

May 19, 1959

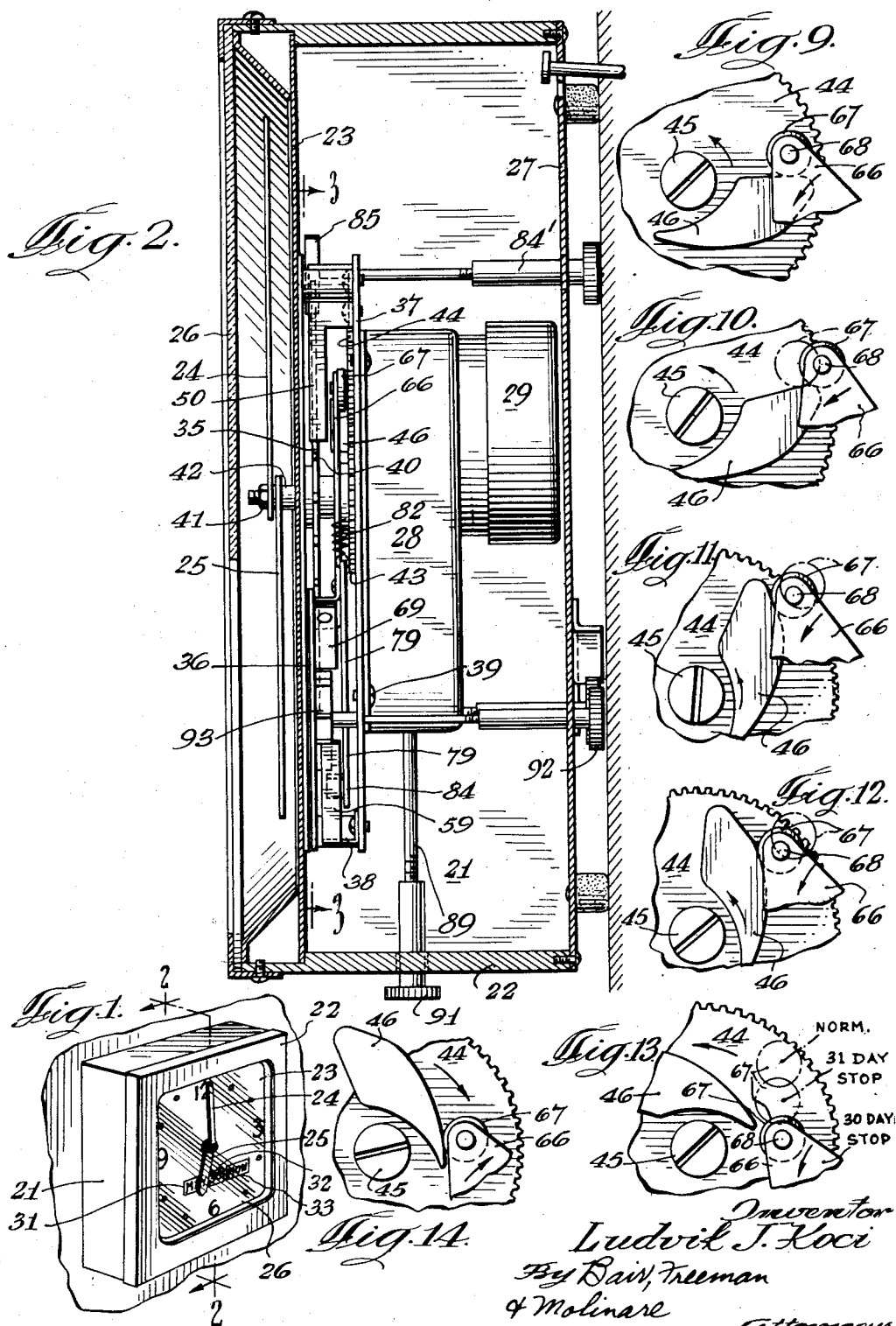
L. J. KOCI

2,886,910

CALENDAR MECHANISM

Filed March 29, 1956

8 Sheets-Sheet 1



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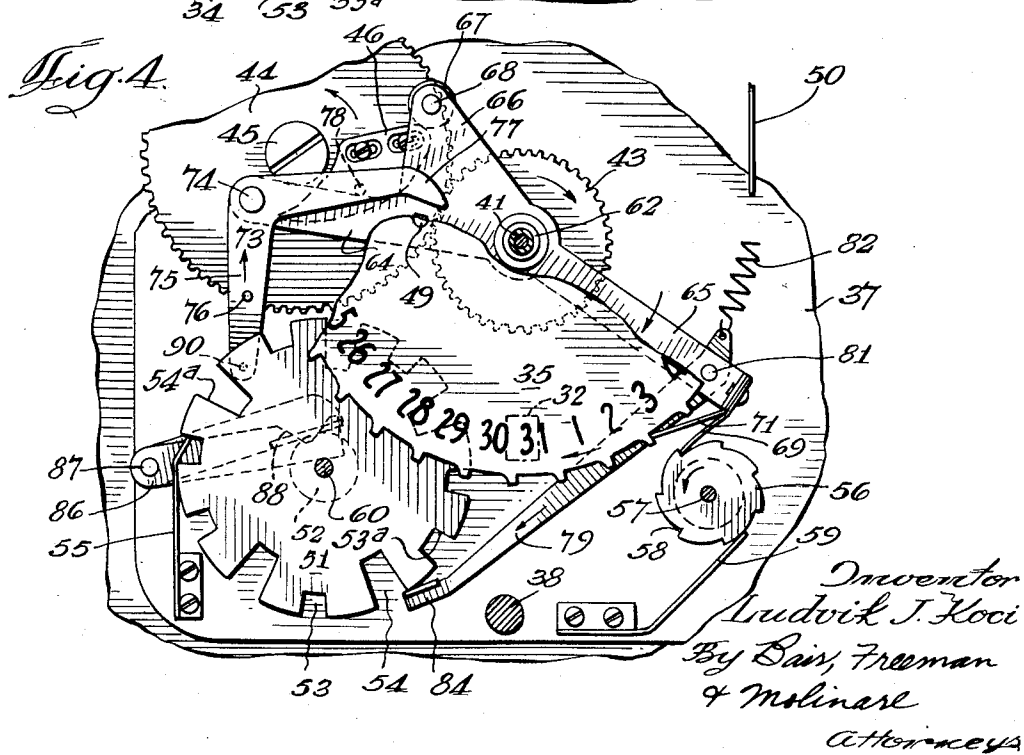
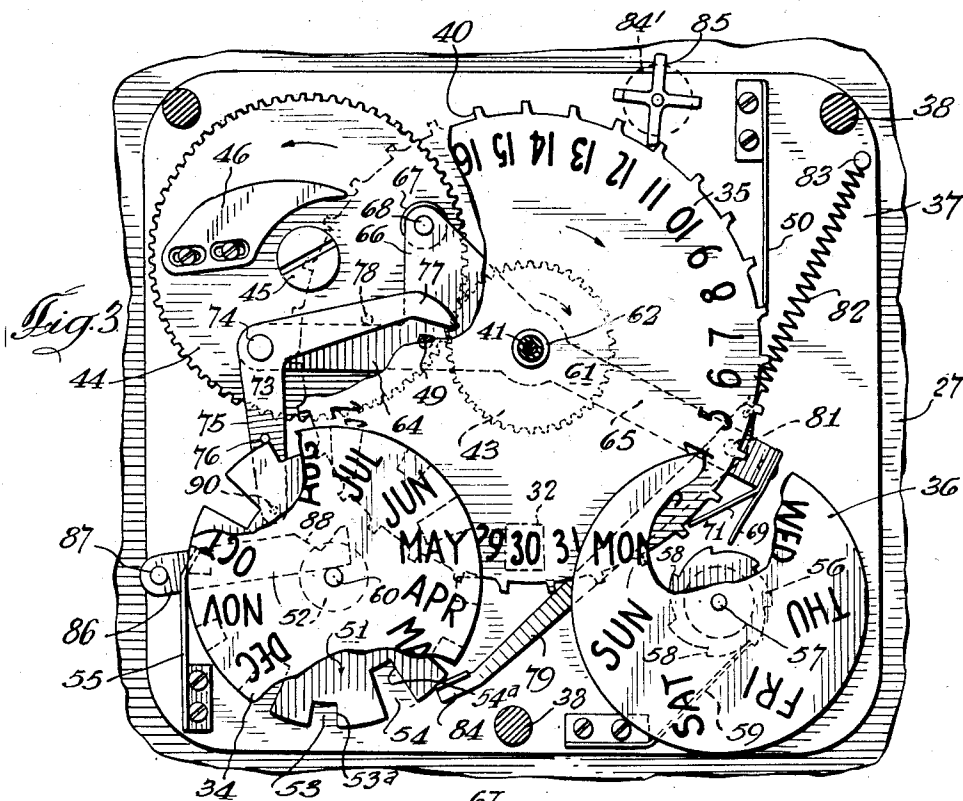
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Fig. 5.

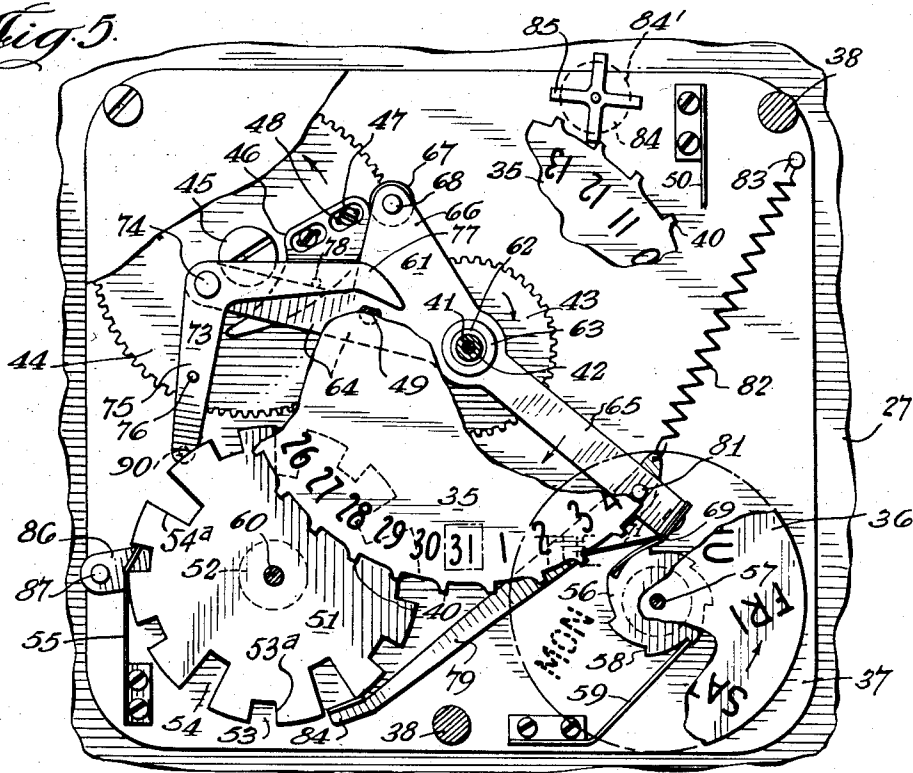
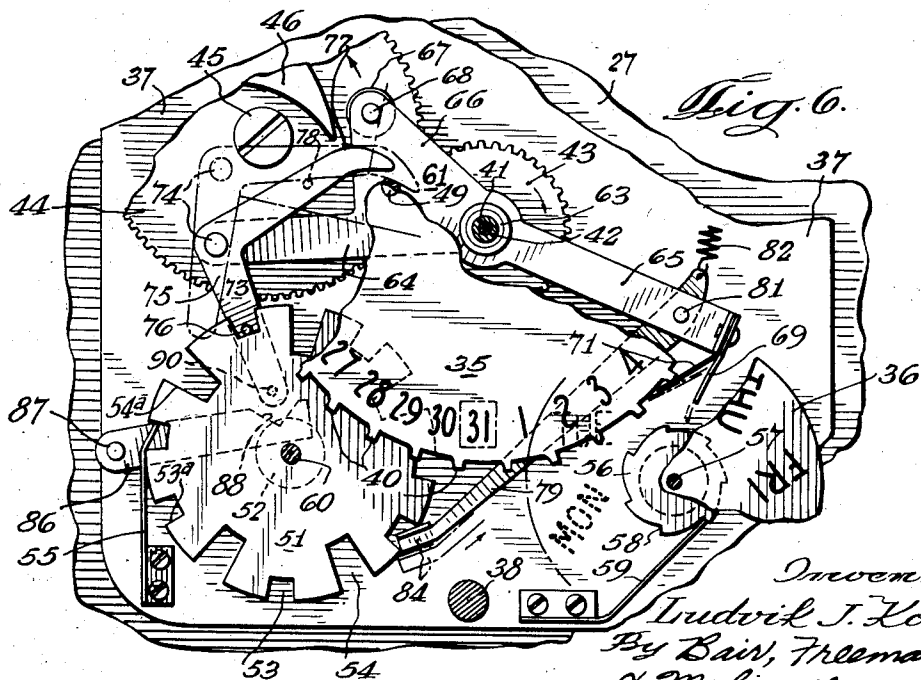


Fig. 6.



