S. P. THRASHER.

TIME INDICATING DEVICE.

APPLICATION FILED SEPT. 4, 1906.

914,534.

Patented Mar. 9, 1909.

3 SHEETS—SHEET 1.

Fig. 2.

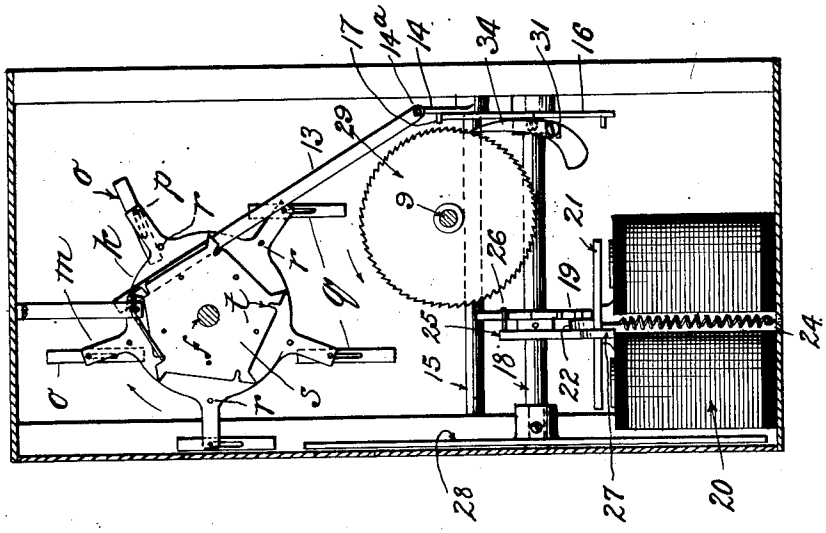
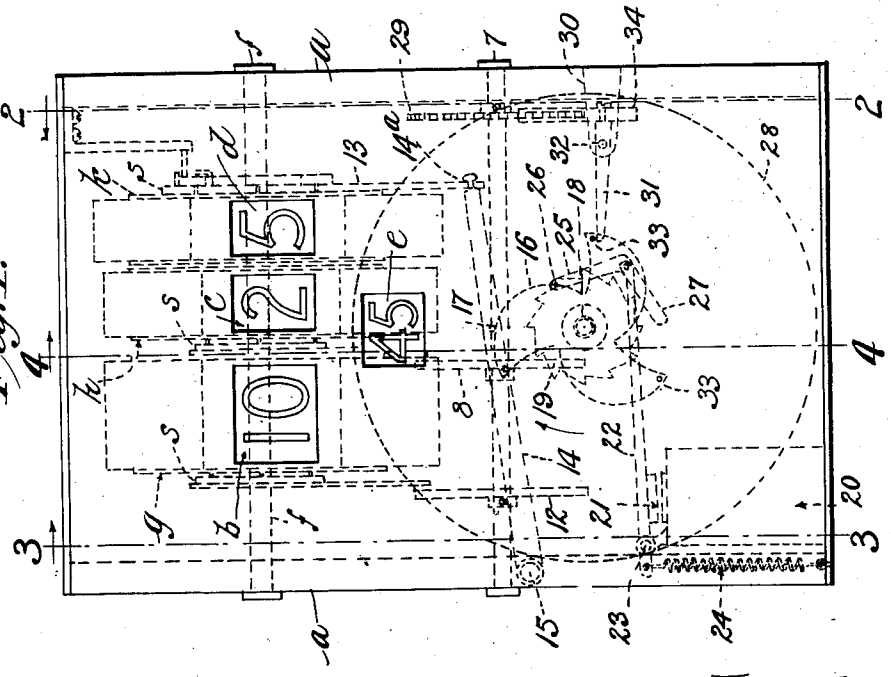


Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 3.

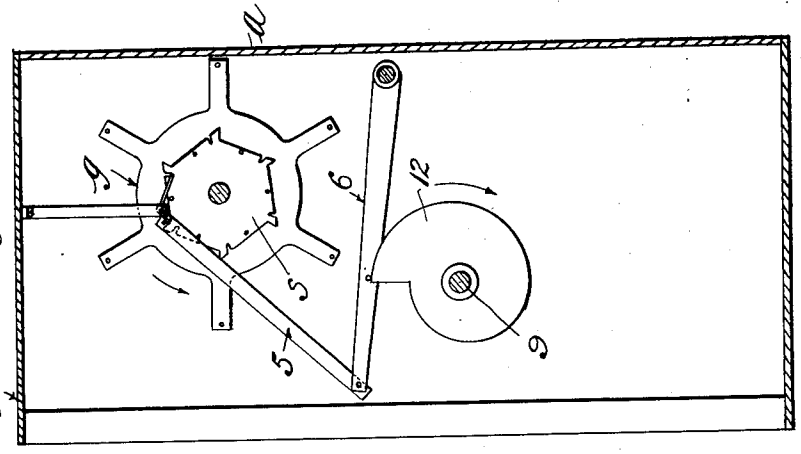


Fig. 4.

