Feb. 2, 1954 R. SOLARI 2,667,735

ELECTROMECHANIC WALL CALENDAR CLOCK

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Fig. 8

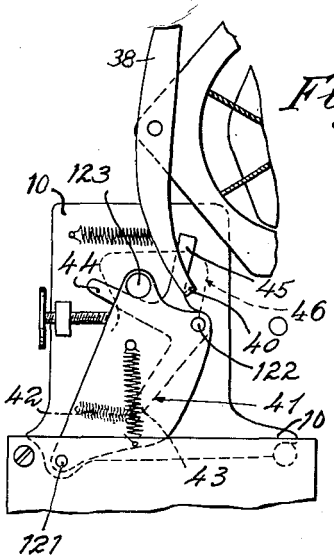


Fig. 9

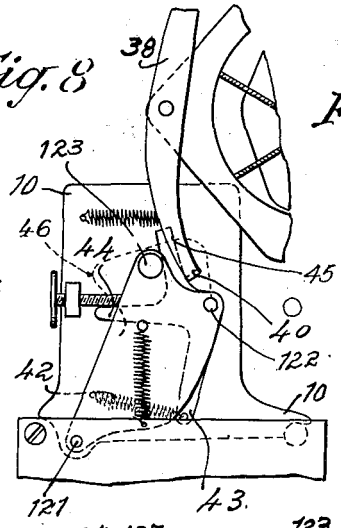


Fig. 6

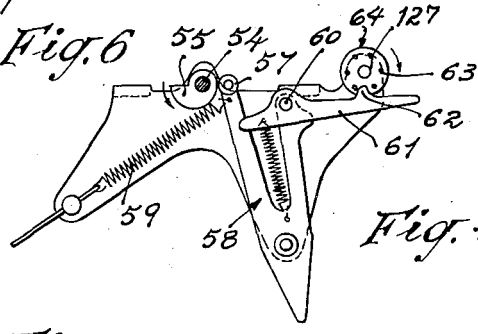


Fig. 10

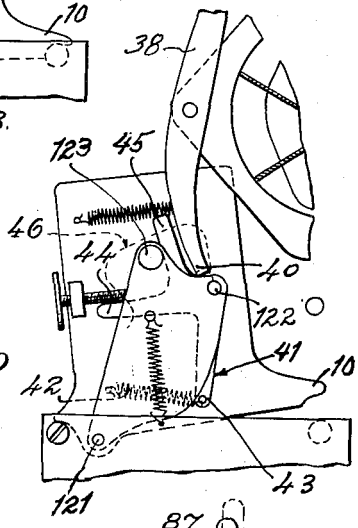


Fig. 1

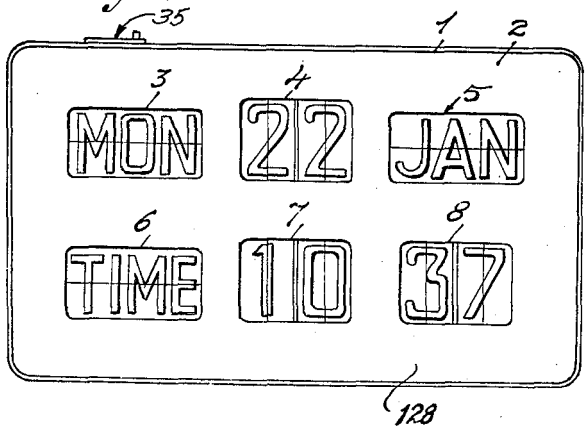
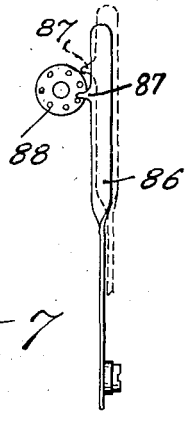