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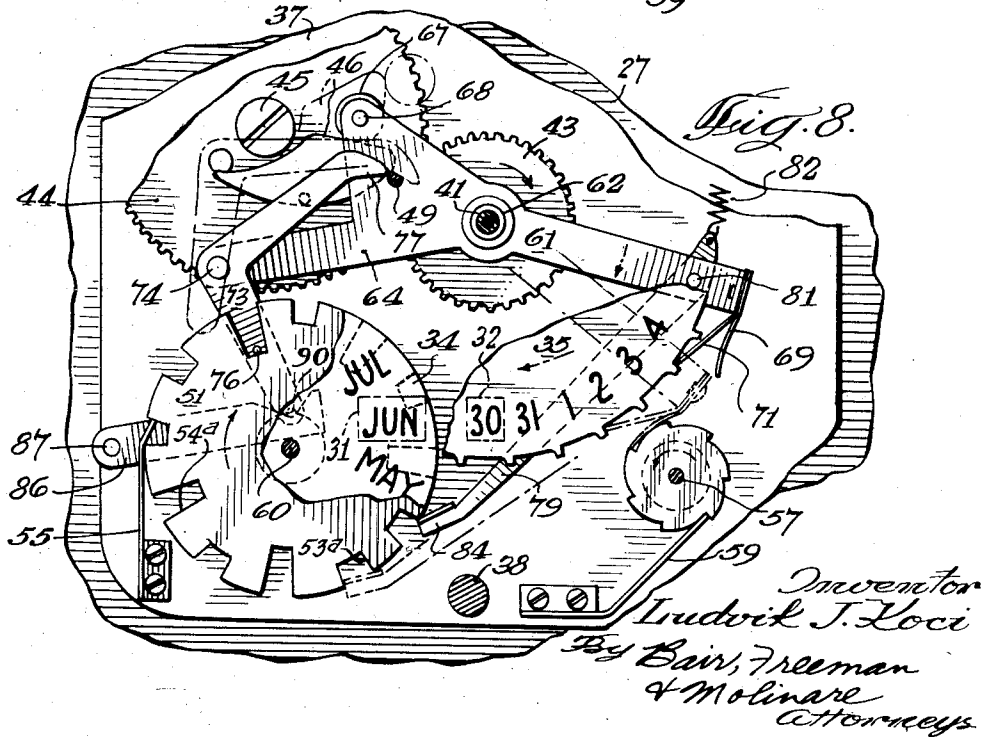
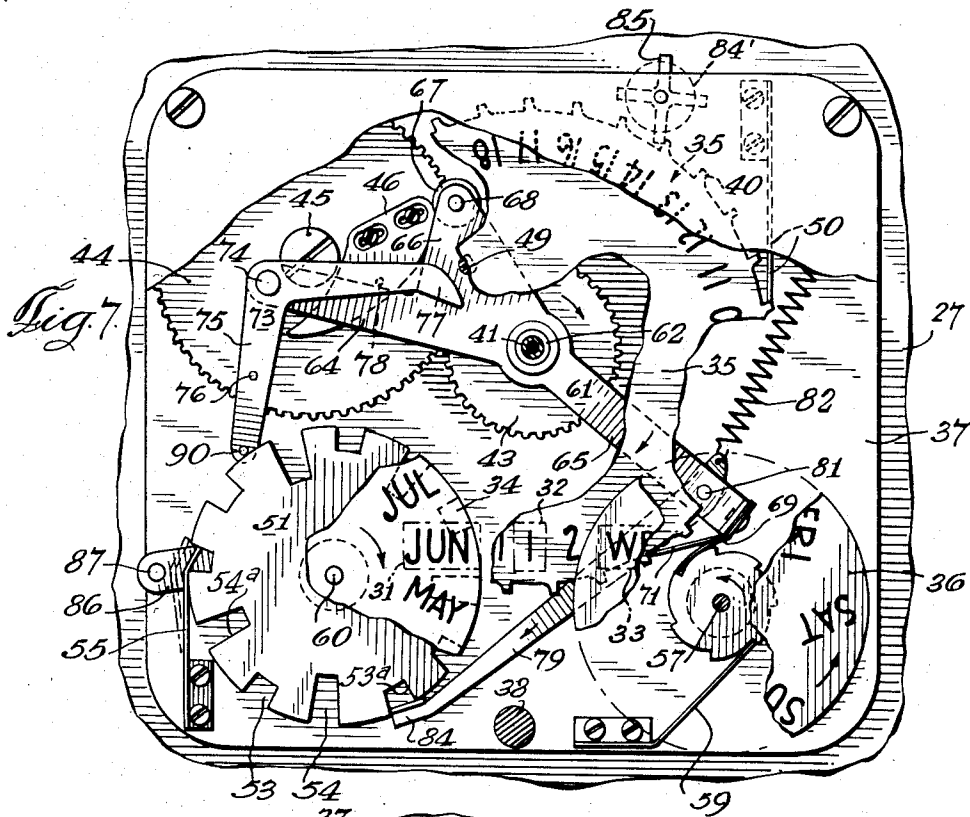
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Fig. 15

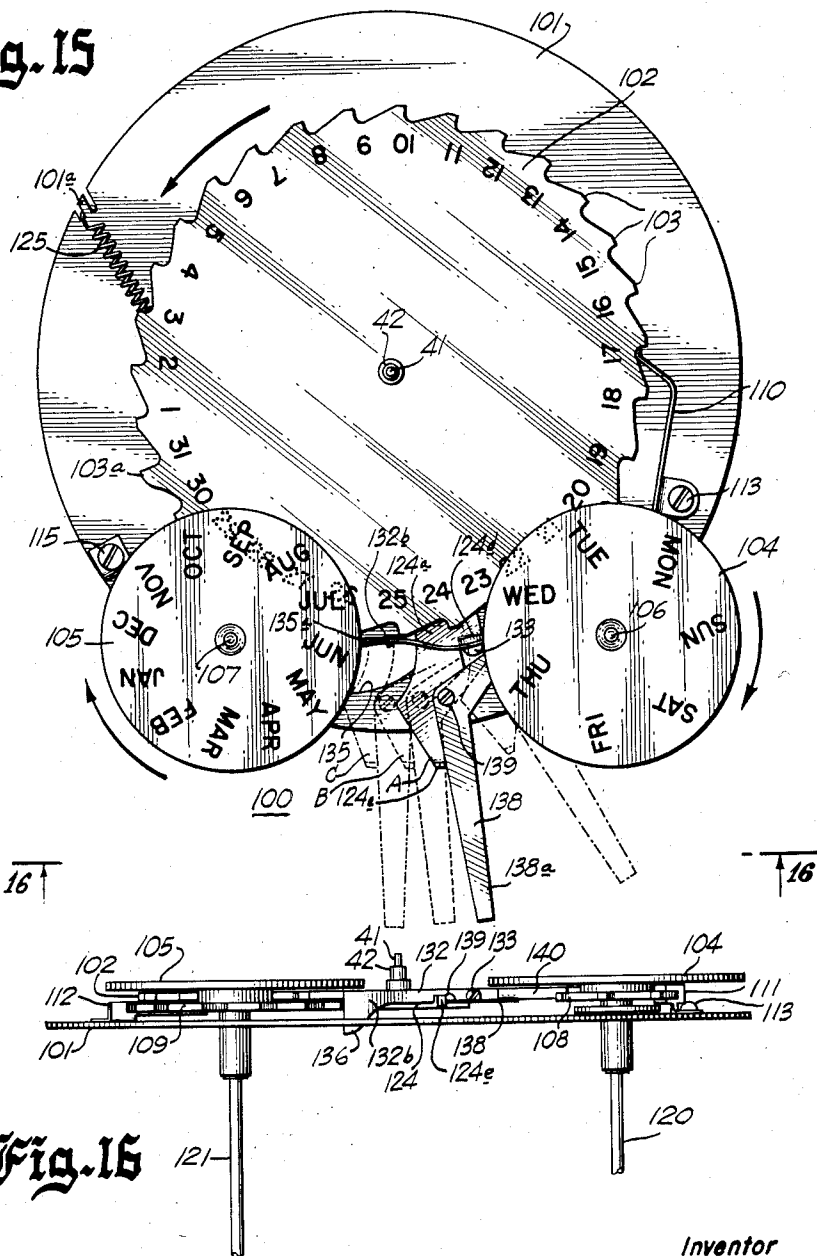


Fig. 16

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Fig. 17

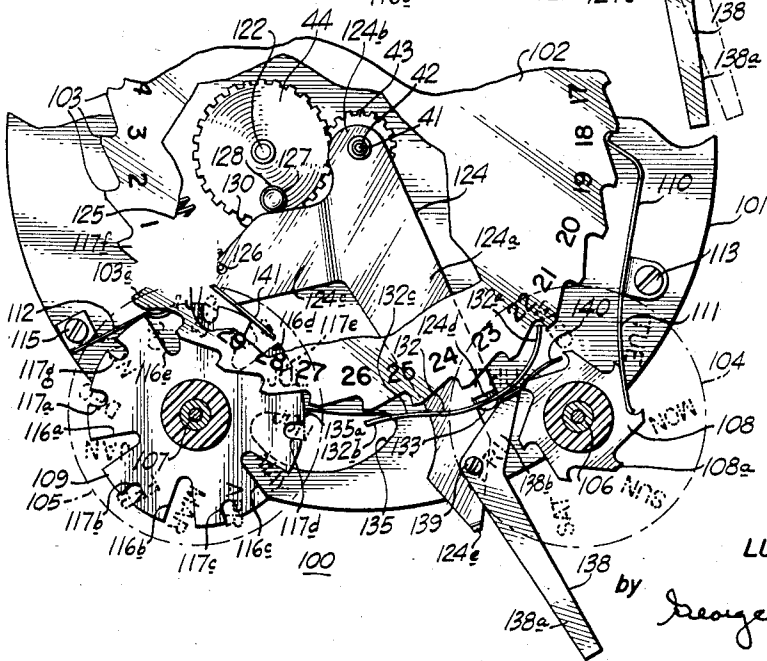
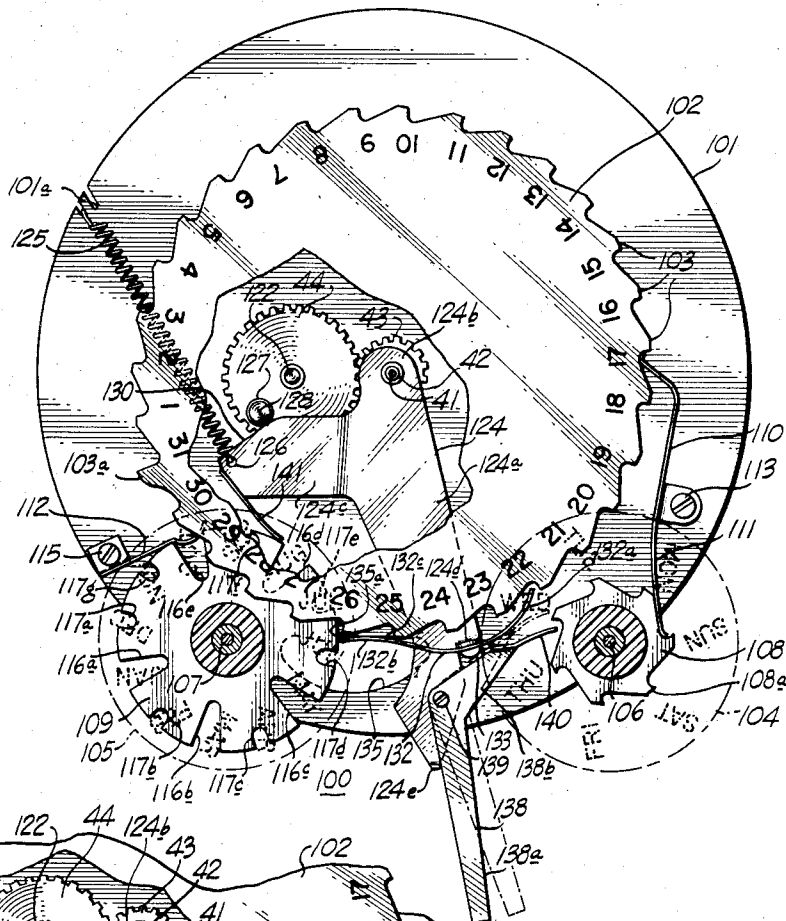