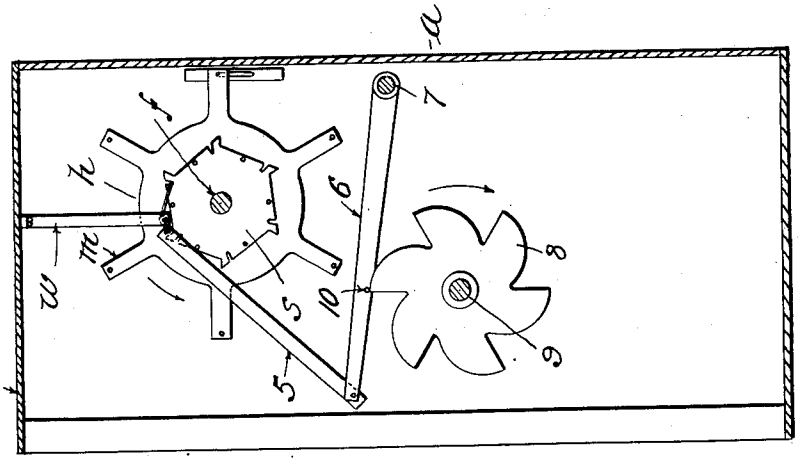


Fig. 5.

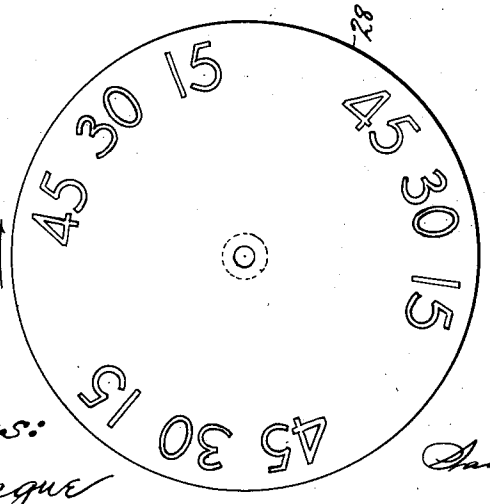
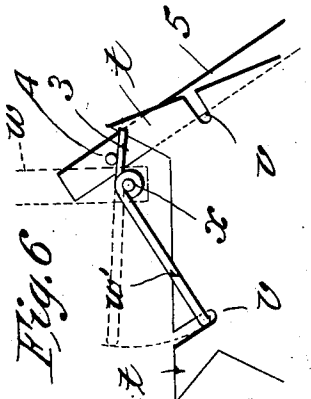


Fig. 6.



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3 SHEETS—SHEET 3.

Fig. 7.