Fig. 7



Inventor
Remigio Solari

By Henderson, Link & Ponack
Attorneys

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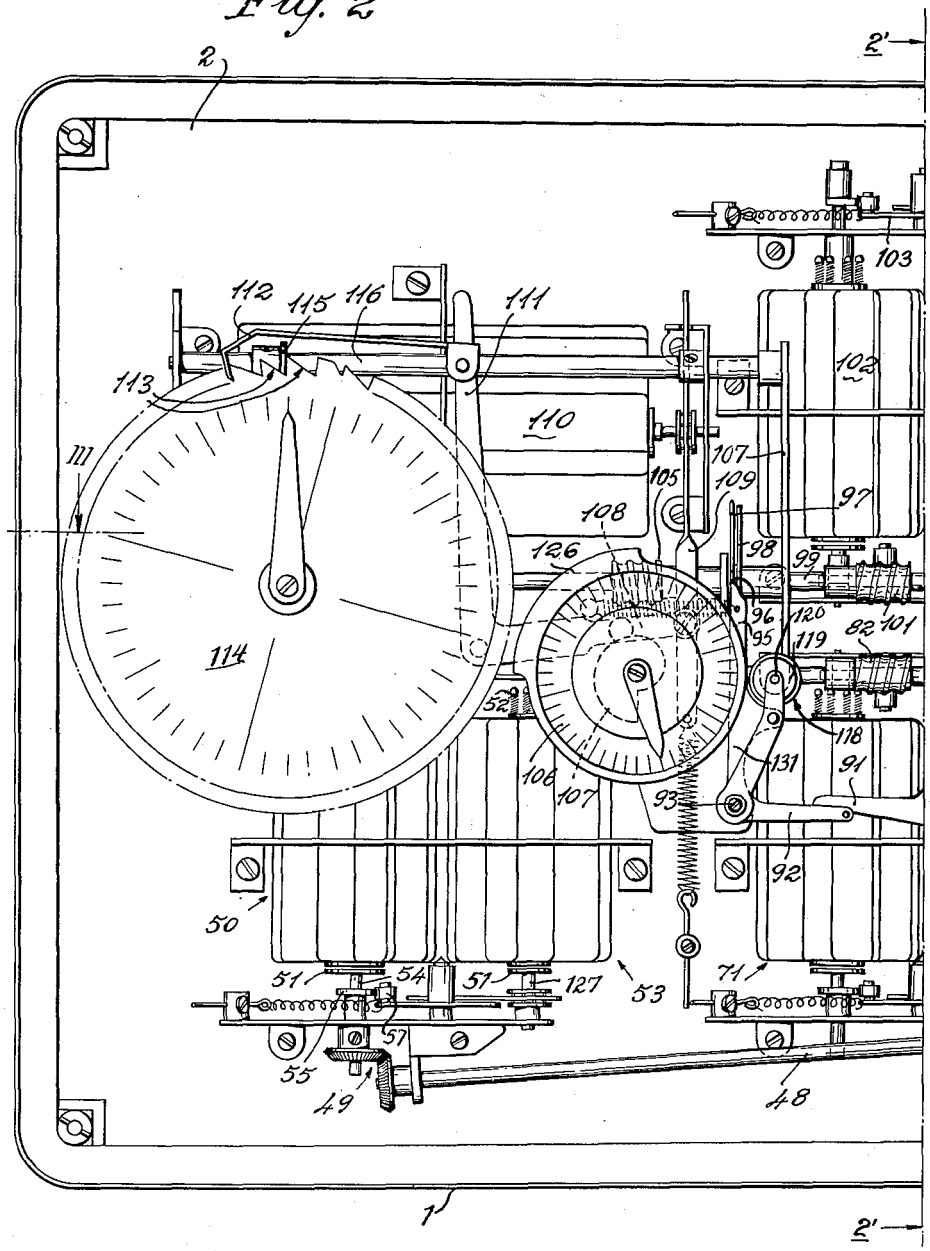
Fig. 2



Inventor
Remigio Solari

By Thenderoth, Lind & Ponack
Attor...

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ELECTROMECHANIC WALL CALENDAR CLOCK

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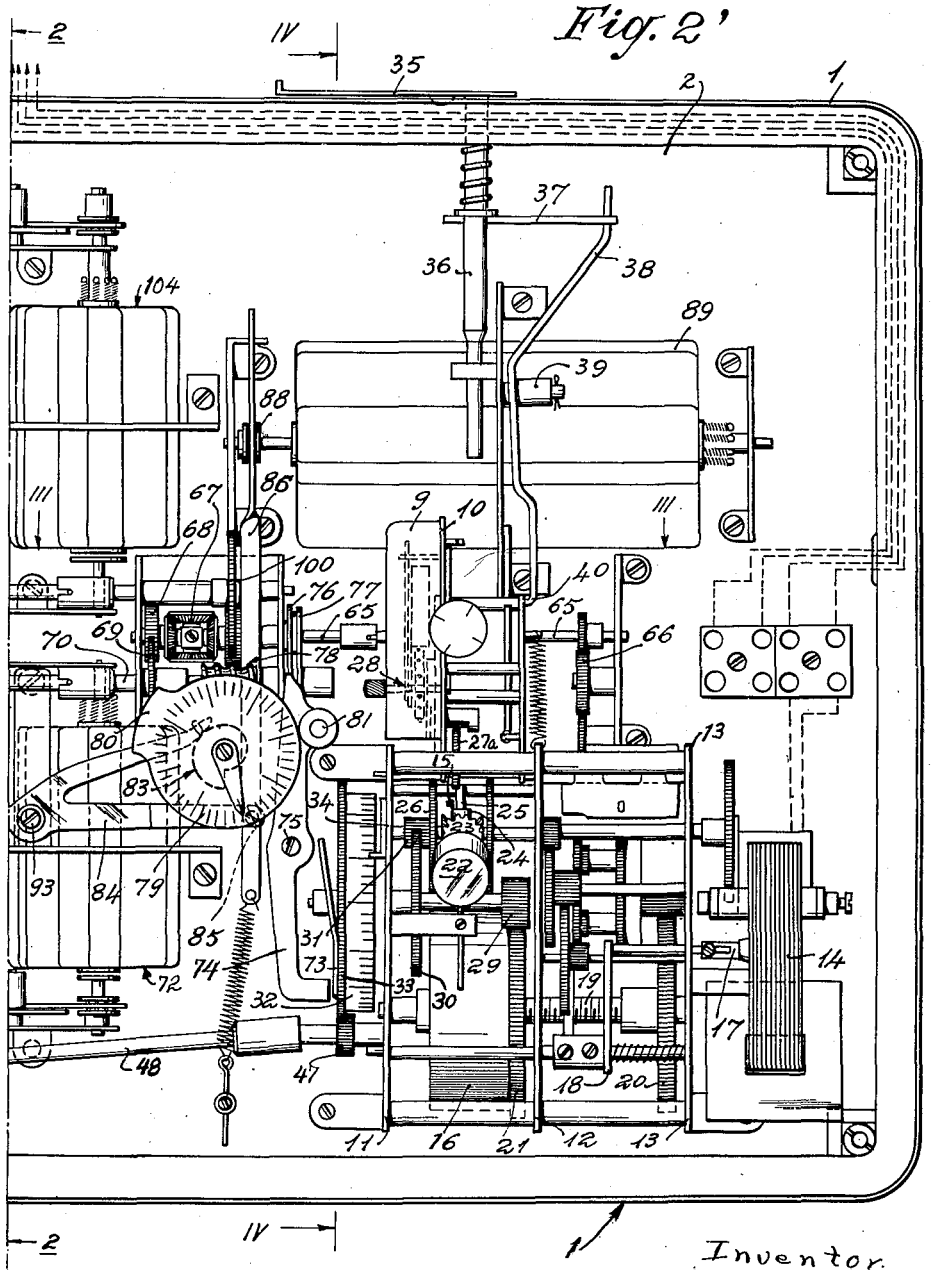
Fig. 2'



Inventor
Remigio Solari

By Henderson, Lind & Ponack
Attorneys.