Fig. 18

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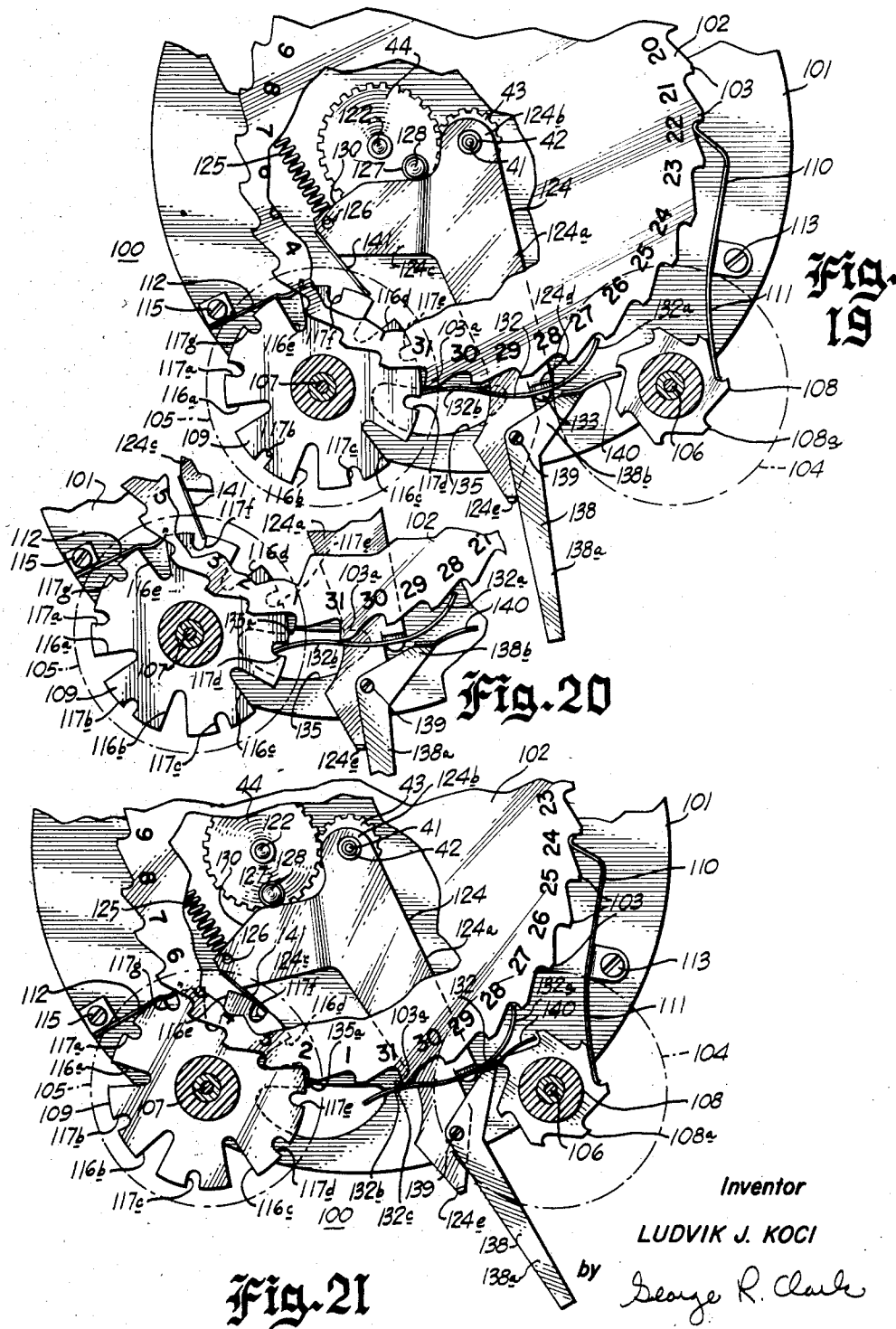
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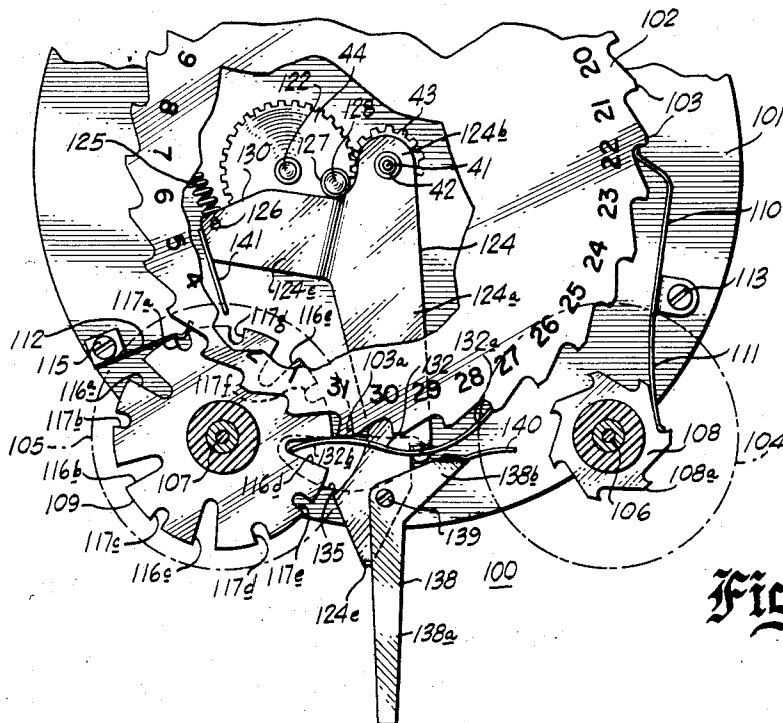


Fig. 22

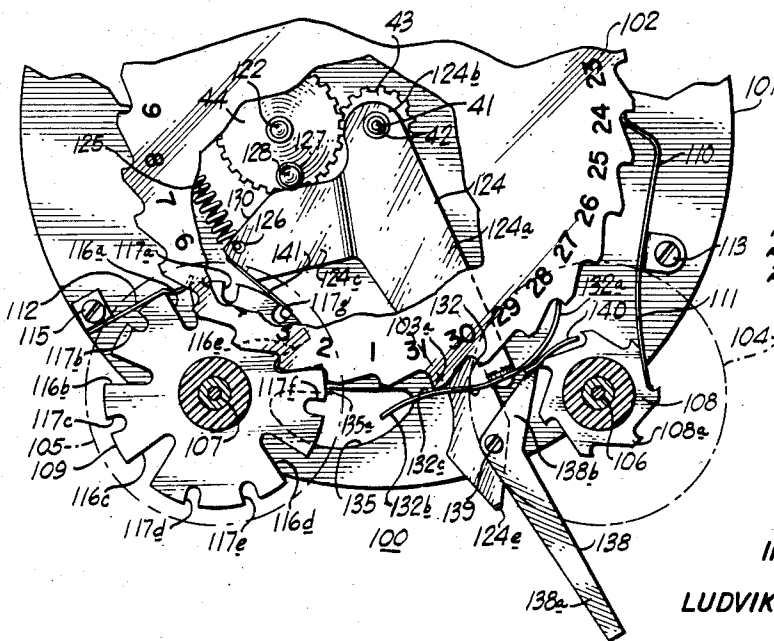


Fig. 23

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CALENDAR MECHANISM

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Application March 29, 1956, Serial No. 574,665

16 Claims. (Cl. 40—112)

The present invention relates to a calendar mechanism, and particularly to a calendar mechanism for association with a clock so as to provide what is commonly termed a calendar clock. This application is a continuation-in-part of a copending Koci application, Serial No. 280,712, filed April 5, 1952, now abandoned, which, in turn, is a continuation-in-part of Koci application Serial No. 219,177, filed April 4, 1951, now abandoned.

Mechanisms for automatic calendars or date indicators, whether perpetual or not, are well known. Moreover, so-called calendar clocks and watches have also been known for a long time. Such calendar mechanisms and calendar clocks must take into account the calendar year and automatically take care of the variations which occur from month to month, and in some cases those variations that occur in different years. The calendar year has a duration of three hundred and sixty-five days, five hours, forty-eight minutes and forty-eight seconds. To compensate for the fractional days occurring at the end of our calendar year, or more particularly to compensate for the difference between the astronomical year as compared with the calendar year of the Gregorian calendar now in general use, the normal year consists of three hundred and sixty-five days, and every year divisible by four is a leap year containing three hundred and sixty-six days. However, to further compensate for the discrepancy between our calendar year and the astronomical year, every centesimal year which is divisible by four is a leap year only when divisible by four hundred. Thus, the centesimal years two thousand, and twenty-four hundred are leap years having three hundred and sixty-six days, while the years twenty-one hundred, twenty-two hundred, and twenty-three hundred have only three hundred and sixty-five days. Obviously, it would be possible to provide a calendar mechanism which would be perpetual, taking into consideration all the differences between the astronomical year and the year of the Gregorian calendar for all time. Such a device would be very complicated and of little use, since the likelihood that anyone would want a calendar mechanism which would operate over several hundred years is very remote. It has been pretty well established that a calendar mechanism which will take care of an entire year requiring an adjustment only at the end of February is adequate. As a matter of fact, the principal drawback of most calendar mechanisms has been the intricacy thereof. It would be desirable to provide a calendar mechanism adapted to be used as a portion of a calendar clock which could be manufactured from standard parts with wide or easy manufacturing tolerances, and which can be operated by surplus power from an ordinary clock.

Accordingly, it is an object of the present invention to provide a calendar mechanism which will correctly indicate the day of the week, the day of the month, and the month of the year, and which will not need to be adjusted or reset except once a year after the last day of February.

It is another object of the present invention to provide

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a calendar mechanism which may be operated by the surplus power of a clock or which may be manually operated, if desired.

It is another object of the present invention to provide a very simple calendar mechanism which is sturdy and foolproof in operation and which may be manufactured in a simple manner, principally from metal stampings or plastic parts and the like, without requiring close tolerances or precision parts.

It is still another object of the present invention to provide a calendar mechanism comprising a simple and compact unit.

Still another object of the present invention resides in a calendar mechanism which properly changes the day of the month at the end of both thirty-day and thirty-one-day months.

It is a further object of the present invention to provide a calendar mechanism having simple and effective means of setting the indicators thereof at proper positions initially or in the event that resetting is required.

Further objects and advantages of the present invention will become apparent as the following description proceeds, and the features of novelty which characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of the present invention, reference may be had to the accompanying drawings, in which:

Fig. 1 is a perspective view of a combined clock and calendar mechanism embodying the calendar mechanism of the present invention;

Fig. 2 is a greatly enlarged sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2 with certain portions thereof cut away, assuming that Fig. 2 shows the complete structure, and illustrating the parts of the mechanism which they assume at approximately noon on Monday, May 30th;

Fig. 4 is a fragmentary view similar to Fig. 3 showing the position the parts assume just before midnight on Monday May 30th;

Fig. 5 is a view similar to Fig. 3 showing the position of the parts on Tuesday, May 31st, shortly after midnight of May 30th;

Fig. 6 is a fragmentary view similar to Fig. 4 showing the position which the parts of the mechanism assume on Tuesday, May 31st, shortly after the position shown in Fig. 4, and showing in dotted lines a second position of some of the parts;

Fig. 7 is a view similar to Figs. 3 and 5 showing the position of the parts on Wednesday, June 1st, shortly after midnight of May 31st;

Fig. 8 is a similar view showing the position of the parts on June 30th shortly before midnight;

Figs. 9 to 14, inclusive, are fragmentary views illustrating the positions of the certain parts of the mechanism at various times during each twenty-four-hour period;

Fig. 15 is a top plan view of a calendar mechanism illustrating another embodiment of the present invention with the parts shown in the position assumed on Wednesday, July 25th, shortly before midnight of that day, and with certain limiting positions of the mechanism being shown in dotted lines, these limiting positions being assumed at different times during the year;

Fig. 16 is a view looking in the direction of the arrows 16—16 of Fig. 15;

Fig. 17 is a top plan view of the mechanism of Fig. 15 with certain portions cut away, illustrating the same position of the parts as in Fig. 15 and further showing in

dotted lines the position of certain parts upon manual actuation thereof;

Fig. 18 is a fragmentary view similar to Fig. 17 illustrating the position of the parts of the mechanism of Fig. 15 immediately after midnight on July 25th, or, in other words, July 26th;

Fig. 19 is a view similar to Fig. 18 with the parts of the mechanism in the position assumed thereby shortly after midnight of July 29th, or, in other words, on July 30th;

Fig. 20 is a fragmentary view similar to Fig. 19 with the parts of the mechanism in the position assumed thereby shortly after midnight of July 30th, or in other words, on July 31st;

Fig. 21 is a view similar to Fig. 19 illustrating the parts in the position assumed thereby just after midnight on July 31st, or, in other words, on August 1st;

Fig. 22 is a view similar to Fig. 19 illustrating the parts in the position assumed thereby just after midnight on September 29th, or, in other words, on September 30th; and

Fig. 23 is a view similar to Fig. 19 showing the parts in the position assumed thereby shortly after midnight of September 30th, or, in other words, on October 1st.