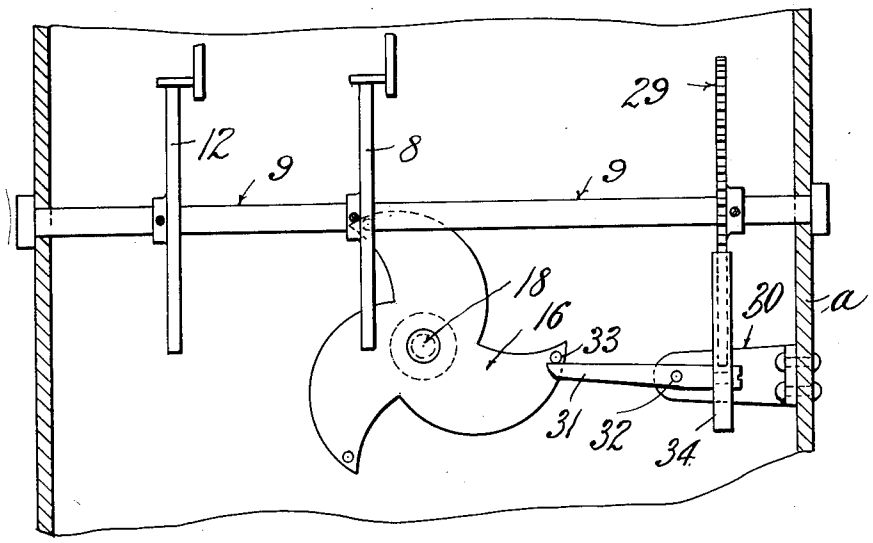
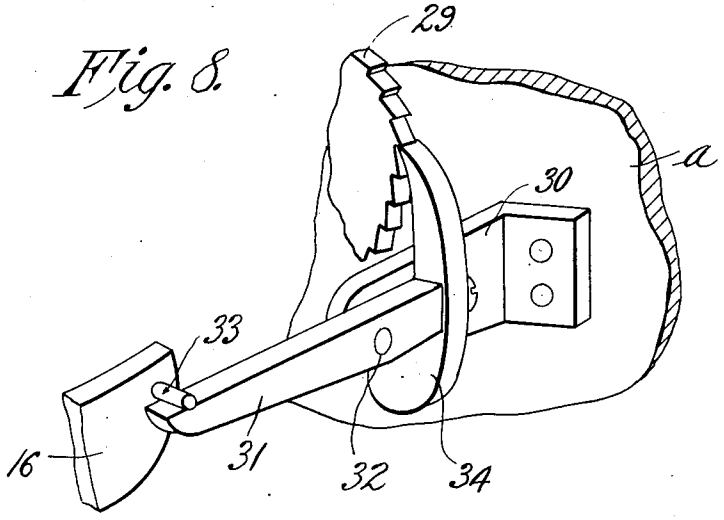


Fig. 8.



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UNITED STATES PATENT OFFICE.

SAMUEL P. THRASHER, OF MANCHESTER, CONNECTICUT, ASSIGNOR TO THRASHER CLOCK COMPANY, OF MANCHESTER, CONNECTICUT, A CORPORATION.

TIME-INDICATING DEVICE.

No. 914,534. Specification of Letters Patent. Patented March 9, 1909.

Application filed September 4, 1906. Serial No. 333,166.

To all whom it may concern:

Be it known that I, SAMUEL P. THRASHER, a citizen of the United States of America, residing at Manchester, in the county of Hartford and State of Connecticut, have invented new and useful Improvements in Time-Indicating Devices, of which the following is a specification.

This invention relates to time-indicating devices and has special reference to that class of devices of this type in which the time is indicated by numerals, the object of the invention being to provide a time-indicating device in which the hours, minutes, and any desired subdivision of the minute other than seconds, are shown through suitably arranged apertures in the face of the instrument by the exposure of shifting indicators, means being provided to shift these indicators by the operation of the mechanism at proper periods and in proper sequence.

This instrument is especially constructed for the use of telegraph and telephone offices, and other uses where it is necessary to note with great exactness the time of any occurrence and where error might occur more readily if any one noting the time of such occurrence is obliged to read the same on an ordinary clock-dial where it is impossible to tell, except by a close examination, where the minutes and the seconds pointers are at the moment. This principle of indicating time is not new as far as indicating the hour and minute is concerned by exposing to view shiftable indicators through apertures in the face of the instrument, the invention forming the subject matter of this application residing in the provision of means to indicate parts of a minute, other than seconds, and in the construction and arrangement of actuating devices for the indicators.

Other novel features incidental to the carrying out of this invention are embodied in the drawings of this application but will not be claimed herein, these being described and claimed in my Letters Patent of the United States dated December 8, 1908 and numbered 905,956, but they are necessary to the present application for a clear understanding of that part of the construction in which the invention resides.

It is obvious that to properly indicate the time by numerals in the manner herein described, the hour indicators must be mounted on a carrier which will rotate one-twelfth of a revolution at each step, the next carrier at the right indicating tenths of an hour will rotate but six times, while the third carrier at the right of the last (which, in combination with the second one indicates the number of minutes) will have a rotative step-by-step movement at minute intervals.

This time-indicating device shown herein may be actuated by a pendulum in the manner shown in my prior United States Patent dated July 17, 1900 #653,713, as a primary or master clock, or as a secondary clock by means of the electro-magnet shown herein, the invention in this application running particularly to the combination of indicator carriers to indicate hours, minutes, and any desired subdivision of the minute, and actuating mechanism for the carrier, in combination with any prime mover for said mechanism. Where these indicating-devices are used as secondary clocks, they are actuated by a circuit closer in a master clock, the circuit closing device being so arranged as to impart an impulse at such fractions of a minute as may be desired. As shown in the drawing, it would be every fifteen seconds. A circuit closing device is described in my Patent No. 653,713.