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ELECTROMECHANIC WALL CALENDAR CLOCK

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Fig. 3

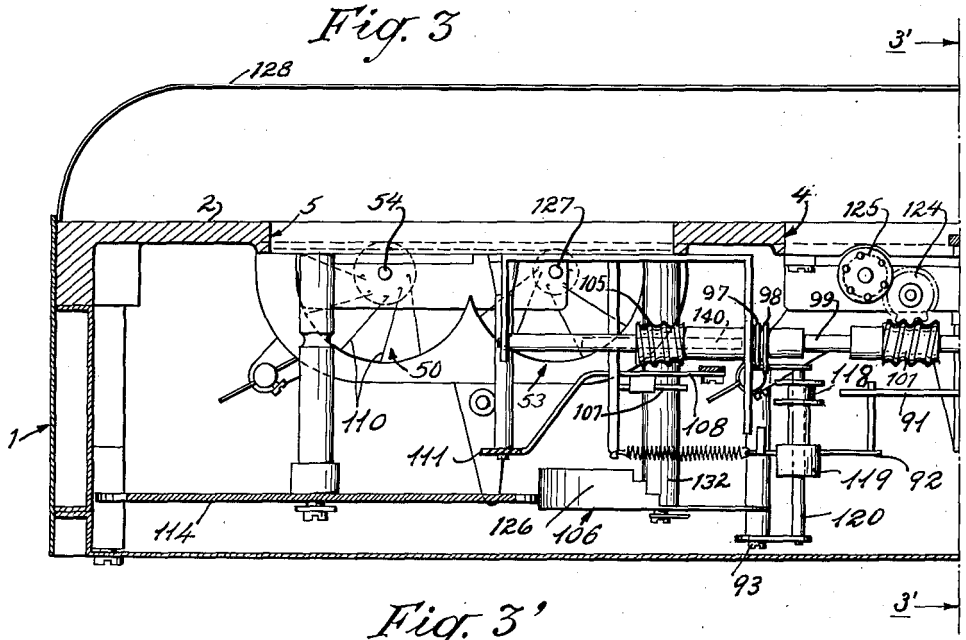
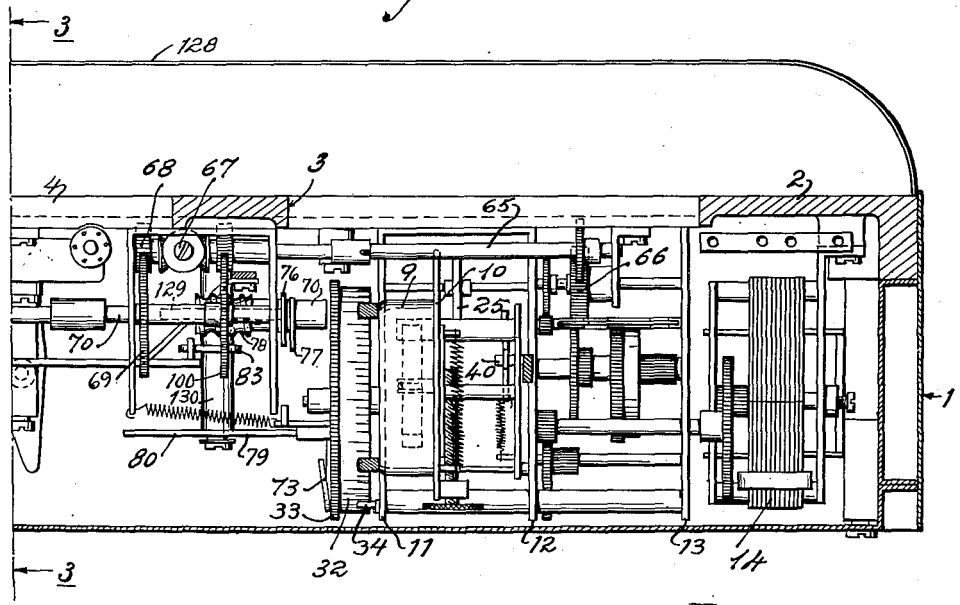


Fig. 3'



