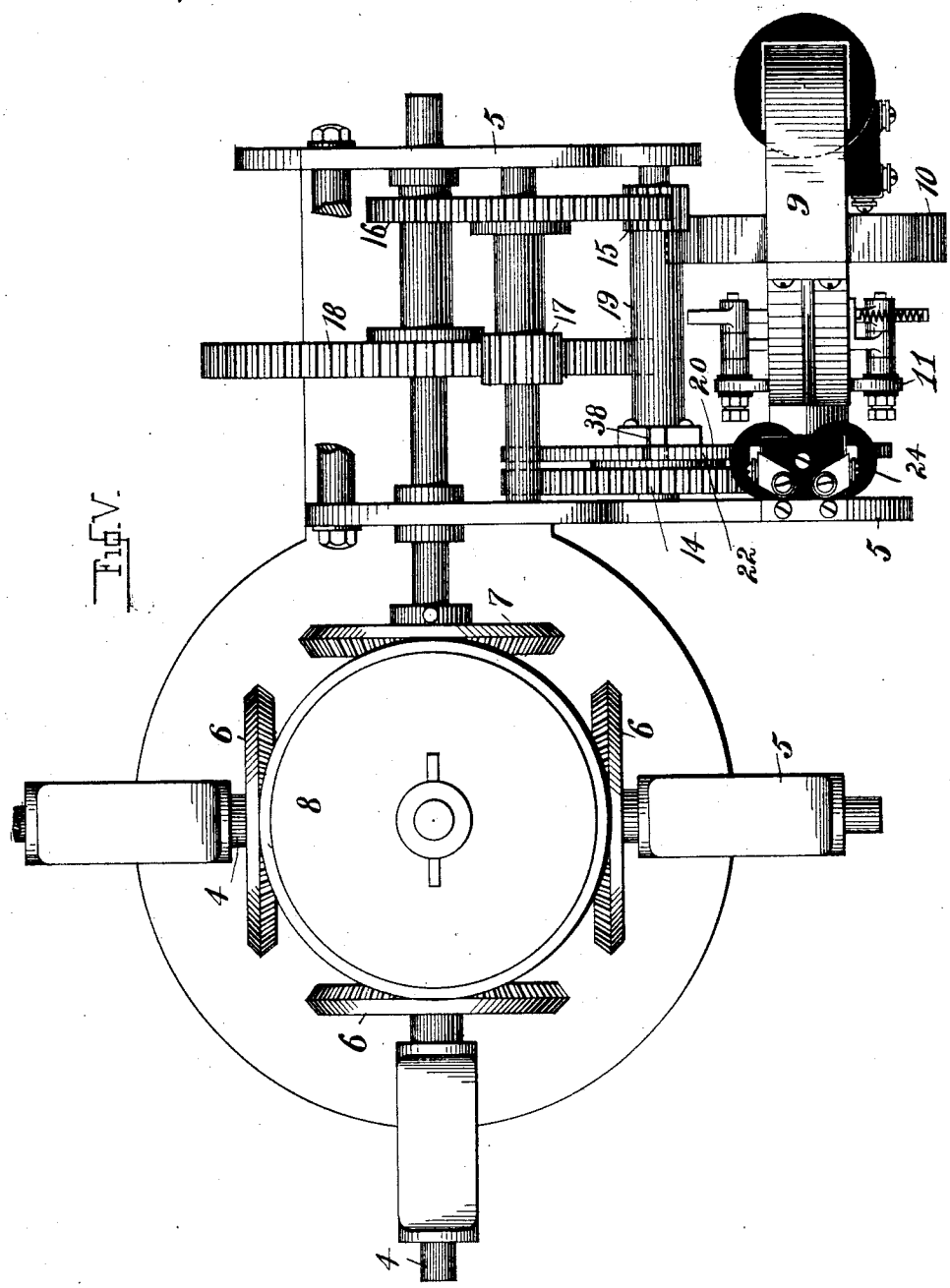

Fig. V.