The invention is clearly illustrated in the accompanying drawings in which,—

Figure 1 is a front elevation of a time-indicating device in which the invention is embodied showing in dotted lines the carriers for the hours and minutes and subdivisions of the minute. Fig. 2 is a sectional elevation of the instrument, the plane of the section being on a line 2—2 of Fig. 1 looking in the direction of the arrow, this view showing one of the indicator-carriers, its actuating lever and locking mechanism of the carrier, together with the magnetically actuated mechanism for imparting movement to the carrier. Fig. 3 is a sectional elevation taken in the plane of line 3—3, Fig. 1, looking in the direction of the arrow, and showing the cam which actuates the hour-indicating carrier. Fig. 4 is a sectional elevation in the plane of line 4—4, Fig. 1, looking in the direction of the arrow and shows the cam which actuates the ten-minute indicating carrier. Fig. 5 is a front elevation of the disk which indicates the fractions of a minute. In this instance the disk being arranged to show the minute

in quarters or every fifteen seconds. Fig. 6 is a detailed view of the locking devices for the indicating carriers. Fig. 7 is an enlarged detail view of the mechanism for operating the cam-shaft from the electro-magnet which is in electrical connection with a master clock. Fig. 8 is a perspective view of the ratchet mechanism.

Referring now to these drawings, *a* may indicate any suitable casing or boxing for the instrument in the face of which are the apertures *b*, *c*, *d* through which numerals are exposed to indicate the hour and minutes, and another aperture *e* through which numerals are exposed to indicate some predetermined subdivision of the minute.

Mounted in the case of the instrument, parallel with the face thereof, is a shaft *f* on which are rotatably supported the carriers *g*, *h*, and *k*,—*g* indicating the carrier for the hour-indicating cards or tablets and rotating step-by-step once every hour, *h* indicating the ten-minute carrier and moving six times an hour, or one-tenth of a revolution at each step, and *k* indicating the minute carrier, having a step-by-step rotary movement each minute. The construction of these carriers is indicated in Figs. 2, 3, and 4, taken in connection with Fig. 1, and each carrier consists of two circular disks having radiating arms *m* thereon in opposed relation one to the other between which are loosely hung the cards or tablets *o*, on the face or faces of which the numerals are placed. These tablets are supported on pins *p* in the arms *m*, which extend into an elongated slot *q* in the opposite edges thereof, whereby when these tablets are in a position to swing freely on the pins, they will be supported in the upper end of the slots *q*. Near the base of each of the arms *m* are pins *r* which extend inwardly to a position overlapping the edge of the tablets *o* to the end that as these are carried upwardly during the revolution of the carrier and over the center of rotation, the lower end of the tablets will swing against the pin *r*, and thus as the carrier moves onward this tablet will eventually slide downwardly and outwardly on its supporting pins *p*, thus bringing the reverse side thereof into position to be exposed through one of the apertures in the casing. By this means, for example, while the carrier *k* shows the ten numerals in succcession, it is necessary to provide only five cards or tablets to do this, the same being true of the carrier *g* shown in Fig. 3, which need be provided with but six cards or tablets to indicate the twelve hours. Of course, the two sides of the carriers instead of having radiating arms *m* may be simply disks between which the cards or tablets may be hung in the manner described, but owing to its lighter weight, the construction shown herein is preferred.