Inventor
Remigio Solari

By Henderson, Lind & Ponack

Attorneys

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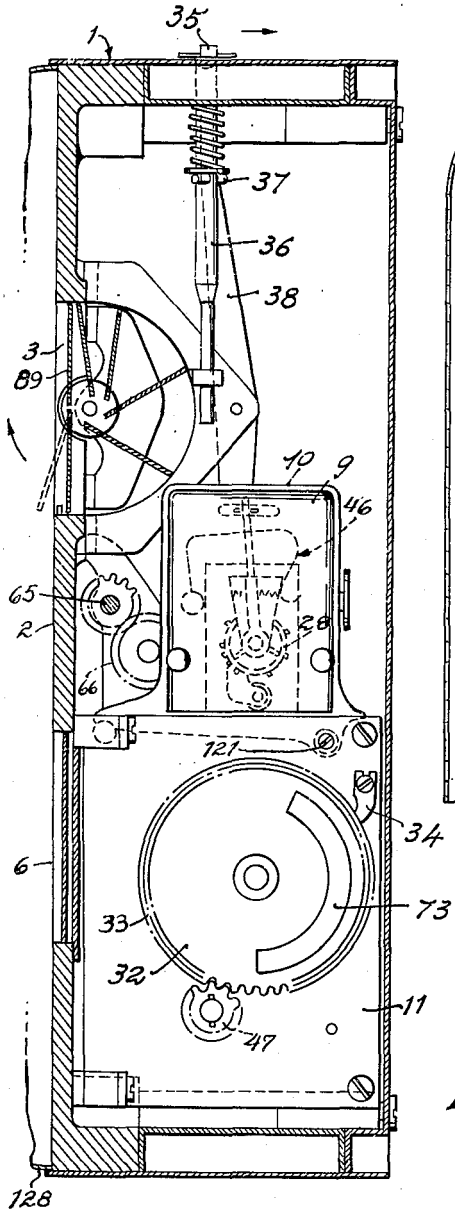

Fig. 4

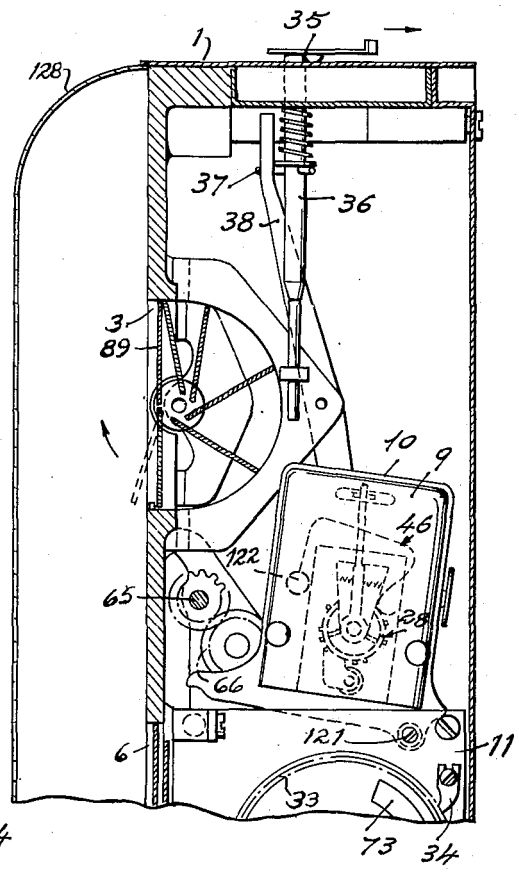

Fig. 5

Inventor
Remigio Solari

By Henderson, Lind
+ Ponack
Attorneys.

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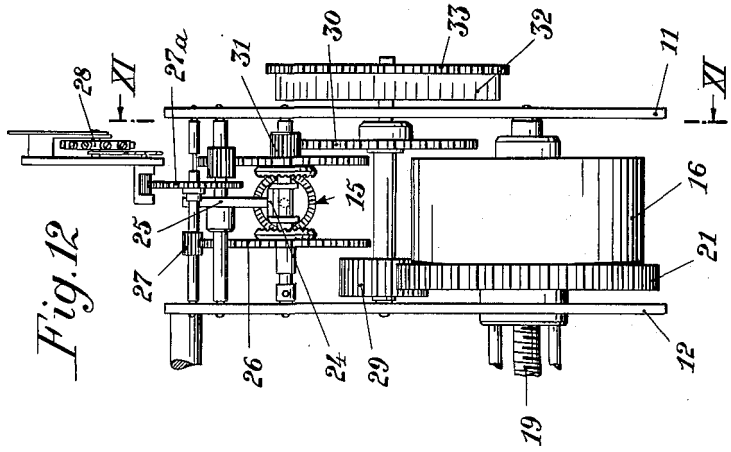

Fig. 12

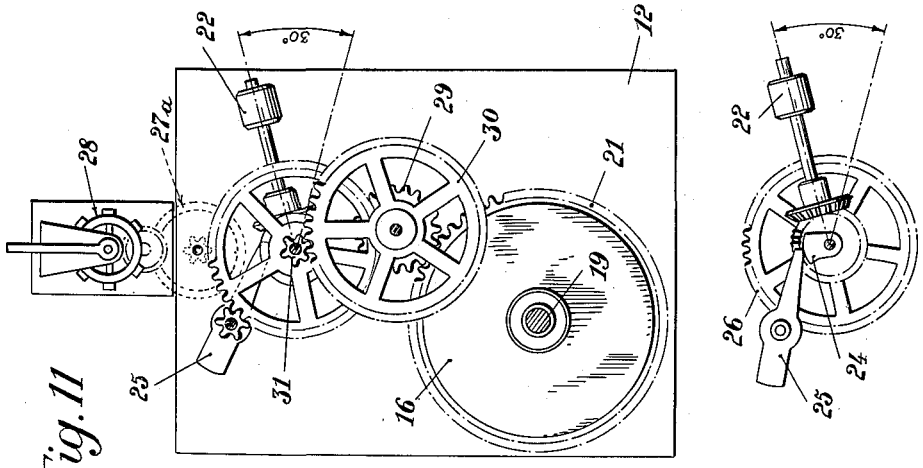

Fig. 11

Fig. 13

INVENTOR.
Remigio Solari
BY
Wenderoth, Lind & Ponack
attorneys

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UNITED STATES PATENT OFFICE

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ELECTROMECHANIC WALL CALENDAR CLOCK

Remigio Solari, Udine, Italy, assignor to Solari Remigio & C. Fabbrica Orologerie Industriali, Udine, Italy, a company of Italy

Application August 6, 1951, Serial No. 240,484

Claims priority, application Italy August 8, 1950

8 Claims. (Cl. 58—4)

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The present invention relates to an electromechanical wall calendar-clock, of the type with a rapid release of blades for the automatic indication of the time, the date and also for the month of February in leap years.