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ELECTRIC CLOCK SYSTEM.

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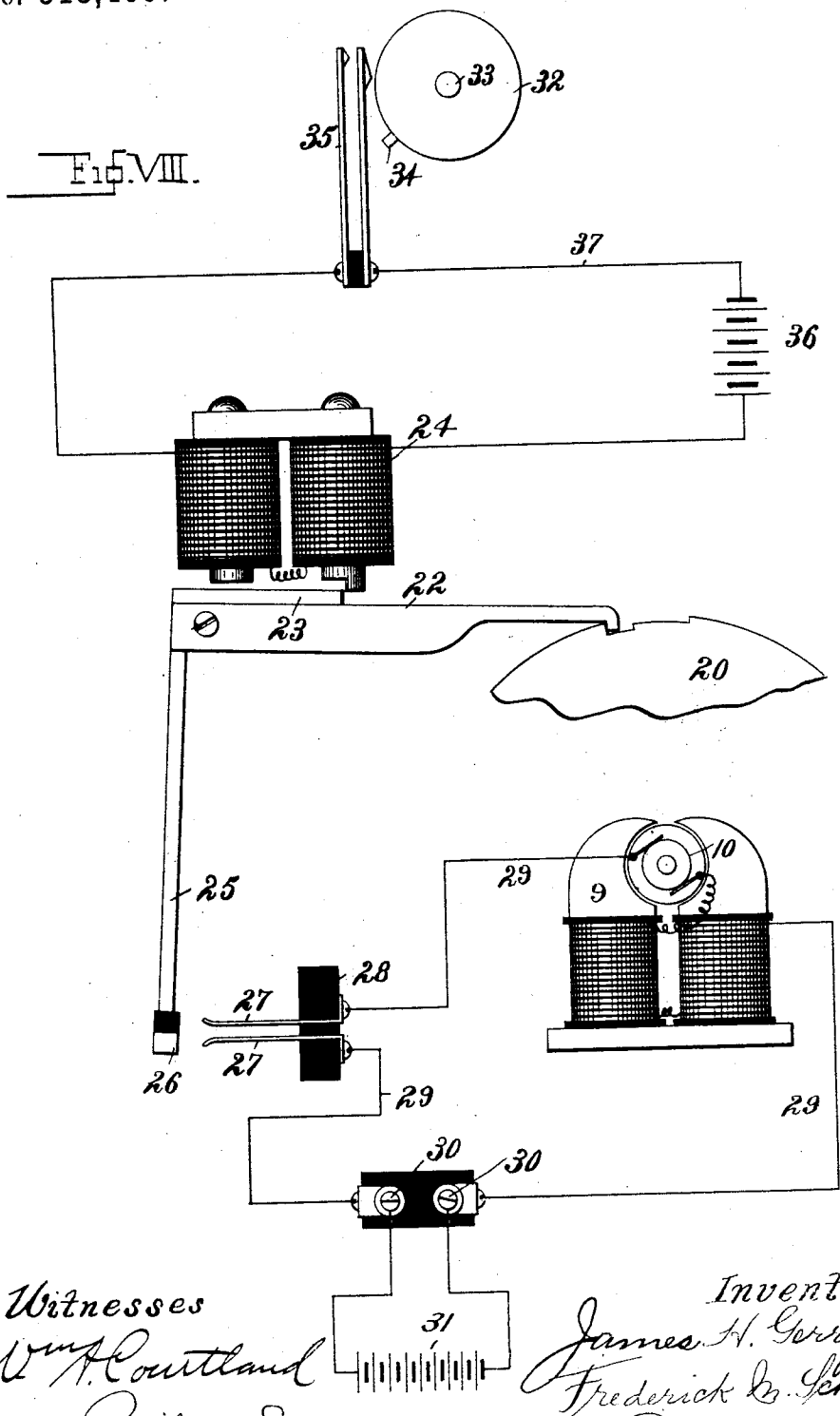
Fig. VIII.