To rotate the carriers, each one is provided on one side thereof with a ratchet-wheel *s* having a number of teeth *t* thereon corresponding with the number of intervals between the rotative steps of a carrier. Located in proximity to each of the teeth of these ratchet-wheels *s* is a deep notch *v*, and supported in any suitable way, as on an arm *w*, is a locking-latch w^1 for the ratchet-wheel. This latch is pivotally supported at *x* and has a short arm 3 thereon which extends under a pin 4 in the actuating-arm 5 for the ratchet-wheel, and this pin 4 in said arm, when the latter is allowed to fall in the manner to be described, first comes against the short arm 3 of the locking-latch swinging the latter up out of the notch *v*, the pin then engaging the tooth *t* of the ratchet and rotating the carrier a distance sufficient to bring the next card or tablet to its proper position. When the latch w^1 has been lifted out of engagement with its notch, the pin 4 will move the ratchet-wheel far enough to permit a succeeding tooth to pass under the latch, while the latter is raised, to the end that when the latter falls against the periphery of the ratchet-wheel (after having been released by the passing on of the pin 4) it will be in a position on the periphery of the ratchet beyond the tooth to drop into the next succeeding notch *v* in the ratchet, as the latter rotates. The actuating lever 5 is pivotally connected to the end of another lever 6 which may swing freely on a shaft 7 extending across the back of the casing parallel with the shaft *f* which arm swings close to the side of a six-leaved cam 8 fixed on a shaft 9 which is parallel with the shaft 7, the lever 6 carrying a pin 10 which extends over and bears on the cam. The back side of the leaves of this cam are radially disposed so that as the pin 10 rides upon the curved forward edge of one of the leaves it will drop off suddenly and be caught in the notch formed by the meeting of the back side of one leaf with the forward edge of the other, and the weight of the arms 5 and 6 will be sufficient to rotate the carrier. As the cam 8 rotates, these arms are gradually raised by the riding of the pin on the leaf of the cam until the pin 4 in the upper end of the arm 5 rides up over the point of the leaf above it and drops onto the short arm 3 of the locking latch in position to again trip this latch and rotate the ratchet-wheel and its attached carrier. The cam 8 just described is that which actuates the carrier *h* being provided with six leaves for that purpose. Further on, on this shaft 9 is a cam 12 provided with only one leaf. This cam (seen in Fig. 3) will actuate its arms 5 and 6 once only in one revolution, and serves to move the carrier indicating the hour. The same type of ratchet-wheel is applied to this carrier as the one previously described. To operate the carrier *k*, however, the mechanism is associated more or less with the rota-

tion of the device for indicating fractional parts of the minute and differs somewhat in its construction from that just described, and is constructed as follows: The carrier *k* is rotated by means of a ratchet *s* in the same manner as the carriers *g* and *h*, its operating arms (which are the equivalents of the arms 5 and 6 of said last named carriers) being indicated by 13 and 14 which, as shown in Figs. 1 and 2, are arranged somewhat differently than the arms 5 and 6 though their operation is the same. In this case, the arm 14 has a loose connection at 14ª with the arm 13 and is located at right angles to the latter and is pivotally supported on a shaft 15 and has a swinging movement in a vertical plane along the side of a three-leaved cam 16, there being a pin 17 on the arm 14 which bears on said cam and which drops off the point of each of the three leaves to effect the rotation of the carrier *k*. This cam 16 is fixed on a shaft 18, parallel with the shaft 15, and also fixed thereon is the ratchet-wheel 19. In the bottom of the casing is an electro-magnet 20 provided with an armature 21 attached to an arm 22 which is pivotally supported near one end thereof, as at 23, one end thereof extending beyond this point having secured thereto a spiral or other suitable spring 24, or a weight to normally hold the armature out of contact with the core of the magnet when the same is disengaged. On the opposite end of the arm 22 is a gravity pawl 25 located close to the ratchet-wheel 19 and having a pin 26 therein extending over and into engaging relations with the teeth of the ratchet-wheel, this pawl having a weighted end 27 to constantly hold its pin 26 against the ratchet. Whenever the electro-magnet 20 is energized by the closing of the electrical circuit in which it is connected, the arm 22 is drawn downwardly and the ratchet 19 thereby rotated a distance of one tooth.

On the same shaft 18 to which the cam 16 and the ratchet-wheel 19 are secured is secured the rotating disk 28, shown in Fig. 5, and in this case, where it is desired to indicate the quarters of a minute, this disk is provided with the figures 15, 30 and 45 to indicate the first, second, and third quarters of the minute there being no zero shown for the reason that when the zero would appear in aperture *e* of the face of the instrument, it would be only at the expiration of the minute and during the first fifteen seconds of the succeeding minute, and it is thought best to leave the space blank. To the end that the figures on the disk 28 may be as large as possible, they are shown as applied to a disk as large as the casing will accommodate and are so spaced thereon as to represent twelfths, the center of the blank space between the three groups of figures being regarded as one space, and the ratchet-wheel 19 being provided with the same number of teeth as there are of these spaces. Therefore, each successive energization of the magnet will move the disk one-twelfth of a revolution and bring into view successively 15, 30, 45, and then a blank space. Therefore the terminals of the circuit in a master clock in this particular case must be brought into contact at intervals of fifteen seconds, to present these subdivisions of the minute in their proper sequence. This being so, it is apparent that the time elapsing between the passing of any two of the points of the cam 16 will be one minute, there being four teeth of the ratchet 19 between these points. Therefore, the pin 17 of the arm 14 will, at each minute, run off of one of the three points of said cam imparting thereby proper periodic rotation of the carrier *k*. The other carriers *g* and *h* are actuated by the rotation of the shaft 9 and this is effected also by the rotation of the three leaved cam 16 as follows: Fixed on the shaft 9 which carries the cams 8 and 12 is a 60-tooth ratchet-wheel 29, and supported on a bracket-arm 30, (shown clearly in dotted lines in Fig. 1,) is a pawl-lever 31 pivotally supported therein at 32 having its end extending into the path of rotation of pins 33 located at the point of the three leaves of the cam 16; and on the opposite end of the pawl-lever 31 is a pawl 34 having a weighted lower extremity to keep its point in contact with the teeth of the ratchet-wheel 29. Now as the distance between any two points of the cam 16 is one minute, it follows that each of the pins 33 of the cam 16 will depress the pawl-lever 31 and lift the pawl 34, the throw of the pawl-lever 31 being so adjusted as to rotate the ratchet-wheel 29 one tooth. It follows that the cams 8 and 12 on this shaft 9, which is rotated by the ratchet-wheel 29, will at the proper time allow their respective carrier-operating levers to fall off the points of their respective cams thus effecting the rotation of these carriers each independently of the other.