An object of this invention is to provide a construction indicating the day of the week, the day of the month, the month, the hours and the minutes by means of letters and numbers appearing in a dial.

Such letters and numbers are carried by rapidly released blades appearing in openings in the front surface of the clock and they are preferably of equal size.

A further object of the invention is to provide a clock movement under constant stress controlled by a single spring for operating all the mechanisms of the blades whatever may be the indication that these latter have to give. The constant stress is secured by the displacement due to gravity of a weight which is returned to initial position by the spring. All the mechanism is contained between three flat plates on which are pivoted all the shafts bearing the gears of the movement.

The spring is constantly loaded by an induction electric motor, fed by the common current. In the case of temporary interruption of the current, the spring has a load reserve of about 24 hours.

The movement may be intermittently actuated by an anchor escapement, in the case of an independent clock, or by an electric receiver instead of the anchor escapement in the case of a clock placed in a clock network and in such case the electric receiver receives the pulses each minute from the central master clock and is operated in synchronism with the other clocks in the network.

Summarizing, the invention is concerned with the combination of the mechanical parts allowing the different synchronous movements of the blades to be obtained and with their operation, as will appear from the detailed description below with reference to the attached drawings wherein:

Fig. 1 shows a front elevational view of the dial of the clock;

Figs. 2 and 2' show an elevational rear view of the entire clock;

Figs. 3 and 3' show a cross sectional view of Figures 2 and 2' along section line III—III;

Figure 4 shows a cross sectional view of Figure 2' along section line IV—IV;

Figure 5 shows a detail sectional view similar to that of Figure 4 with the anchor escapement box in a different position;

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Figure 6 shows a detail of one of the claw levers, controlling the release of the blades of tens, for indications which require two digits;

Figure 7 shows a detail of a vertical claw lever controlling the blades with horizontal shafts;

Figures 8 to 10 show in three different positions a detail in the displacement of the anchor escapement box, seen from the opposite side with respect to Figures 4 and 5;

Figure 11 is a detail view showing the gearing, its connection to the escapement and the weight, along line XI—XI of Fig. 12;

Fig. 12 is a side view of Fig. 11, and

Fig. 13 is a detailed view of the connection of the gearing with the weight.

The clock is contained in a flat box 1 which may be covered on its front surface by a transparent material and contains all the mechanisms for the blades operation. These blades appear within openings provided in the front part of the box which forms the dial.

The dial 2 (Fig. 1) has an opening 3 in which appears, on two blades with horizontal shafts, the indication of the day of the week (Monday, Tuesday, etc.), an opening 4 in which, on two pairs of blades having vertical shafts, appears the indication of the date of the month, an opening 5 in which, on blades having horizontal shafts appears the indication of the month, and below a sham opening 6 with horizontal development, in which appears the stationary indication "Time," an opening 7 in which appears on blades having vertical shafts, the indication of the hour, and an opening 8 similar to the opening 7, and in which appears on two pairs of blades with vertical shafts, the indication of the minutes.

As far as the operating mechanism of the clock movement and the release of the blades is concerned, it is to be noted that the form of embodiment shown in the figures relates to the case of a single clock, and it is therefore provided with an anchor escapement.

The anchor escapement is contained, for protection, in a box formed by a small supporting plate 10 to which is applied a cover 9, for instance of transparent material. The plate 10 is pivoted on the shaft 121 (Figures 8 to 10) so that the whole device may be disengaged from the remainder of the mechanism in order to carry in phase the minutes, as it will be described hereinbelow.

All the gears of the clock movement for the operation of the plurality of blades of the calendar clock are contained between three plates 11, 12 and 13 and the operation of the gears is

effected by the spring contained in the barrel 16. The spring is tensioned by the electrical motor 14, fixed at the outer side of plate 13, which operates through a group of reduction gears and the differential gear 15. After the tensioning of the spring is completed a brake 17 urged against the rotor of the motor by the disc 18 stops the motor and tensioning is interrupted. Disc 18 can move towards the right or left on a threaded portion of the spring shaft 19 so as to follow the tensioning and the releasing of the spring. The spring through the shaft 19 operates the gear 20 mounted on said shaft. The spring is fixed at one end to the shaft 19 and at the other end is fixed to the barrel 16, which in turn is fixed to the gear 21 loosely mounted on the shaft 19.

At the end of a predetermined time period the sector 24 frees the stop 25 and allows the spring to lift the weight 22. At the same time, stop 25 makes a complete revolution and again stops against sector 24. This operation is repeated each minute. During its lowering, the weight 22, through gears 26, 27 and 27*a* imparts movement to the escapement of the balance 28. In the return phase, the spring which acts through the gears 29, 30 and 31 besides lifting the weight 22, advances by a mark also disc 32 which bears 60 marks corresponding to the minutes of an hour. Said disc is fixed to a gear 33 and indicates at 34 the minute which begins at that moment. Gear 33, as will be later set forth, controls the transmission which operates the blades indicating the minutes.