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J. H. GERRY & F. M. SCHMIDT.

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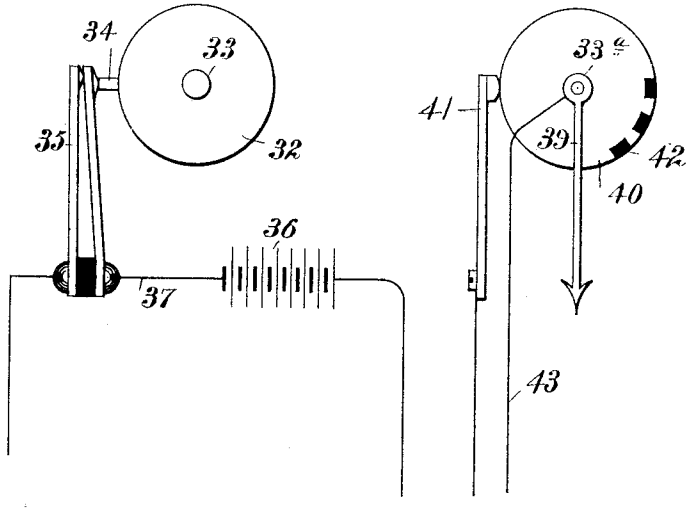
Fig. IX.



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UNITED STATES PATENT OFFICE.

JAMES H. GERRY AND FREDERICK M. SCHMIDT, OF BROOKLYN, ASSIGNORS TO THE SELF WINDING CLOCK COMPANY, OF NEW YORK, N. Y.

ELECTRIC-CLOCK SYSTEM.

SPECIFICATION forming part of Letters Patent No. 513,469, dated January 23, 1894.

Application filed May 16, 1893. Serial No. 474,486. (No model.)

To all whom it may concern:

Be it known that we, JAMES H. GERRY and FREDERICK M. SCHMIDT, citizens of the United States, residing at Brooklyn, county of Kings, State of New York, have invented certain new and useful Improvements in Electric-Time Systems, of which the following is a specification.

Our present invention relates both to the form of mechanism and the method of operation of an electric clock.

The object we have had in view particularly is the applying to a tower clock which has its several sets of hands driven by a common motor, suitable electric propelling and regulating devices which render the clock an accurate time piece and do away with the clumsy and inconvenient winding and setting mechanisms incident to the use of ordinary mechanical clocks.

Referring to the accompanying drawings which form a part of this specification:—Figure I is a plan view of our improved tower clock. Figs. II and III are side elevations thereof, the latter being partly sectional (omitting certain parts), taken from opposite sides and to a somewhat larger scale than Fig. I. Fig. IV is an end view of the clock omitting the end frame and certain other parts. Fig. V is a plan view. In Figs. II, III, IV and V the view is made to so large a scale that the hands and the arbors thereof are omitted. Fig. VI is an elevation of a contact device. Fig. VII is a sectional view of the stop disk and adjacent parts. Fig. VIII is a diagrammatic view of the circuits. Fig. IX is a diagrammatic view showing the relation between the time signaling devices and the time synchronizing devices.