What I claim is:—

1. A time-indicating device comprising carriers having rotative step-by-step movements independently one of the other to indicate the hours and minutes, a face provided with apertures together with another carrier located in complemental relation to the first named carriers and having a like step-by-step movement to indicate subdivisions of a minute, reversible and slidable pendent devices on said carriers and moved thereby past said apertures through which the numerals thereon are exposed to view, together with means to actuate said carriers at the proper time and in proper sequence, the subdivision of the minute being exposed at quarter subdivisions thereof by the following elements, to wit:—a disk bearing the subdivisions of the minute, a shaft carrying

the disk, a ratchet-wheel 19 secured to the shaft, an electro-magnet, a pawl carried by the armature thereof and engaging the ratchet wheel, whereby upon the energization of the magnet the disk will be rotated, as described.

2. A time-indicating device comprising carriers having rotative step-by-step movements independently one of the other to indicate the hours and minutes, a disk located in complemental relation to the first named carriers and having a step-by-step movement to indicate subdivisions of a minute in quarter periods of the minute, a cam-shaft, cams thereon operatively located relative to the hour and minute carriers, connections extending between said cams and said carriers to effect the rotation of the latter step-by-step at the proper time by the rotation of the cams, a second shaft having a cam thereon operatively located relative to the said cam-shaft and having a pawl and ratchet connection therewith, together with means to rotate said second shaft step-by-step.

3. A time-indicating device comprising carriers having rotative step-by-step movements independently one of the other to indicate the hours and minutes, a rotative element located in complemental relation to the first named carriers and having a step-by-step movement to indicate subdivisions of a minute, a prime mover, a shaft, connections between said prime mover and shaft to rotate the latter step-by-step, a second shaft, hour and minute indicator carriers thereon, a cam-shaft having cams thereon to actuate certain of said carriers, a cam on said first named shaft to effect the actuation of another of said carriers, and suitable connections between the first-named shaft and said cam-shaft to rotate the latter step-by-step.

4. A time-indicating device comprising carriers having rotative step-by-step movements independently one of the other to indicate the hours and minutes, together with another carrier located in complemental relation to the first named carriers, a shaft for said carriers, a cam on said shaft having a number of projections thereon equal to the desired number of subdivisions of the minute, and devices extending from said cam-shaft to the carriers indicating the hours and minutes whereby the unitary minute-carrier may be actuated at the proper time; a second cam-shaft operatively connected with the other hour and minute carriers, means to rotate the said second cam-shaft by the rotation of the first named cam-shaft, and a suitable prime mover to actuate the latter.

5. A time-indicating device comprising carriers, a face provided with apertures pendent reversible and slidable rotatable numeral bearing devices carried by said carriers for indicating through the apertures the hours and minutes, means for moving the same independently of each other, in combination with a disk element bearing the numerals 15, 30 and 45, and means for rotating said disk so that the numerals are exposed through an aperture at quarter minute periods, as described, and means for causing the pendent rotatable numeral bearing devices to be reversed during their rotation.

6. A time-indicating device having in combination a casing, parallel shafts rotatably mounted therein, one shaft supporting carriers having radiating arms, a ratchet-wheel on the carrier, a trip mechanism engaging the ratchet-wheel, and means operable from the other shaft for locking and unlocking the carriers independently of each other, and means for reversing carriers rotatably held by said carriers.

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