The plate 10, on which the anchor escapement is fixed, may be displaced, through its rotation around the shaft 121 (Figs. 8, 9 and 10), for easy regulation of the setting.

This displacement is carried out when the clock has to be set by advancing or retarding it a given number of minutes. This setting operation is carried out by displacing the lever 35 outside the clock, so as to rotate the vertical shaft 36 on which it is mounted. The shaft 36 is provided with a finger 37 engaging a lever 38 which may rotate in a vertical plane on the shaft 39. The displacement from its usual position, of the lower extremity 40 of the lever 38 rotates the forked lever 41, against the action of the spring 42 (Figs. 8, 9 and 10).

The lever 41 is provided with three arms 43, 44, and 45. The arm 45 is acted on by the end 40 of lever 38. A rotation of the lever 38 causes a rotation of the shaft 122 on which the forked lever 41 is mounted. Inside the cover 9 there is fixed on the shaft 122 a bent flat spring 46 (Figs. 4 and 5) which upon lowering when the shaft 122 is rotated blocks the balance wheel 28. When the operation of the lever 38 is continued by lever 35, the end 40 of the lever 38 slides along the arm 45 compelling the lever 41 to further rotate until (Figure 10) the arm 45 abuts the stationary shaft 123, and in order to continue its rotation, compels the balance wheel box to rotate around the shaft 121. This rotation disengages the different gearings so that the weight 22 may fall together with the sector 24 thus freeing the stop 25 which makes a complete revolution causing the gear 33 to advance a graduation corresponding to a minute. Therefore each operation of the lever 35 causes the clock to advance one minute. To slow the clock the lever 35 need only be partially displaced, so as to accomplish half of its stroke. In this case the balance wheel is stopped and the clock is slowed.

The gear 33 operates, through the pinion 47, the driving rod 48, which, by means of the bevel gears 49 directly actuates the drum 50 comprising ten blades corresponding to the minute units which appear in the opening 8.

Each blade is mounted on a shaft carried by a disc which, in the case of the drum 53 is 51, and is pressed by a little spiral spring 52 wound on each blade shaft. The spring 52 rotates each blade on its own shaft while the following blade advances the amount necessary to be brought in line with the front surface of the dial. It is to be noted that this operation is the same for all the blades of all the drums for the different indications.

The rod 48 makes a tenth of a complete revolution each minute, and releases a blade of the drum 50 each minute. At the moment of the tenth minute, i. e. when the rod 48 and the shaft 54 of the drum 50 have accomplished a complete revolution, the cam 55 (Figure 6) has its step in correspondence with the roller 57 at the end of one arm of a forked lever 58. This arm of the lever is urged on the cam 55 by the spring 59, while the other arm thereof has, pivoted at 60, a claw lever 61 with a tooth 62 for operating the pins 63 carried by a disc 64 fixed on the shaft 127 of the drum 53 for indicating the tens digits of the minutes.

In this way when the shaft 54 has accomplished a complete revolution and shown the ten blades corresponding to the units of the minutes, the step of the cam 55 allows the forked lever 58 to be oscillated. Lever 58 displaces the claw lever 61 and the tooth 62 causes the rotation of the disc 64 for an angle corresponding to the number of the pins 63 carried by said disc, and in this case for a sixth of a complete revolution since there are six of such pins.

The movement of the units of the hours is controlled by the driving rod 65 which is operated by the spring contained in barrel 16 through gear 20, a plurality of cooperating gearings, the differential gear 15 and the gear 66. The drive 65 comprises a differential gear 67, after which the drive operates a pinion 68 engaging a gear 69 fixed on the shaft 70 which controls the movements of the drum of the hour units.

Also in this case the directly operated drum 71 relates to the units of the hours, while drum 72 showing the tens of the hours is operated by the former through a claw system analogous to the one already disclosed with respect to the minute drums.

The release of each blade of the drum 71, through the revolution of the shaft 70 is controlled by a head cam 73 carried by the gear 33, which operates a lever 74 pivoted at 75. The end of the lever 74 blocks a pair of stop lugs 76 and 77 fixed on the actuating shaft 70 of the drum 71. At the end of a complete revolution of the gear 33 the cam 73 oscillates the lever 74 and the upper end thereof frees in two successive steps the lugs 76 and 77 located in parallel planes thereby allowing the differential gear 67 to actuate the shaft 70 for a complete turn. After a complete revolution the stop lugs 76 and 77 are again stopped by the upper end of the lever 74 and remain stationary until the end of the succeeding hour.

The shaft 70, in its revolution rotates the worm gear 78 engaging a gear 129 fixed to a shaft 130 whereon the disc 79 is mounted. A complete revolution of the shaft 70 causes a displacement of the disc 79 for 1/30 of a complete revolution,

and the angle of displacement corresponds to an hour.

At the same time the drum 71 of the hour units is advanced by the worm 82 which is fixed on the shaft 70. The drum 71 rotates a tenth of a revolution, releasing a blade for showing on the dial the successive hour.

For the tens of the hours the release of the blades is the same as that for the tens of the minutes, and precisely at the tenth and at the twentieth hour, a cam fixed on the shaft of the drum 71 releases a lever which by means of a claw lever of the above described type (Fig. 6), controls the drum 72 of the tens of the hours.

The drum 72 has six blades, two of which are without numbers, two with the number 1, and two with the number 2, and accomplishes a complete revolution every 48 hours, thus allowing a more suitable functioning of the drum.