Briefly, the present invention is concerned with a very simple calendar mechanism which requires resetting only once a year, namely, at the end of February, and includes primarily metal stampings or other inexpensive sheet metal parts or even plastic parts which are simple to manufacture and which do not require close tolerances, so that the mechanism may be appended to a conventional clock with little additional manufacturing cost. Essentially, the mechanism comprises a main pivotally mounted operating lever which is adapted to be actuated once each twenty-four hours and at the end of that twenty-four-hour period to cause a rotatable day-of-the-month indicating dial and a rotatable day-of-the-week indicating dial to move forward one notch, such movement to take place approximately at midnight. Additionally, once each month, a month-of-the-year indicating dial is actuated. Also, in the event of a thirty-day month, the day-of-the-month indicator must be moved two days at approximately midnight of the last day of the month. Thus, automatic date information is supplied throughout the year requiring only one manual adjustment at the end of February. Moreover, this is accomplished by three simple dial indicators rotatably mounted about three spaced parallel axes which are located at the apices of a triangle. The main lever is moved in one direction to the same predetermined point by an associated clock mechanism and is returned to one of three different predetermined positions under the influence of a spring. These three different positions are utilized for controlling movement (1) substantially every day except near the end of a month, (2) at the end of a thirty-one-day month, and (3) at the end of a thirty-day month. The only gears required are those for converting the motion of the hour hand of the clock, which conventionally is two revolutions per day, to one revolution per day.

Referring now to Figs. 1 to 14 of the drawings, there is disclosed in Figs. 1 and 2 a calendar clock comprising the casing 21 which houses not only the clock mechanism, but also the calendar mechanism of the present invention. Obviously, the particular configuration of the casing or the type of clock mechanism is unimportant as far as the present invention is concerned. The clock casing 21, which by way of example in Fig. 1 of the drawings is illustrated as a rectangular casing, has associated therewith a shell 22 having an opening therein to expose a suitable stationary clock face dial 23 which is supported in the casing 21 in a conventional manner. The clock mechanism included within the casing 21 is provided with the conventional minute hand 24 and an hour hand

25 which cooperate with the dial 23. Preferably, a glass cover 26 is provided for protecting the dial 23 and the hands 24 and 25, which cover may be secured to the shell 22. The casing 21 also includes a back cover member 27 so that the entire mechanism may be enclosed.

The clock mechanism contained within casing 21 forms no part of the present invention and is illustrated as comprising a standard electric clock motor 29 which drives a conventional clock gear mechanism shown generally at 28. The gear mechanism 28 is arranged to rotate the hands 24 and 25 to indicate the time of day in a conventional manner. It should be appreciated that the clock motor 29 need not be an electric motor but may comprise some other suitable clock mechanism. In any event, the clock mechanism is well known and no further description thereof is included herein.

For the purpose of having associated therewith a calendar mechanism of the present invention, the clock dial 23, which may comprise a metal or plastic plate or the like, is provided at a position thereon readily visible to the user of the clock with a plurality of openings arranged along a line comprising the openings 31, 32 and 33. As illustrated in the drawings, the opening 31 is provided to permit an indication of the month of the year, while the opening 32 permits a showing of the day of the month, and the opening 33 permits a showing of the day of the week. As illustrated in Fig. 1, the legends "May," "30," and "Mon" are visible through the openings 31, 32 and 33, respectively.

In accordance with the present invention, the calendar mechanism shown in Figs. 1 to 14 of the drawings comprises a plurality of superposed indicators movable relative to the dial 23 and relative to each other for respectively indicating at any time the day of the week, the day of the month, and the month of the year. Moreover, these indicators are arranged so that a portion of each is visible through the respective openings 31, 32 and 33 for indicating the designation of a given date. To this end, one of said indicators comprises a rotatable month-of-the-year dial 34 which has the twelve months of the year indicated on one face thereof, with the months spaced equidistant around the periphery, as shown in Figs. 3 and 7 of the drawings. Another of the plurality of superposed indicators comprises a day-of-the-month indicator and is illustrated as a circular dial 35 which has the numbers 1 to 31 on one face spaced equidistantly along the periphery thereof. A third of such plurality of indicators, designated by the reference numeral 36, comprises a circular rotatable dial or disc which has the seven days of the week spaced equidistantly thereabout.

Preferably and as illustrated, the axes of rotation of the three dials 34, 35 and 36 are in spaced parallel relationship and are effectively disposed at the apices of a triangle with portions of the dials overlapping so that the proper indicia will show through the openings 31, 32 and 33 in the face of the clock dial to indicate the correct date. The direction of rotation of the dial 35 is indicated by an arrow in Fig. 3 of the drawings, and the direction of rotation of the dials 34 and 36 is indicated by arrows in Fig. 7 of the drawings. Also as illustrated in the drawings, the dials 34 and 36 are disposed in a common plane in front of the plane of the dial 35, although it will be obvious that the particular positioning of these dials could be varied.

For the purpose of properly supporting the calendar mechanism of the present invention and the associated clock mechanism, there is provided a common mounting plate or support designated as 37, which is disposed in a plane parallel to the dials 34, 35 and 36 and suitably supported in casing 21. The calendar mechanism of the present invention and the associated clock mechanism are secured to the plate 37 by studs 38 and screws 39. The dial 35 preferably is provided with a plurality of

ratchet teeth 40, one for each day of a thirty-one-day month.

It will be appreciated that the clock mechanism 28, which may comprise any standard clock, conventionally rotates an hour shaft specifically designated as 41, which rotates once every hour and drives the minute hand 24. Obviously, the clock mechanism also drives the conventional hour hand shaft 42 which makes one complete revolution every twelve hours and drives the hour hand 25. The shafts 41 and 42 are illustrated as concentric shafts. Preferably, there is associated with the shaft 42 a suitable gear 43, the purpose of which is to convert the twice-a-day rotation of the shaft 42 to a movement which comprises one complete rotation in twenty-four hours. To this end there is provided a gear 44 suitably journaled in the support 37 which meshes with the gear 43 and so designed as to make one complete revolution during each twenty-four-hour period. As illustrated, the gear 44 is journaled on a stud 45 which is secured to the mounting plate 37.

For the purpose of actuating the calendar mechanism of the present invention, there is secured to the gear 44 a specially shaped cam 46 which is illustrated as being secured to the gear 44 by means of screws 47. Slots 48 are provided in cam 46 through which the screws 47 extend, and the slots permit limited adjustment of the cam 46 to compensate for slight manufacturing inaccuracies, thus permitting initial adjustment of the cam for proper operation thereof. It will be apparent that cam 46 secured to the face of gear 44 makes one complete cycle during each twenty-four-hour period.

As indicated above, the dial 35, in addition to indicating the dates of the month, is effectively a ratchet wheel having the plurality of ratchet teeth 40 provided around the periphery thereof, there actually being thirty-one teeth, one for each day of the month which exists in the longest months of the year. Secured to the back of the dial or disc 35 is a pin 49 which rotates with the disc and describes a circular path once during each twenty-four-hour period. This pin 49, which is clearly indicated in Figs. 3 to 8 of the drawings, performs a control function described in greater detail hereinafter. The ratchet teeth 40 are directed in a manner to cause rotation in a clockwise direction, as viewed in Fig. 3 of the drawings, when actuated by a suitable pawl to be described hereinafter. In order to prevent rotation of dial 35 in a counterclockwise or opposite direction, a suitable spring pawl 50, best shown in Figs. 2 and 3 of the drawings, is provided.

To cause proper movement of the month-of-the-year dial 34, there is preferably provided a toothed ratchet plate 51, which ratchet plate is illustrated as being disposed behind the dial 34 and secured thereto by means of a suitable bushing 52. The ratchet plate 51 is provided around the periphery thereof with a plurality of recesses designated as 53 and 54. For a purpose described in detail hereinafter, the recesses 53 are substantially shallower than the recesses 54. Moreover, the rearward or trailing edges of the recesses are disposed at different distances from the centers of the recesses, the trailing edge 53a of each recess 53 being disposed at a smaller distance from the center of the recess 53 than the trailing edges 54a of the deeper recesses 54. There are seven of the shallower recesses 53 which correspond to the seven thirty-one-day months of the year. There are five deeper recesses 54 which correspond to the five months of the year which have thirty days or less. It will be apparent that the recesses are arranged around the periphery of the ratchet wheel 51 in a predetermined pattern so that the thirty-one-day months and the thirty-day or less than thirty-day months are orientated in the proper sequence. Moreover, the position of these recesses is orientated with the particular indicia visible through the opening 31, so that proper movement of the ratchet wheel 51, as described in detail hereinafter, will occur.

In this connection and referring specifically to Fig. 3 of the drawings, the shallow notch 53, partially visible adjacent the legend "Aug," may be designated as the May recess, as will become apparent from the following description, and it is a shallow recess because of the thirty-one-day month. Moving around the ratchet wheel 51 in a counterclockwise direction as viewed in Fig. 3 of the drawings, there next appears in full lines, because of the cutaway portion of dial 34, a deep recess 54 between the legends "Aug" and "Oct," which may be designated as the June recess and, of course, is a deep recess because of the thirty-day month. Continuing to move around the ratchet wheel 51 in a counterclockwise direction, as viewed in Fig. 3 of the drawings, the next two successive recesses are shallow recesses 53 and can be designated as the July and August recesses, since both July and August are thirty-one-day months. Then follows a deep recess 54, which is the September recess, followed by a shallow recess 53 for October, which is completely visible due to the dial 34 being cut away in Fig. 3, followed by another completely visible recess 54, which is the November recess. This is followed by two shallow recesses 53, which are the December and January recesses, followed by a deep recess 54 for February, another shallow recess 53 for March, and a deep recess 54 for April, thus returning to the shallow starting recess 53 which was designated as the May recess.

To prevent counterclockwise rotation of the ratchet wheel 51 and the associated month-of-the-year indicating dial 34, there is provided a spring pawl 55 suitably mounted on support 37. Preferably, the dial 34 and ratchet wheel 51 are mounted for simultaneous rotation about the axis of a shaft 60, which is supported on the mounting plate or support 37 and which is located at one of the apices of the triangle mentioned above.

For the purpose of causing rotation of the day-of-the-week dial 36, it has associated therewith a ratchet wheel 56 which is secured to the dial 36 in any suitable manner for rotation therewith, preferably both being rotatable about the axis of a shaft 57 journaled in the mounting plate 37. As illustrated, the ratchet wheel 56 is provided with seven teeth, designated as 58, one for each day of the week. To prevent clockwise rotation of the day-of-the-week dial 36 and associated ratchet wheel 56, which normally rotates in a counterclockwise direction as viewed in Fig. 7 of the drawings, there is provided a suitable spring pawl 59 which engages the ratchet teeth 58 to permit only counterclockwise rotation thereof. This pawl 59 is suitably supported from the plate or support 37. The day-of-the-month indicating dial 35 is journaled for rotation about the concentric shafts 41 and 42 and which form the other apex of the triangle referred to above.

For the purpose of actuating the various indicating dials described above, the calendar mechanism of the present invention also includes a main operating lever generally indicated at 61. As illustrated in the drawings, this lever is pivotally mounted about the common axis of the concentric shafts 41 and 42 so as to have the same pivotal axis as the axis of rotation of the day-of-the-month indicating dial 35. To insure proper operation, a pair of concentric collars 62 and 63 are provided, the collar 62 immediately surrounding the outer shaft 42 of the two concentric shafts, and the collar 63 being disposed within an opening defined in the lever 61 whereby lever 61 is free to pivot about this common axis of the shafts 41 and 42. As illustrated in the drawings, the lever 61 is effectively a Y-shaped lever including arms 64, 65 and 66, the arm 66 comprising the base of the Y, and the arms 64 and 65 comprising the upper part of the Y. A roller 67 is indicated as being pivotally supported at the free end of the arm or projection 66, and this roller is disposed in a position to be engaged by the cam 46, mentioned above. Obviously, since the cam 46 rotates about the axis of gear 44 once during

each twenty-four-hour period, it will impart pivotal movement to the main lever 61 once each day when cam 46 engages the roller 67. The relationship of cam 46 and roller 67 is such that the movement of lever 61 occurs approximately at midnight of each day.