1, 1, 1, 1 are clock dials the number and arrangement of which are optional. One or more may be used. Over each dial are fitted to move the hands 2 having the usual or preferred means for actuating one from the other at a different speed. The arbor 3 of the hands of each dial is clamped or otherwise suitably attached to a shaft 4 which, in the form of the invention here shown, forms one of four shafts radiating from a common point and mounted in a suitable framework 5. Each shaft 4 carries near or at its inner end a bevel gear 6, 6, 6, 7 of which the bevel gear 7 is the driving member whose motion is transmitted to the other bevel gears 6 by means of the horizontal bevel gear 8. The gear 7 is driven by means of an electric motor whose field magnets are represented at 9 and whose rotary armature is shown at 10. Usual means of conveying current to the motor may be employed. In Fig. II the commutator brushes and their holders 11 are omitted for sake of clearness. The armature drives a train of gears 13, 14, 15, 16, 17 and 18 to the shaft 4 of bevel gear 7 which latter shaft carries said gear 18. On the shaft of one of the said train of gears, for example, upon the shaft 19 of gear 14 we arrange a stop disk 20 which turns with the gear 14 so as to make a half revolution while the hands are moving over one minute space of the clock dials. At diametrically opposite edges of the disks 20 are arranged notches 21, 21 into which the toe of an armature lever 22 is arranged to drop. The lever 22 carries the armature 23 of an electro magnet 24 which is mounted on the clock frame 5. At right angles to and otherwise disposed with reference to the armature lever 22 and rigid therewith is an arm 25 whose metallic end 26 is insulated from the main body of said arm and adapted to form a bridge between the two contact springs 27, 27 which are mounted in insulating block 28 and form parts of the circuit of the electric motor 9, 10 which circuit also includes the conducting wires 29, binding posts 30 and the motor-operating-battery or other source of electricity 31.

The parts heretofore described all form elements of the tower clock proper and are all preferably arranged immediately in the tower centrally of the four dials thereof though obviously the battery may be located in any position which is found most convenient.

To set the motor of the clock in operation, we arrange means which may be located at a distant point and electrically connected by suitable conducting wires with said clock whereby the motor is thrown into action temporarily at regularly re-current periods and acts when its armature is in motion to cause the clock hands to move forward over the dials the space of one minute.

Referring to Fig. VIII: 32 may represent a disk on the second arbor 33 of a master clock which master clock is of any approved construction (not necessarily illustrated here, its only requsite being that it shall keep accurate time). The disk 32 is adapted during its revolutions to make regularly recurring makes and breaks of a circuit which includes electro magnet 24 of the tower clock. As we are now describing a clock which moves at minute intervals, we have shown by way of example, upon the disk 32 a stud 34 which at minute intervals brings together the two spring contacts 35 and so closes the circuit from the battery 36 through the line conductor 37 and the coils of electro magnet 24 thus drawing the lever 22 away from the notch 21 of disk 20 and simultaneously bridging the space between the spring contacts 27, 27. The edge of the disk 20 now holds the lever 22 up and maintains the contact at 27 while the motor 9, 10 receiving current from battery 31 drives the shaft 4 by means of the connecting train of gears and thereby shifts the hands of all the clocks forward the space of one minute. When the clock hands have traveled a sufficient distance the toe of the lever 22 drops into the notch 21 of disk 20 diametrically opposite to the notch which it last engaged thus arresting the disk 20 when it has made a half revolution and arresting the rest of the clock mechanism at the same instant that the contact is broken at 27. The suddenness of the fall of the toe of lever 22 into the notch 21 may be lessened by forming the notch in two steps as shown in Fig. VIII. Preferably also, we ease the motion of the stopping and starting of the disk and other parts of the apparatus by arranging the springs 38 upon the disk 20 adapted to engage the toe of the lever 22 at the instant of stopping so that the lever will arrest and hold the disk in a yielding manner.

In the ordinary method of operating a secondary clock from a master clock at minute intervals, that is to say, on a minute jump, the secondary clock harmonizes in time with the master clock at the instant when its hands are brought forward each minute; then the secondary clock is stationary while the master clock runs ahead for a full minute and then the circuit being made, the secondary clock jumps forward again into harmony with the master clock. Thus the secondary clock in these intermittently acting systems runs at each minute a full minute behind and errs therefore in the most serious direction, for it would not in most cases involve such serious consequences to have a clock a minute ahead of time, as to have it a minute behind time. In describing our improvements in this connection we will refer to the space moved over by a secondary clock at each jump as a time period. Where a secondary clock is moved at minute intervals such time period would be indicated by a minute space on the dial.