The disc 79 is provided with a projecting sector 80, placed at such an angular position that it displaces, at the exact moment of midnight, a roller 81 carried by the lever 74. The sector 80 has a function similar to that of the above mentioned cam 73. When the sector 80 operates the roller 81, the latter displaces the lever 74, freeing the lugs 75—77, allowing the shaft 70 to accomplish quickly a number of revolutions so that the dial shows hours zero and minutes zero.

At the last moment of the revolution of the disc 79, the cam 83 connected to the same disc, allows a movement of the forked lever 84 pivoted on the pin 90 which lever, by means of its end 85 controls a vertical claw lever 86 of the type shown in Fig. 7.

The vertical claw lever 86 engages with projection 87 one of the pins on a disc 88 fixed on the shaft of the drum 89 for the days of the week, rotating it for one seventh of a turn and thus varying the exposed blade for the days of the week.

The lever 84 has a projecting arm 91 resting on the arm 92 of a crank lever 131 with three arms, pivoted on the shaft 93. The motion of the lever 84 causes the lowering of the arm 92 which displaces the arm 95 which, by means of its tooth 96 engages two stop lugs 97 and 98 carried by a shaft 99 operated by the differential gear 67 by means of the gear 100 (Fig. 2). The shaft 99 carries the worm gear 101 which engages a gear 124 (Fig. 3) which in its turn engages the gear 125 keyed on the shaft of the drum 102 for the units of the month's days.

The drum 102, by means of the claw lever 103 similar to that shown in Fig. 6 actuates, at the end of every ten days, the drum 104 for the tens of month's days.

The shaft 99 (Fig. 2) projects beyond the two stop lugs 97 and 98 and carries the worm gear 105 engaging a gear 140 carried by a shaft 132 on which are fixed a graduated disc 106 and a cam 107. The disc 106 is subdivided into 60 graduations and has the task of bringing from the day 28, 29, 30 or 31 of each month, the day's drum to the 1st of the succeeding month, by acting in a similar way as above described for the functioning of the hours at midnight.

For this purpose the disc 106 has an extension 126 with an edge turned inwardly having four steps corresponding respectively to the days 28, 29, 30, and 31 of each month.

A complete revolution of the shaft 99 rotates the disc 106 for an angle corresponding to one of its graduations.

At the end of a complete revolution of the disc 106 the cam 107 releases the lever 108 which is

connected to the vertical claw lever 109 which controls the drum 110 for the month. In this way the variation for the month is obtained.

In the meantime the lever 108 by means of its arm 111 operates the claw lever 112 which engages one of the teeth 113 of the ratchet wheel 114 which is provided with 48 teeth corresponding to the months of four years in order to comprise the leap year. The depth of the teeth vary according to whether the concerned months have twenty-eight, twenty-nine, thirty or thirty-one days.

The claw lever 112 at the end of every month, i. e. at the end of a complete turn of the disc 106 displaces the wheel 114 for one tooth. In the tooth corresponding to the month is inserted a lever 115 fixed to a shaft 116. The lever 115 has an angular motion depending upon the depth of the teeth 113 and causes therefore a rotation of greater or minor amplitude of the shaft 116.

At the end of the shaft 116 is fixed the arm 117 which is inserted in a double ring 118 (Fig. 3) to which is connected a roller 119 which may slide on a shaft 120. The sliding of the roller occurs against the action of a spring (not shown in figure) acting on the lever 117.

Owing to the amplitude of the displacement angle of the lever 115 into the teeth 113, there is an angular displacement, for a greater or minor angle, of the lever 117 and thereby a displacement of the roller 119 on the shaft 120. The roller has therefore a definite position in front of the stepped edge on the extension 126 of the wheel 106, so that at the end of each month, the roller is in contact, according to the number of days comprised in the concerned month, with the projecting part of extension 126 of the wheel 106. Said projecting part displaces the roller 119 and therefore the shaft 120 which is mounted on an arm 92 of the bell crank 131 which arm, shifting the arm 95 frees the lugs 97 and 98 allowing the shaft 99 to quickly rotate until the blades, from the last day of the concerned month, i. e. from 28, 29, 30, or 31 are brought to the first day of the following month.

On wheel 32, disc 79, disc 106 and on wheel 114 are marked respectively the minutes, hours, month's days and the months. The graduations of the discs correspond to the numbers and words of the relative drums, and at any moment the discs may be quickly turned for proper setting.

Blade clocks of small dimensions may be constructed having only the indication of the hours and of the minutes and of the date and larger sizes may be used in wall appliances, which have to be clearly seen from a distance.

I claim:

1. An electromechanical wall calendar clock comprising in combination a casing having a front wall provided with a plurality of openings vertically and horizontally spaced with respect to each other, at least one drum at each opening, a shaft for each said drum, a plurality of blades on each said drum, the blades of a first drum bearing the numbers of the units of the minutes, the blades of a second drum bearing the numbers of the tens of the minutes, the blades of a third drum bearing the numbers of the units of the hours, the blades of a fourth drum bearing the numbers of the tens of the hours, the blades of a fifth drum bearing the numbers of the units of the days of the month, the blades of a sixth drum bearing the numbers of the tens of the month days, the blades of a seventh drum bearing the name of the days of the week, the

blades of an eighth drum bearing the name of the months, a power source inside the casing, an anchor escapement operable by the said power source, a weight coacting with and controlling the said escapement, a gear provided with sixty teeth operated by said power source for rotating a tooth at each minute, a shaft driven by said gear and connected to the drum of the minute units, a differential gear driven by said power source, a shaft mounting said gear, means associated with the said differential gear arranged to transmit at each hour the motion to the drum of the hours units, means associated with the said differential gear arranged to transmit the motion to the drum of the units of the days, means associated with the said differential gear arranged to transmit the motion to the drum bearing the name of the months, a head cam mounted on the side of said gear, a vertical lever controlled by said cam, a fork shaped lever, provided with a projection, in operative connection with the said means associated with the differential gear, and means associated with the said vertical lever and with said fork shaped lever arranged to rotate the drum of the week days.