For the purpose of actuating the day-of-the-month cam 35 and the day-of-the-week cam 36 in response to limited pivotal movement of the Y-shaped lever 61, the arm 65 thereof extends adjacent the peripheries of both the ratchet teeth 40 of the dial 35 and adjacent the ratchet teeth 58 associated with the dial 36. Moreover, for actuating these ratchet teeth, a pair of pawls 69 and 71, indicated as spring fingers, are secured to this end of the lever 61 adjacent the ratchet teeth, the pawl 69 being engageable with the ratchet teeth 58 and the pawl 71 being engageable with the ratchet teeth 40. It will be apparent that pivotal movement once during each twenty-four-hour period of the lever 61 could be utilized to move the day-of-the-month dial 35 and the day-of-the-week dial 36 forwardly one ratchet tooth for each cycle of pivotal movement of the main operating arm 61.

Associated with the month-of-the-year ratchet wheel 51, there is an L-shaped lever or stop member generally indicated at 73, which is pivoted as indicated at 74 to the end of the arm 64 of Y-shaped lever 61. The L-shaped lever 73 has one arm 75 which extends in a direction toward the day-of-the-month ratchet wheel 51 and includes a pin 76 thereon which, as will become apparent from the following description, is capable of engaging with the periphery of dial 51 or with different ones of the recesses 53 and 54 therein, as the case may be. The lever 73 further includes the arm 77 having a motion limiting stop pin 78 secured thereto on the side thereof opposite the location of the pin 76 and capable of engaging the edge of arm 64 of lever 61.

In order to move the month-of-the-year dial 34, and specifically the ratchet wheel 51 connected thereto, there is provided a pawl or lever 79 which is pivoted to the end of the lever 61, and specifically the arm 65 thereof adjacent the point thereof to which the pawls 69 and 71 are secured. The pivotal junction between the pawl 79 and the arm 65 of the lever 61 is designated at 81. To bias the lever 61 in a counterclockwise direction as indicated in Fig. 3 of the drawings, there is provided a tension spring 82 which has one end thereof connected to a stud 83 on the mounting plate 37, the other end of the spring 82 being connected to the pawl 79 adjacent its pivotal connection with the lever 61. The spring 82 obviously tends to bias the lever 61 in a counterclockwise direction, as viewed in Figs. 3 to 8 of the drawings, and since the L-shaped lever 73 and the pawl 79 are secured to arms 64 and 65 of lever 61, it similarly tends to bias them in the same predetermined direction. This movement produced by the spring 82 is opposite to and in opposition to the movement of lever 61 caused by virtue of cam 46 engaging the roller 67 secured to the arm 66 of the lever 61. The head of the pawl 79 designated by the reference numeral 84 is adapted to engage with the recesses 53 or 54 to cause, once each month, incremental movement of the dial 34 and associated ratchet wheel 51 about the axis of shaft 60. Such incremental movement will comprise one-twelfth of a revolution of dial 34.

It will be apparent that in initially setting the calendar mechanism to the correct date, manual movement of the day-of-the-month dial 35 is required. To accomplish this, a knob 84' is provided for rotating a ratchet wheel 85 which is adapted to engage the teeth 40 associated with the periphery of the dial 35. As best shown in Fig. 2 of the drawings, the ratchet wheel 85 may be connected through an elongated shaft with the knob 84' which may protrude from the back of the casing 21 to permit correct setting of the day of the month in a simple manner. By virtue of the pawl 50, it will be

apparent that only clockwise rotation of the day-of-the-month dial 35 can occur.

Obviously, to adjust the day-of-the-week dial 36, manual actuating means must also be provided, particularly initially to set up the correct calendar information. Of course, in the event an electric clock is employed as the driving means, a power failure will require resetting of the mechanism. To this end there is suitably secured to shaft 57 for rotation thereof a knob (not shown) which can rotate the dial 36 only in a counterclockwise direction by virtue of the pawl 59. In a similar manner the month-of-the-year dial 34 may be manually actuated as by means of a knob 92 drivingly connected to shaft 60 for rotating the ratchet wheel 51 and associated dial 34. It will be apparent that if the pin 76 attached to the arm 75 of L-shaped lever 73 happens to be in one of the recesses 53 or 54 in the ratchet wheel 51, manual rotation thereof by knob 92 will be prevented. For the purpose of moving lever 73 and, consequently, lifting pin 76 out of one of the recesses 53 or 54 to permit manual rotation of the ratchet wheel 51 for adjustment purposes, there is preferably provided a lever 86 pivoted at 87 to the support 37. This lever 86 is indicated as being provided with a notch 88 disposed directly beneath the arm 75 of the lever 73 so as to receive therein a pin 90 secured to the arm 75 below the pin 76. Preferably, there is provided a member 93 which upon initial rotation of the knob 92 causes lifting of the notch 88 in the lever 86 whereby manual rotation of the month-of-the-year dial 34 in a clockwise direction can readily be accomplished. It will be appreciated that the member 93 will cause lifting of the notch 88 before any rotation of the ratchet wheel 51 occurs.

It should be understood that the clock mechanism 23—29 will be provided with suitable means manually to set the hands 24 and 25 thereof to the correct time of day. As best shown in Fig. 2 of the drawings, a knob 91, adapted to rotate a shaft 89, is provided for this purpose. With this arrangement it is apparent that the time of day, the month of the year, the day of the month, and the day of the week may all be manually set when the calendar mechanism is originally set up. Thereafter, assuming that the associated clock does not stop, it will be unnecessary to make any adjustments except at the end of February each year. This will become more apparent from the ensuing description of the operation of the calendar mechanism.

Considering now the operation of the calendar mechanism shown in the drawings, it will be apparent that Fig. 3 shows the parts of the mechanism in the positions these parts would assume at about noon on Monday, May 30th. These illustrated positions are merely by way of example. In this condition of the mechanism, the cam 46 is still about twelve hours removed from actuating the roller 67, and, consequently, the lever 61 is biased to the position shown under the influence of the spring 82. As there indicated, the pin 76 on the lever 73 engages the periphery of the ratchet wheel 51 at a point between the shallow May recess and the deeper June recess. These recesses are so designated, since they are effective to perform certain control operations at the end of May and June, respectively. The pin 76, due to the position of the trailing edge 53a of the slot 53, does not fall into the recess, although if it were a deeper recess 54 it would fall in due to the position of trailing edge 54a farther from the center of the recess. The stop pin 78 on the opposite side of lever 73 from the pin 76 is moved into engagement with the top edge of the arm 64 of the lever 61 by virtue of spring 82, as viewed in Fig. 3 of the drawings. Effectively then, the pins 76 and 78 engaging the ratchet wheel 51 and the arm 64 of lever 61 limit the rotation of the lever 61 in a counterclockwise direction under the influence of spring 82. This is one of three limiting positions of lever 61 and is the normal one which it assumes for substantially all the days of the year ex-

cept the last day or days of each month. The pin 49 secured to the back side of the day-of-the-month dial 35 is moving in a clockwise direction about the axis of shaft 41 toward the path of movement of the arm 77 of the lever 73. At noon on May 30th, all of the parts of the calendar mechanism are stationary, with the exception of the gear 44 which is moving at the rate of one revolution during each twenty-four-hour period.

As the gear 44 rotates during the afternoon of May 30th, as viewed in Fig. 3 of the drawings, the cam 46 will ultimately reach the successive positions shown in Figs. 9, 10, 11, 12 and 13 of the drawings. Fig. 9 shows the position of cam 46 just as it engages the roller 67 associated with the lever 61, while Fig. 10 indicates an instant a short time period thereafter as continued movement of cam 46 causes movement of roller 67 and, consequently, rotation of lever 61 about the axis of shafts 41 and 42. Figs. 11, 12 and 13 then show successive stages in the movement of the cam 46 right at midnight or shortly thereafter. It will be apparent that this will occur every day at the same time.

In Fig. 4 of the drawings the remainder of the calendar mechanism is shown in the position which the parts assume when the cam 46 is in the position of Fig. 10 of the drawings. In this position some movement of the lever 61 in a counterclockwise direction has occurred. It will be apparent that the pawl 71 has engaged ratchet teeth 40 of the day-of-the-month dial 35, and pawl 69 has engaged one of the seven ratchet teeth 58 of the ratchet wheel 56 associated with the day-of-the-week dial 36. Obviously, continued clockwise rotation of the main lever arm 61 will cause one tooth forward movement of each of the dial 35 and the ratchet wheel 56, and the legend "31" indicating the thirty-first day of May is just moving into the opening 32 in Fig. 4 of the drawings. Although not shown, the next day of the week Tuesday on the dial 36 will move into the opening 33. As the cam 46 continues its rotation, it causes the continued clockwise rotation of the lever 61, which lifts the lever 73 and the associated pin 76 away from the month-of-the-year ratchet wheel 51. Due to the early stopping of the lever 61 when returned by spring 82, the head portion 84 of the pawl 79 does not engage any of the notches 53 or 54 in the ratchet wheel 51 to move the same one notch, but merely rides on the periphery thereof, as is clear from Figs. 3 and 4 of the drawings. The relative position of the pin 49 on dial 35 and the arm 77 of the lever 73 is not changed due to the lifting of the lever 73 simultaneously with the movement of the dial 35 and, consequently, the pin 49.

As the high point of the cam 46 passes the effective point of engagement with roller 67, represented by Fig. 11 of the drawings and also shown in Fig. 5, the day-of-the-week and day-of-the-month indications are changed. This is the position assumed by the mechanism on Tuesday, May 31st, shortly after midnight on May 30th. Thus, the maximum clockwise stroke of the lever 61 has been reached. Thereafter the cam 46 is provided with a gently sloping tail so that the lever 61 does not abruptly shift in position, with the result that the pawl 79 might be jarred into one of the recesses in the month-of-the-year cam 51. Thus, the lever 61 is permitted to return by moving in a counterclockwise direction under the influence of spring 82 at a relatively slow rate governed by the shape of the cam 46 when moving from the position of Fig. 11 to the position of Fig. 13 of the drawings. Moreover, during all of the motion of the mechanism that has occurred, the head 84 of the pawl 79 merely rides on the periphery of the day-of-the-month ratchet wheel 51, and the pin 76 associated with the lever 73 has no opportunity to drop into one of the recesses 53 or 54 of the ratchet wheel 51.

As the cam 46 continues to rotate from the position shown in Fig. 5 to the position shown in Fig. 6, the cam 46 is no longer in engagement with the roller 67. By

this time the lever 61 has begun to return to its initial position, and in so doing the pin 49 on the dial 35 engages with the arm 77 of the lever 73, with the result that pivotal rotation of the L-shaped lever 73 about the pivot point 74 occurs. Such pivotal movement from the dotted line position of Fig. 6 to the solid line position thereof, which is in a counterclockwise direction about pivot point 74, causes pin 76 to move into the shallow recess 53 which has been designated as the May recess of ratchet wheel 51. Such movement of the pin 76 into the shallow recess 53 permits the lever 61 to return to a greater extent than it could when the pin 76 engaged the periphery of the month-of-the-year ratchet wheel, with the result that the head 84 of the pawl 79 is moved sufficiently counterclockwise as to permit it to engage one of the recesses in the ratchet wheel 56, as clearly shown in Fig. 6 of the drawings. This is the second of the three limiting positions of lever 61 and occurs only at the thirty-first day of the thirty-one-day months. In this condition the pawls 69 and 71 have moved back of another tooth so as to be in a position for actuating the associated ratchet teeth forwardly. Actually, the pawl 69 is disengaged from the teeth 58 of the ratchet wheel 56 associated with the day-of-the-week dial 36. It will be apparent that when the parts are in the positions shown in Fig. 6 of the drawings, the next time that lever arm 61 is actuated the month-of-the-year ratchet wheel 51 and associated dial 34 will be actuated one notch in addition to actuation of dials 35 and 36.

This can best be understood from Fig. 7 of the drawings where the cam 46 has again reached the position similar to Fig. 11 of the drawings just after midnight on May 31st. Under these conditions it will be apparent that the day-of-the-month dial 35 is moved so that the legend "1" is visible through the opening 32. Also, the month-of-the-year dial 35 has been moved by pawl 79 so that the legend "Jun," representing the month of June, is visible through the opening 31. Similarly, the day-of-the-week dial 36 has been actuated so that the legend "Wed," representing the day Wednesday, is visible through the opening 33. The rotation of one step forward of the day-of-the-month dial 35 causes the pin 49 to rotate to the position shown in Fig. 7, and this is permitted while the lever arm 61 moves in a counterclockwise direction with pin 76 moved out of one of the recesses 53 and 54 whereby L-shaped lever 73 may pivot without interference from the pin 49. Obviously, the pin 49 will not again be in a position to affect the lever 73 until the end of another month when the dial 35 is rotated a full revolution. In the position shown in Fig. 7 of the drawings, the pin 78 of the L-shaped lever 73 engages the arm 64 of the lever 61 and is held in that position by the force of gravity.