Our invention consists in the method of and apparatus for making the time period of the secondary clock run only a half interval behind the time indicated by the master clock the arrangement being such that when the master clock has advanced a half interval ahead of the secondary clock the time signal is sent to the secondary clock and the hands of the latter are brought forward so as to indicate half a time period in advance of the master clock. Thus the time indicated by the secondary clock never varies more than half a minute from the time indicated by the master clock and is first slower and then faster than the time indicated by the master clock whereas in the ordinary system the time indicated by the secondary clock is always either the same as that of the master clock or slower and never faster.

Fig. IX illustrates in diagram the devices which may be employed for this purpose. We have shown here in addition to disk 32 on the seconds arbor 33 an additional disk 40 on the same or another seconds arbor 33ª and for simplicity's sake we have shown on the same arbor a second hand 39. Any ordinary syncronizing device may be used. We have shown here merely by way of illustration a contact spring 41 which is adapted to come in contact with contact blocks 42 on disk 40 which are in circuit with the circuit 43 which goes to the synchronizing devices on the secondary clock. Comparing the relation of disk 40 to disk 32, it will be seen that at the instant when the contact is being made by the stud 34 at 35 the seconds hand 39 is at the half minute and that when the seconds hand 39 has moved around to indicate the end of the minute the disk 32 will have shifted so that no time signals are being sent but the synchronizing devices have come into action. Of course the synchronizing devices are here shown only partially and it is not supposed that ordinarily the clock is to be synchronized every minute, but it will be seen that at the time when the synchronizing devices are in action, the time signals cannot be sent and so there will be no interference between the action of the two devices on the secondary clock. And furthermore it will be apparent that, as above stated, by thus operating a secondary clock at half a time period after instead of a whole time period after the time indicated by the master clock, the secondary clock never varies more than half a time period from the correct time.

When in the claims we refer to a "minute" or a "half-minute" the expression is used merely for the sake of clearness of description. We do not intend that the claim shall be limited to a clock whose hands are moved at those definite time period intervals; the mechanism will be substantially the same whether the hands jump each time a half minute, a minute or any other time period.

Having thus described our invention, the following is what we claim as new therein and desire to secure by Letters Patent:

1. In an electric time system, the combina-

tion of the master-clock, a secondary clock and means substantially as described whereby the master-clock transmits time signals to the secondary clock at the half-minute and the secondary clock hands are moved forward a full minute so as to indicate, at the moment of shifting, a half-minute faster than the master-clock.

2. The combination of a master-clock, a secondary clock and means for controlling the latter from the former, comprising an electromagnet whose circuit is controlled by the operation of the master-clock and an armature lever arranged and adapted in one position to lock the secondary clock and open its motor circuit and in another position to release said clock and close the said circuit, substantially as set forth.

3. In an electric time system the combination of a master-clock, a secondary clock an electric motor adapted to operate continuously until arrested by external means, said motor having connection by a clock train directly with the secondary clock hands, and means for controlling the said motor from the master-clock, substantially as set forth.

4. In an electric time system the combination of a master-clock, a secondary clock, an electric motor adapted to operate continuously until arrested by external means, said motor having connection by a clock train directly with the secondary clock hands, means for controlling the starting of said motor from the master-clock and means controlled by the operation of the secondary clock for arresting the movement of the latter, substantially as set forth.

5. The combination with a tower clock having hands, their arbor and operating shaft, an electric motor, a train of gears operating said shaft from said motor, a disk carried by said train and notched as described, a contact in the electric motor circuit, an armature lever controlling said contact and itself controlled by said notched disk a distant master clock and an electric circuit including a source of electricity, means for making and breaking said circuit at regularly recurrent intervals and an electro magnet controlling said armature lever, substantially as set forth.

6. In combination with the clock, the electric motor and the train of gears, the controlling disk and armature lever, the said disk having the springs 38 arranged and adapted to operate, substantially as set forth.

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