2. An electromechanical wall calendar clock as claimed in claim 1, and including means arranged to transmit the motion from the drum of the units to the drum of the tens, which comprise a cam mounted on the shaft of the units drum, a spring urged fork shaped lever operable by said cam, a claw lever pivoted to said spring urged fork in engagement with a disc fixed to the tens drum, said cam being arranged to rotate, through the fork shaped lever, the tens drum by a fraction of turn at each complete rotation of the unit drum.

3. An electromechanical wall calendar as claimed in claim 1, wherein the means associated with the differential gear to transmit the motion to the drum of the hour units comprise a first shaft parallel to the shaft of the differential gear, a first worm gear mounted on the said parallel shaft, a shaft perpendicular to the shaft of the worm gear, a second gear on said perpendicular shaft and engaged with said worm gear, a cam mounted on the said perpendicular shaft, a disc mounted on the end of the latter arranged to make steps of 1/30 of a revolution and a sector thereon arranged to engage at the end of each twenty-four hour period the said vertical lever to impart thereto a partial rotation, two lugs mounted on the shaft parallel to the shaft of the differential gear which engage an end of said vertical lever and being arranged to be disengaged from the latter when the vertical lever rotates under the action of the said sector and of the said head cam, a second worm gear mounted on the shaft parallel to the shaft of the differential gear, said worm being in engagement with a gear mounted on the shaft of the drum of the hour units, whereby the said drum is made to rotate.

4. An electromechanical wall calendar clock as claimed in claim 3, including a vertical claw lever controlled by the cam of the perpendicular shaft, said claw lever being in engagement with the drum of the week days, whereby the said drum is made to rotate at each complete revolution of the shaft bearing the cam.

5. An electromechanical wall calendar clock as claimed in claim 1, wherein the means associated with the differential gear for transmitting the rotation to the drum of the units of the month days, comprises a shaft parallel to the shaft of the differential gear, a worm gear mounted on the said parallel shaft, a second gear in engagement with said worm gear, a pinion mounted on the shaft of the said drum of the units and connected to said worm gear whereby said drum is made to rotate.

6. An electromechanical wall calendar clock as claimed in claim 1, wherein the means associated with the differential gear arranged to transmit the rotation to the drum bearing the name of the month comprise a shaft parallel to the shaft of the differential gear, a first worm gear in operative engagement with the drum of the unit of the month days, two stop lugs and a second worm gear mounted on said parallel shaft, a shaft perpendicular to the shaft of the worm gear, a second gear mounted on said perpendicular shaft in engagement with said second worm gear, a cam mounted on said perpendicular shaft, a graduated disc provided with forty graduations mounted at the end of said perpendicular shaft having an extension provided with an edge inwardly bent, this edge having four steps corresponding respectively to the days 28, 29, 30 and 31, of the month, a lever with two arms arranged to be moved by said cam, said last mentioned lever being provided with an arm substantially horizontal in engagement with a claw lever which engage for rotation the shaft of the drum of the names of the month, and with an arm substantially vertical, a claw lever provided at one end with a pawl and pivoted at the other end to the vertical arm of said lever with two arms, a shaft perpendicular to the forward wall of the casing, a toothed wheel thereon, said wheel being provided with forty-eight saw teeth having different heights, the said heights corresponding to the number of the days composing the months comprised in a cycle of four years including a leap year, the pawl of said claw lever being in engagement with the saw teeth of the disc, a lever mounted on a shaft parallel to the forward wall of the casing arranged to penetrate between two teeth of said wheel with forty-eight teeth, a lever having three arms pivoted on a shaft perpendicular to the forward wall of the casing, a vertical arm on said lever being in engagement with the teeth mounted on the shaft parallel to the shaft of the differential gear, a vertical rod connected at one end of the shaft parallel to the forward wall of the casing, a pulley engaging said vertical rod, said pulley being slidable along a shaft carried by an arm of the lever with three arms, a roller fixed to the pulley arranged to face the steps of the bent edge of the extension on the said graduated disc, said steps being arranged to rock the lever with three arms for thus freeing the vertical arm of the lever last mentioned from engagement with the lugs mounted on the shaft parallel to the shaft of the differential, whereby said parallel shaft quickly rotates to bring the blades of the last day of the month to the first day of the next month.

7. An electromechanical wall calendar clock as claimed in claim 1, a second gear provided with sixty teeth operated by said power source, a head cam mounted on the side of said second gear, a vertical lever controlled by said cam, a shaft perpendicular to the shaft of said second gear, a cam mounted on said shaft, a fork shaped lever rockable on a shaft parallel to the shaft of said second gear and arranged in operative connection with said cam, a projection on said fork shaped lever, a lever provided with three arms rockable around a shaft perpendicular to the for-

ward wall of the casing, an arm of the lever last mentioned being in engagement with the projection on said fork shaped lever, and the other arms of the lever with three arms being in opertive connection with the means associated with the differential gear arranged to transmit the motion to the drum bearing the name of the months.

8. An electromechanical wall calendar clock as claimed in claim 1, including means for carrying out manual resetting of the minutes, the hours, the days and the name of the month.

REMIGIO SOLARI.

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