From the above description it is apparent that the mechanism moves the various dials in the proper manner, the dials 35 and 36 being moved once each day and the dial 34 once a month. The only other problem involved is the movement at the end of a thirty-day month, and this can best be understood by reference to Fig. 8 of the drawings, which shows the parts in positions somewhat similar to those of Fig. 6 of the drawings, but at approximately midnight of June 30th. It will be apparent from Fig. 8 that in this case, unlike the case of Fig. 6, the pin 76 has moved into the recess 54, which is a deep recess having also a greater width as compared with the shallow recess 53 in which the pin 76 was disposed in Fig. 6. This, of course, permits the arm 61 to move under the influence of spring 82 to the maximum limit of its counterclockwise rotation, which movement is sufficiently great to slide over two of the teeth 40 on ratchet wheel 35, whereby when subsequently actuated the ratchet wheel 35, which is the day-of-the-month dial, will move forward two spaces instead of the usual one, thereby skipping the date June 31st, which does not exist, and moving directly to July 1st. Upon the next clockwise actuation of the lever 61 under the influence of the cam 46, since the pawl

69 is out of engagement with the ratchet teeth 58 of the ratchet wheel 56 associated with the day-of-the-week dial for a substantial portion of the stroke, it will only advance the day-of-the-week dial one notch, which is desirable. The day-of-the-month dial will, however, only be advanced one notch, and it is readily apparent from a comparison of Figs. 6 and 8 of the drawings that two different limits of movement of the lever 61 in these two figures occur. This can best be seen by reference to the position of pawl head 84 of pawl 79, which in Fig. 6 has just moved into one of the recesses 53, whereas in Fig. 8 it is moved substantially beyond the recess but not sufficiently far to catch a second one and move the month-of-the-year dial more than one notch forwardly. The lever 75, and specifically the pin 76 mounted thereon, enters the slot 54 in Fig. 8 of the drawings on June 30th in the same manner that it entered the slot 53 on the thirty-first day of the month in a thirty-one day month. However, as was mentioned above, the slots on the month-of-the-year ratchet wheel 51 differ not only in depth, but also in angular width. The trailing edges 54a of the recesses 54 are so located that the pin 76 drops into the deep slots on the thirtieth day, whereas the edges 53a of the shallow recesses 53 are disposed so that the pin 76 drops therein only after the thirty-first day of the month is reached, when pin 49 performs the function shown in Fig. 6 of the drawings.

Fig. 13 clearly illustrates the three different limiting positions of the lever arm 61, and specifically the roller 67. One of these positions is the normal position, since it occurs once a day for most of every month. Then there is the thirty-one-day month stop which permits greater movement of lever 61, and, finally, the thirty-day month stop which permits greatest movement of lever 61. These last two stops are used only on the last day of thirty-one-day or thirty-day months, respectively.

In order to prevent damage to or jamming of the parts if for some reason the rotation of gear 44 is reversed, the cam 46 is designed with the trailing slope best shown in Figs. 9 to 14 of the drawings. As a matter of fact, Fig. 14 shows what happens if, when the cam is in the position of Fig. 13, its movement is reversed. It is quite obvious that with this arrangement it merely moves the lever 61 without jamming the parts.

From the above description it will be apparent that by means of a very simple linkage mechanism the lever 61 is always moved in a clockwise direction to the same extent by the cam 46, but the limit of counterclockwise rotation varies, and, in fact, three separate limits are provided which are clearly indicated by the three positions of the roller 67 in Fig. 13 of the drawings. The minimum counterclockwise rotation normally occurs throughout the major portion of the month. However, at the end of the month, depending upon whether it is a thirty-day month or a thirty-one-day month, the stop means for limiting the maximum counterclockwise rotation of the lever 61 is varied in dependence upon the pin 76 and the ratchet wheel 51.

In view of the detailed description included above, it is believed that the operation of the calendar mechanism of the present invention will readily be understood by those skilled in the art, as will also the functions of the stop means and the devices for setting the calendar mechanism either when it is first purchased or in the event of a power outage should the clock 28 be an electric clock. At the end of February during each year a manual adjustment is necessary. It will be apparent that there has been provided a very simple mechanism which is completely automatic, requiring manual actuation only once each year. Moreover, the parts need not be made to close tolerances, and most of the parts, except gears 43 and 44, may be made from simple metal stampings or from plastic.

In Figs. 15 to 23 of the drawings, there is illustrated a modification of the present invention which requires even fewer parts than the preceding embodiment. Like the pre-

ceding embodiment, it depends upon the variable positioning of stop means for limiting pivotal movement of a main spring-returned lever. Referring now to Figs. 15 to 22, there is indicated generally a calendar mechanism designated by the reference numeral 100, which calendar mechanism may be associated with the clock 28 described above and, of course, will be mounted in a suitable casing such as shown in Fig. 1 of the drawings. The clock mechanism and the casing have been eliminated, however, in order to simplify the disclosure and the description. As in the preceding embodiment, the calendar mechanism 100 comprises a main support or mounting plate 101 which corresponds to the plate 37 in Fig. 2 of the drawings. Suitably secured to the mounting plate 101 is the conventional clock mechanism having the concentrically disposed minute hand shaft 41 and the hour hand shaft 42, which may be identical with those shafts in the preceding embodiment and, hence, are designated by the same reference numerals. As in the preceding embodiment, a plurality of superposed rotatable indicators are associated with the support 101. These indicators include a rotatable day-of-the-month indicating dial 102 which may be formed of a suitable plastic or the like and which has the days of the month spaced equidistant from one another on the face of the dial adjacent the periphery thereof. Preferably, the dial 102, as in the preceding embodiment, is provided along its periphery with a plurality of ratchet teeth 103, thirty-one such teeth being provided, of which thirty are identical and the thirty-first tooth, designated as 103a, being substantially longer but subtending the same angular increment as the other thirty teeth. The purpose of the large tooth 103a will become apparent as the following description proceeds. The dial 102, as in the preceding embodiment, is rotatable about the axis of the concentric shafts 41 and 42.

The superposed rotatable indicators, in addition to the indicating dial 102, include indicating dials 104 and 105, the indicating dial 104 being a day-of-the-week dial, and the indicating dial 105 being a month-of-the-year dial. The dial 104 is rotatable with a shaft 106 journaled in the support 101, while the dial 105 is rotatable with a shaft 107 also journaled in the support 101. Preferably and as in the preceding embodiment, the axes of the shafts 106, 107 and 41 are parallel and are spaced at the apices of a triangle which is substantially an equilateral triangle, as illustrated in the drawings. Moreover and as will be clearly evident from Fig. 16 of the drawings, the dials 104 and 105 are disposed in the same plane and overlie the dial 102. In any event, the dials are arranged so that the month of the year, the day of the month and the day of the week will appear simultaneously along a line as in Fig. 1 of the drawings, suitable windows being provided in a dial, which preferably includes a clock face, to insure that only the legends pertinent to a particular day are visible.

For the purpose of controlling the movement of the dials 104 and 105, each has associated therewith, as in the preceding embodiment, a suitable ratchet wheel, the day-of-the-week dial 104 having associated therewith a ratchet wheel 108, while the month-of-the-year dial has associated therewith a ratchet wheel 109. In the drawings the ratchet wheels 108 and 109 are illustrated as being disposed in substantially the same plane beneath the dial 102, so that, effectively, the dial 102 extends into the space between the dial 105 and its associated ratchet wheel 109, and between the dial 104 and its associated ratchet wheel 108. Obviously, the described arrangement provides a very compact mechanism, but it should be understood that other arrangements might also be used. It should also be understood that the dial 104 and its associated ratchet wheel 108 are mounted so as to rotate together, and, similarly, the dial 105 and its associated ratchet wheel 107 are also secured together so as to rotate as a unit about the axis of shaft 107. The direction of rotation of the dials 102, 104 and 105 is indicated by arrows in Fig. 15 of the drawings, the dials 104 and 105 rotating in a clockwise

direction, as viewed in Fig. 15, while the dial 102 rotates in a counterclockwise direction. It will be apparent that the particular rotation will depend upon the manner in which the indicia are applied to the dials, and it may be noted that the dial 102 rotates in the opposite direction from the dial 35 in the preceding embodiment, since the indicia are oppositely arranged. Similarly, the dial 104 rotates oppositely from the direction of rotation of the dial 36 of the preceding embodiment, while the dial 105 rotates in the same direction as the dial 34 of the preceding embodiment. This clearly indicates that the particular direction of rotation may be varied, although considerable simplification results from the arrangement of Fig. 15 of the drawings over that of Fig. 3 of the drawings.

For the purpose of preventing rotation of dials 102, 104 and 105 in directions other than the desired directions of rotation, as indicated by the arrows in Fig. 15 of the drawings, there are provided a plurality of pawls 110, 111 and 112 which engage the respective ratchet wheels associated with the dials. Specifically, the pawl 110 secured to the support 101 as by fastening means 113 engages the teeth 103 of dial 102 to prevent other than counterclockwise rotation thereof as viewed in Fig. 15 of the drawings. Similarly, the pawl 111, which is indicated in the drawings as being a continuation of the pawl 110 and secured to the support 101 by the same fastening means 113, engages the teeth 108a of ratchet wheel 108 to prevent other than clockwise rotation thereof. Incidentally, the ratchet wheel 108 is provided with seven teeth, one for each of the seven days of the week, and this ratchet wheel may be identical with the ratchet wheel 56 of the preceding embodiment. Also, the pawl 112, which is secured to the support 101 as by fastening means 115, engages spaced recesses designated as 116 and 117 defined in the ratchet wheel 109. The recesses 116 are deep recesses, five of them being disposed around the periphery of the ratchet wheel 109, while the recesses 117 are shallow recesses, seven of them being provided around the periphery of the ratchet wheel 109. The seven recesses 117 correspond to the thirty-one-day months, of which there are seven, while the recesses 116 correspond to the months having thirty days or less, of which there are five. The recesses are arranged so as to be substantially equally spaced around the periphery of the ratchet wheel 109, and arranged in the calendar sequence of the thirty-one-day and thirty-day or less than thirty-day months. Moreover, the recesses 116 and 117 are arranged so that they correspond with the legends on the indicating dial 105 secured thereto and rotatable therewith. Actually, the recesses 116 are provided with subscripts *a*, *b*, *c*, etc., and the recesses 117 are provided with subscripts *a*, *b*, *c*, etc., to indicate the particular month that they control. Specifically, the recesses 117a, 117b, 117c, 117d, 117e, 117f and 117g correspond to the months of January, March, May, July, August, October and December, respectively, while the recesses 116a, 116b, 116c, 116d and 116e correspond to the months of February, April, June, September and November, respectively. Whenever a particular one of the recesses 116 or 117 is effective, then the legend of the corresponding month will be in position to be visible through the opening such as 31 in Fig. 1 of the drawings. This will become more apparent from the following description. The pawl 112 prevents undesirable rotation of the dial 105 and associated ratchet wheel 109.

As in the preceding embodiment, manual means are provided for adjusting the positions of the dials 104 and 105. As best shown in Fig. 16 of the drawings, a shaft 120 is secured to the ratchet wheel 108 and associated dial 104, and, similarly, a shaft 121 is secured to the ratchet wheel 109 and associated dial 105. It will be understood that the shafts 120 and 121 will extend through the casing for the mechanism, as, for example, in Fig. 2 of the drawings, to permit adjustment in a simple manner.

In order to actuate the calendar mechanism of the present invention in response to the elapse of a predeter-

mined time, there are provided, as in the preceding embodiment, the gears 43 and 44, the gear 43 being secured to the hour shaft 42 in the conventional manner so as to make one revolution every twelve hours, while the gear 44 in meshing engagement therewith makes one revolution during each twenty-four-hour period. The gear 44 is illustrated as being rotatable about the axis of a suitable shaft 122 suitably journaled in the support 101.

For the purpose of actuating the various dial members defining the calendar mechanism 100 of the present invention, there is provided a main lever 124 which corresponds to the lever 61 of the preceding embodiment and is pivotal about the axis of the concentric shafts 41 and 42. Also as in the preceding embodiment, the lever 124 is somewhat of a Y-shaped lever including arms 124a, 124b and 124c. The pivot point of the lever 124 is substantially at the end of the arm 124b. A suitable spring 125, illustrated in the drawings as a tension spring, is connected between the support 101 and the arm 124c of the lever 124 to bias the lever in a clockwise direction. As illustrated, the tension spring has one end thereof hooked to a projection 101a integral with the support 101, and the other end hooked into an opening 126 defined in the arm 124c of the lever 124.

To actuate the lever 124 to perform certain operations with respect to the superposed indicators comprising dials 102, 104 and 105, there is provided on the gear 44 a suitable roller 127 rotatable about a shaft 128 secured to the face of the gear 44 at a point displaced from the axis of rotation thereof. This roller 127 functions very much in the manner of the cam 46 described in connection with the preceding embodiment and cooperates with a cam surface 130 defined on the arm 124c of the lever 124. During the rotation of the gear 44, which rotates at one revolution during a twenty-four-hour period and approximately at midnight, the roller 127 begins to engage the cam surface 130 to cause counterclockwise rotation of the lever 124 about the pivotal axis thereof in a manner similar to that described in the preceding embodiment, so that once during each twenty-four-hour period the lever 124 is actuated by the roller 127 to move to a predetermined position in a counterclockwise direction and then is permitted to return to three different stop positions described hereinafter by the force exerted by tension spring 125.

For the purpose of actuating the day-of-the-month dial 102, the lever 124 is provided with an integral projection 124d to which is secured as by fastening means 133 a combined pawl and stop member 132. The member 132 includes a pawl portion 132a which is disposed to engage the teeth 103 to cause counterclockwise rotation of the dial 102. The member 132 includes a somewhat flexible stop arm portion 132b which extends in a direction opposite from that of the portion 132a, and this is effectively a stop member for limiting the maximum clockwise rotation of the lever 124 under the influence of the spring 125. This stop arm 132b also includes a sort of raised cam surface 132c for a purpose described in detail hereinafter. Stop arm 132b extends toward the ratchet wheel 109 and also has a somewhat lateral projection 136 (Fig. 16) extending into an opening 135 defined in the support plate 102, which opening is provided with a shoulder 135a which acts as a stop to engage the end of the stop arm 132b. This shoulder 135a (best shown in Figs. 18 and 23) is substantially coincident with the periphery of the ratchet wheel 109. It will be appreciated that the lateral projection 136 at the end of the stop arm 132b, best shown in Fig. 16 of the drawings, projects through the opening 135 in the plate 101, and whenever the stop arm 132b engages the shoulder 135a, as is the case in Fig. 17 of the drawings, further clockwise movement of the lever 124 under the influence of spring 125 is prevented. This is the normal stop used once every day except the last day or two of each month. However, if the flexible stop arm 132b is displaced downwardly as

viewed in Fig. 17 of the drawings, then it will move free of the shoulder 135a and will engage an adjacent portion of ratchet wheel 109. It will be obvious that if the stop arm 132b should happen to move into one of the recesses 116 or 117, two different stop positions of the lever 124 are permitted in addition to the so-called normal stop position referred to above when the stop arm 132b engages the shoulder 135a. These three stop positions of lever 124 are shown in Fig. 15 of the drawings as the A, B and C positions. The A position is shown in full lines and is used during most of every month. The B position is the thirty-one-day stop position used at the end of a thirty-one-day month, and the C position is the thirty-day stop position used at the end of a thirty-day month. Thus, as in the preceding embodiment, the lever 124 is moved by the roller 127 to the same extent in one direction, specifically the counterclockwise direction, but will be stopped in three separate and independent positions insofar as the clockwise rotation thereof under the influence of the spring 125 is concerned.

In order to actuate the day-of-the-week ratchet wheel 104 and also for manual actuation, as will become apparent from the ensuing description, there is pivotally supported from the end of the arm 124a of the lever 124 remote from the pivotal axis thereof an L-shaped lever 138 comprising a manually engageable arm 138a and a pawl supporting arm 138b. As illustrated, the L-shaped lever is pivoted by means of pivot 139 to the lever 124. Preferably, the lever 124 includes a projection 124e at the end thereof adjacent the pivot 139 for limiting the maximum clockwise rotation of the lever 138 relative to the lever 124, as viewed in Figs. 15 and 19 of the drawings. The pawl supporting arm 138b of the lever 138 extends toward the ratchet wheel 108 associated with the day-of-the-week dial 104 and includes a pawl member 140 which is adapted to engage with the ratchet teeth 108a. Normally, the lever 138 assumes the position shown in Figs. 17 and 19 of the drawings under the influence of gravity, with the arm 138a engaging the stop 124e, and upon counterclockwise rotation of the lever 124, the lever 138 is effectively an integral extension thereof. Thus, upon counterclockwise rotation of the lever 124, the pawl 140 will move the day-of-the-week dial in a clockwise direction a distance equal to one-seventh of a full rotation thereof.

From the above description it will be apparent that the pivotally movable lever 124 through the pawl 132a will actuate the dial 102 at the end of each twenty-four-hour period and through the pawl 140 and associated lever 138 will also actuate the dial 104 once each twenty-four-hour period. In order to actuate the month-of-the-year dial 105, there is provided a pawl member 141 secured to the end of arm 124c of lever 124. This pawl is directed toward the periphery of the ratchet wheel 109 so that it will rotate the ratchet wheel 109 and associated dial 105 in a clockwise direction one-twelfth of a rotation at the end of each month.

In view of the detailed description set forth above, the operation of the mechanism of Figs. 15 to 23 of the drawings will readily be understood by those skilled in the art. However, a brief description of what occurs during most of the days of the month, at the end of a thirty-day month and at the end of a thirty-one-day month is described hereinafter better to enable one to understand the operation of the calendar mechanism of the present invention. In Figs. 15, 16 and 17 of the drawings the mechanism is shown sometime during the day of Wednesday, July 25th, which particular date has no significance but has been shown merely to illustrate a conventional operation. In this condition of the mechanism, the stop arm 132b engages the shoulder 135a defined in the opening 105 and the position of the parts is best shown in Fig. 17 of the drawings. This is the position of the lever 124 in its normal or A stop position which it assumes every day of every month except for the last day

or two. In this position the pawl 141 engages the periphery of the ratchet wheel 109, as clearly shown in Fig. 17, but is not in a recess 116 or 117. The pawl 132a is in engagement or substantial engagement with one of the teeth 103 associated with the dial 102, and, similarly, the pawl 140 is in engagement with one of the teeth 108a of the ratchet wheel 108 associated with the dial 104. At approximately midnight of the day represented by the mechanism as shown in the positions of Figs. 15 and 17 of the drawings, the roller 127 begins to engage the cam surface 130, and continued rotation of the gear 44 causes the lever 124 to pivot in a counterclockwise direction about the common axis of the shafts 41 and 42, as viewed in Fig. 17 of the drawings. This results in movement of the dial 102 by an increment of rotation equal to one-tooth width, or, in other words, one-thirty-first of a revolution, and a rotation of the ratchet wheel 108 through one-seventh of a complete revolution. The pawl 141, however, rides on the surface or periphery of the ratchet wheel 109 so that no movement thereof occurs, and, in fact, movement is prevented by virtue of the pawl 112. This is best shown in Fig. 18 of the drawings, where there is illustrated the position of the parts at about the maximum point of the counterclockwise rotation of the lever 124 against the force of the spring 125. The large tooth 103a of ratchet wheel 102 is in a position where it has no effect.

When the thirtieth day of the thirty-one-day month (July) is reached, the parts of the mechanism 100 are as shown in Fig. 19 of the drawings. It will be observed that the large tooth 103a in this position extends closely adjacent the raised cam portion 132c defined on the flexible stop arm 132b, and as the day-of-the-month dial 102 has moved to the position shown in Fig. 19 of the drawings, it engages this raised cam surface 132c and deflects the stop arm 132b slightly, as viewed in Fig. 19 of the drawings, so as to be free of the shoulder 135a. Under these conditions the tension spring 125 will tend to move the lever 124 very slightly in the clockwise direction until the stop arm 132b engages the periphery of ratchet wheel 109. Due to the relatively narrow opening into the shallow recesses 117, the stop arm is deflected only sufficiently to engage the periphery of ratchet wheel 109 and not sufficiently to enter the recess 117d, which is the July recess for controlling movement at the end of July. At midnight of July 30th, the day-of-the-month dial 102, and of course the day-of-the-week dial 104 are each moved forwardly one notch upon movement in a counterclockwise direction of the lever 124. Such movement will cause the large tooth 103a to move from the position of Fig. 19 to the position of Fig. 20. Upon the return movement of the lever 124 under the influence of spring 125, the large tooth 103a again strikes the cam surface 132c or stop arm 132b at a point closer to the pivot point of arm 132b, thus causing greater deflection than the previous day, when the tooth 103a engaged the surface 132c farther from the pivot point. Hence, the greater deflection of arm 132b causes it to enter recess 117d, thus permitting lever 124 to reach the B position of Fig. 15. In this position pawl 141 has moved into recess 117f so that upon subsequent counter-clockwise rotation of lever 124 all three dials 102, 104 and 105 will be moved forwardly one increment each or from July 31st to August 1st. In Fig. 21 the parts of the mechanism are shown during the movement of the lever 24 approximately at midnight of July 31st, or substantially at the beginning of August 1st.

The other condition to consider is the operation at the end of a thirty-day month, best shown in Figs. 22 and 23 of the drawings. Fig. 22 shows the parts of the mechanism just after midnight of September 29th, or, in other words, at the beginning of September 30th. Fig. 22 corresponds to Fig. 19 insofar as the position of the day-of-the-month dial 102 is concerned. However, in Fig. 19, the July recess 117d, which is a

shallow recess, is adjacent the end of the stop arm 132b, while in Fig. 22 the September recess 116d, which is a deep recess, is adjacent the end of stop arm 132b. Moreover, when the lever 124 is pivoted in a counterclockwise direction at approximately midnight of September 29th, the dial 102 is moved forwardly one ratchet tooth or, in other words, one-thirty-first of a revolution. Upon subsequent return or clockwise rotation of the lever 124 under the influence of spring 125, the large tooth 103a is in a position to engage the cam surface 132c, thus deflecting the flexible stop arm 132b out of engagement with the shoulder 135a. Moreover, due to the width of the entrance to September recess 116d, the stop arm 132b moves directly into this deep recess, unlike the situation in Fig. 19 at the corresponding time in a thirty-one-day month when the stop arm engages the periphery of the ratchet wheel 109. The depth of the September recess 116d is such that lever 124 may reach position C as shown in Fig. 15 of the drawings, and the pawl 132a moves sufficiently in a clockwise direction to skip over a second tooth 103 of ratchet wheel 102, whereby upon subsequent actuation on the midnight of September 30th the day-of-the-month dial 102 will be actuated two teeth forwardly so as to skip September 31st and move directly to October 1st. Moreover, under these conditions the pawl 141 will move the month-of-the-year dial 105 one notch forwardly. The pawl 140, for actuating the day-of-the-week dial 104, is so designed as to never move the ratchet wheel 108 more than one-seventh of a revolution, even though the day-of-the-month dial may be actuated two notches or increments. Fig. 23 illustrates the position of the parts shortly after midnight of September 30th when the three dials have all been actuated to give a proper showing of October 1st on the calendar mechanism.

In order to actuate the dial 102 manually for initial setup purposes, and also at the end of February once each year, the manual arm 138a of the lever 138 is actuated. Such manual actuation of the arm 138a tending to move the lever 124 in a counterclockwise direction first pivots the lever 138 slightly about the pivot point 139 until the pawl portion 140 engages the pawl arm 132a. This sort of lost motion connection results first in moving pawl 140 to an ineffective position as far as ratchet wheel 108 is concerned, so that upon further movement of the lever 124 in a counterclockwise direction the lever 124 moves much in the same manner as when actuated by the roller 127, and the day-of-the-month dial 102 can thereby be manually actuated in a simple manner without at the same time moving the day-of-the-week dial.

While there have been illustrated and described several embodiments of the present invention, it will be obvious to those skilled in the art that various changes and modifications thereof may be made, and it is aimed in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the present invention.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A calendar mechanism for association with a clock device and adapted to be driven thereby, comprising a support, a plurality of superposed indicators rotatably mounted on said support and relative to each other for respectively indicating days of the week, days of the month and months of the year, said indicators being arranged so a portion of each is simultaneously visible for indicating the designation of a given date, one of said indicators comprising a rotatable day-of-the-month indicating dial having date numbers from one to thirty-one spaced equidistantly therearound and having thirty-one ratchet teeth spaced equidistantly about a circle movable with said day-of-the-month indicating dial, another of said indicators comprising a rotatable day-of-the-week indicating dial having the days of the week spaced equi-

distantly therearound, uniformly spaced ratchet teeth movable with said day-of-the-week indicating dial, another of said indicators comprising a rotatable month-of-the-year indicating dial having the months of the year spaced equidistantly therearound, a ratchet wheel rotatable with said month-of-the-year indicating dial, a member pivotally mounted about the axis of one of said superposed indicators, means for pivoting said member in one direction once every twenty-four hours, spring means for restoring said member following pivotal movement thereof, variably positioned stop means for limiting the maximum return movement of said member under the influence of said spring means, and means responsive both to pivotal movement and variable positioning of said member for causing said indicators correctly to indicate the date regardless of whether a thirty day or thirty-one day month is involved.

2. In a calendar mechanism, a support, a plurality of superposed indicators rotatably mounted on said support and relative to each other for respectively indicating days of the week, days of the month and months of the year, said indicators being arranged so a portion of each is simultaneously visible for indicating the designation of a given date, one of said indicators comprising a rotatable day-of-the-month indicating dial having date numbers from one to thirty-one spaced equidistantly therearound and having thirty-one ratchet teeth spaced equidistantly about the periphery thereof, another of said indicators comprising a rotatable day-of-the-week indicating dial having the days of the week spaced equidistantly therearound, uniformly spaced ratchet teeth movable with said day-of-the-week indicating dial, another of said indicators comprising a rotatable month-of-the-year indicating dial having the months of the year spaced equidistantly therearound, a ratchet wheel rotatable with said month-of-the-year indicating dial, a member pivotally mounted on said support, means periodically pivoting said member in one direction, spring means for returning said member following such pivotal movement thereof, variably positioned stop means for limiting the maximum return movement of said member under the influence of said spring means, and means responsive to the variable positioning of said member for causing said indicators correctly to indicate the date regardless of whether a thirty-day or thirty-one-day month is involved, said member including three pawl means, one for actuating each of said superposed indicators.

3. A calendar mechanism for association with a clock device and adapted to be driven thereby, comprising a support, three independent superposed indicators rotatably mounted on said support about three spaced parallel axes for respectively indicating days of the week, days of the month and months of the year, said indicators being arranged so a portion of each is simultaneously visible for indicating the designation of a given date, a first of said indicators comprising a rotatable day-of-the-month indicating dial having date numbers from one to thirty-one spaced equidistantly therearound and having thirty-one ratchet teeth spaced equidistantly about the periphery thereof, a second of said indicators comprising a rotatable day-of-the-week indicating dial having the days of the week spaced equidistantly therearound, uniformly spaced ratchet teeth movable with said day of the week indicating dial, the third of said indicators comprising a rotatable month-of-the-year indicating dial having the months of the year spaced equidistantly therearound, a ratchet wheel rotatable with said month-of-the year indicating dial, a member pivotally mounted about one of said axes, means for pivoting said member in one direction once every twenty-four hours, spring means for restoring said member following pivotal movement thereof, variably positioned stop means defined in substantial part by said ratchet wheel rotatable with said month-of-the-year dial for limiting the maximum return movement of said member under the influence of said spring means, and means

responsive to the variable positioning of said member for causing said indicators correctly to indicate the date regardless of whether a thirty day or thirty-one day month is involved.

4. In a calendar mechanism capable of being driven from the surplus power of a clock device, the combination of a support, three independent superposed indicators mounted for rotation about a plurality of spaced axes perpendicular to said support for respectively indicating days of the week, days of the month and months of the year, said indicators being arranged so a portion of each is simultaneously visible for indicating the designation of a given date, a first of said indicators comprising a rotatable day-of-the-month indicating dial having date numbers from one to thirty-one spaced equidistantly therearound and having thirty-one integral ratchet teeth spaced equidistantly about the periphery thereof, the second of said indicators comprising a rotatable day-of-the-week indicating dial having the days of the week spaced equidistantly therearound, uniformly spaced ratchet teeth movable with said day-of-the-week indicating dial, the third of said indicators comprising a rotatable month-of-the-year indicating dial having the months of the year spaced equidistantly therearound, a ratchet wheel rotatable with said month-of-the-year indicating dial, a main Y-shaped member pivotally mounted on said support for rotation about the axis of said day-of-the-month dial for pivoting said member about the axis of said day-of-the-month dial in one direction once during each twenty-four-hour period, spring means for returning said member following pivotal movement by said last mentioned means, a stop arm movable with said lever, variably positioned stop means for engaging said stop arm to limiting the maximum return movement of said member under the influence of said spring means to three independent stop positions, and means responsive to the variable positioning of said member for causing said indicators correctly to indicate the date regardless of whether a thirty-day or thirty-one-day month is involved, one of said stop positions being used every day of the month except the last day or two, another of said stop positions being used only at the end of thirty-one-day months, and the third of said stop positions being used at the end of thirty-day months.

5. In a calendar mechanism, a support, three dials mounted for rotation on said support for indicating days of the month, days of the week and months of the year respectively, said dials being rotatable about spaced parallel disposed axes, said axes being effectively located at the three apexes of a triangle, a calendar mechanism actuator on said support, a main lever pivotally mounted about one of said axes and having a plurality of pawls secured thereto for actuating said dials for indicating days of the month and days of the week once every day and for actuating said dial for indicating months of the year once a month, cam means connected to said actuator for pivoting said main lever in one direction at uniformly recurring intervals, spring means for biasing said lever in the opposite direction, said dial for indicating the months of the year having rotatable therewith a disk member having a plurality of substantially equally spaced ratchet teeth defined in the periphery thereof, said teeth being defined by recesses between said teeth of varying depth corresponding to the months of the year, one depth corresponding to months having thirty-one days and the other depth corresponding to months having thirty days or less, said recesses being orientated around the periphery of said disk member in the orientation of the thirty-one-day months and the other months of the year, a stop lever pivoted to said main lever and having a stop pin thereon arranged to coact with said disk member, said stop pin being engageable with either the bottom of a shallow recess, the bottom of a deep recess or the space between two recesses, pivotal movement of said main lever causing one increment of movement of each of said dials for indicating days of the

month and days of the week without any movement of said dial for indicating months of the year when said pin is in engagement with the space between two recesses, pivotal movement of said main lever causing simultaneous movement to the extent of one increment each of all of said dials when said stop pin is in one of said shallow recesses, and pivotal movement of said main lever causing two increments of movement of said dial for indicating days of the month and one increment of movement of each of said other two dials when said stop pin is in one of said deep recesses.

6. A calendar mechanism comprising a rotatable day-of-the-month dial having equally spaced ratchet teeth around the periphery thereof, one for each of the maximum number of days that can occur in a month and including indicia indicating the days of the month thereon, a rotatable day-of-the-week dial having ratchet teeth fixed with respect thereto corresponding to the number of days in a week and including indicia indicating the days of the week thereon, a rotatable month-of-the-year dial having a ratchet wheel rotatable therewith, including twelve equally spaced teeth defined in the periphery of said wheel corresponding to the number of months in the year, said month of the year dial having indicia thereon indicating the months of the year, said twelve ratchet teeth being defined by twelve spaced recesses in the periphery of said wheel five of which are deeper than the other seven, said deep recesses representing months having thirty days or less while said shallow recesses represent thirty-one-day months, said shallow and deep recesses being orientated around said wheel in the orientation of the thirty-one-day and thirty-day or less months of the year, a support, means for rotatably mounting said three dials about spaced parallel axes disposed perpendicularly to said support and arranged essentially at the apexes of a triangle, a main lever pivotally mounted about one of said apexes, and pawl means secured to said main lever for engaging the ratchet teeth associated with each of said dials to cause incremental movement of said dials at predetermined times.

7. In a calendar mechanism, the combination of a support, a plurality of independent superposed indicators rotatably mounted on said support for respectively indicating days of the week, days of the month and months of the year, said indicators being arranged so a portion of each is simultaneously visible for indicating the designation of a given date, one of said indicators comprising a rotatable day-of-the-month indicating dial having date numbers from one to thirty-one spaced equidistantly therearound and having thirty-one ratchet teeth spaced equidistantly about the periphery thereof, the ratchet tooth associated with the date number indicating the thirty-first day of the month being longer than said other teeth, another of said indicators comprising a rotatable day-of-the-week indicating dial having the days of the week spaced equidistantly therearound, uniformly spaced ratchet teeth movable with said day-of-the-week indicating dial, another of said indicators comprising a rotatable month-of-the-year indicating dial having the months of the year spaced equidistantly therearound, a ratchet wheel rotatable with said month-of-the-year indicating dial, a member pivotally mounted on said support, means for periodically pivoting said member in one direction, spring means for returning said member following such pivotal movement thereof, variably positioned stop means for limiting the maximum return movement of said member under the influence of said spring means, means engageable by said longer ratchet tooth at the end of each month for rendering different ones of said stop means effective, and means responsive to the variable positioning of said member for causing said indicators correctly to indicate the date regardless of whether a thirty-day or thirty-one-day month is involved.

8. In a calendar mechanism, a support, three dials mounted for rotation on said support for indicating days of the month, days of the week and months of the year respectively, said dials being rotatable about spaced parallel disposed axes, said axes being effectively located at the three apexes of a triangle, said day-of-the-month dial having thirty-one equally spaced ratchet teeth around the periphery thereof, the thirty-first of said teeth being longer than the others, a main lever pivotally mounted about the axis of said day-of-the-month dial and having a plurality of pawls secured thereto for actuating said day-of-the-month and day-of-the-week dials once every day and for actuating said month-of-the-year dial once a month, cam means for pivoting said main lever in one direction at uniformly recurring intervals, spring means for biasing said lever in the opposite direction, said dial for indicating the months of the year having rotatable therewith a disk member having a plurality of substantially equally spaced ratchet teeth defined in the periphery thereof, said teeth being defined by recesses between said teeth of varying depth corresponding to the months of the year, the shallow recesses corresponding to months having thirty-one days and the deep recesses corresponding to months having thirty days or less, said recesses being orientated around the periphery of said disk member in the orientation of the thirty-one-day months and the other months of the year, a flexible stop arm secured to said main lever and movable with said main lever along a path close to said ratchet teeth by said day-of-the-month dial, a stop member on said support for engaging said stop arm to limit the maximum movement of said main lever and stop arm under the influence of said spring means, said stop member being disposed adjacent the periphery of said disk member said long ratchet tooth being so positioned at the end of each month to deflect said flexible stop arm out of engagement with said stop member and into engagement with said disk member, pivotal movement of said main lever causing one increment of movement of each of said day-of-the-month and day-of-the-week dials without any movement of said month-of-the-year dial when said stop arm engages said stop member, pivotal movement of said main lever causing simultaneous movement to the extent of one increment each of said three dials when said stop arm is deflected by said longer ratchet tooth into one of said shallow recesses at the end of a thirty-one-day month, and pivotal movement of said main lever causing two increments of movement of said day-of-the-week dial and one increment of movement of each of said other two dials when said stop arm is deflected by said longer ratchet tooth into one of said deep recesses at the end of months having less than thirty days.

9. A calendar mechanism comprising a rotatable day-of-the-month dial having equally spaced ratchet teeth around the periphery thereof one for each of the maximum number of days that can occur in a month and including indicia indicating the days of the month thereon, a rotatable day-of-the-week dial having ratchet teeth fixed with respect thereto corresponding to the number of days in a week and including indicia indicating the days of the week thereon, a rotatable month-of-the-year dial having a ratchet wheel rotatable therewith, including twelve equally spaced teeth defined in the periphery of said wheel corresponding to the number of months in the year, said month-of-the-year dial having indicia thereon indicating the months of the year, said twelve ratchet teeth being defined by twelve spaced recesses in the periphery of said wheel five of which are deeper than the other seven, said deep recesses representing months having thirty days or less while said shallow recesses represent thirty-one-day months, said shallow and deep recesses being orientated around said wheel in the orientation of the thirty-one-day and thirty-day or less months of the year, a support, means for rotatably mounting said three dials about spaced parallel axes disposed perpendicu-

larly to said support and arranged essentially at the apexes of a triangle, a main lever pivotally mounted about the axis of rotation of said day-of-the-month dial and pawl means secured to said main lever arm for engaging the ratchet teeth associated with each of said dials to cause incremental movement of said dials at predetermined times, and means including a special ratchet tooth on said day-of-the-month dial for causing two increments of movement of said day-of-the-month dial at the end of thirty-day months and only one increment of movement at the end of thirty-one-day months.

10. The calendar mechanism of claim 1 in which manual means are provided for moving each of said indicators.

11. The calendar mechanism of claim 1 in which a pivotally mounted manually actuable lever is secured to said main member for manual adjustment of said day of the month indicating dial, said manually actuable lever including a pawl thereon for moving said day-of-the-week dial, means for moving said manually actuable lever as a unit with said member to actuate said day-of-the-week dial once during each twenty-four hour period, and an effective lost motion connection between said lever and said member whereby, said pawl on said lever is rendered ineffective to move said day-of-the-week dial upon manual actuation of said lever.

12. The calendar mechanism of claim 6 wherein said main lever is a Y-shaped member and said pawl means are secured to at least two arms of said Y-shaped member.

13. The calendar mechanism of claim 6 wherein said main lever is a Y-shaped member with the pivot point at the end of one of the arms of the Y.

14. The calendar mechanism of claim 1 in which one of said stop means comprises a shoulder defined on said support and the other stop means comprise portions of the ratchet wheel associated with the month-of-the-year dial.

15. The calendar mechanism of claim 6 in which said day-of-the-week and month-of-the-year dials are disposed in a common plane above said day-of-the-month dial, the indicia on said day-of-the-month dial being exposed in the space between said other two dials.

16. A calendar mechanism comprising a rotatable day-of-the-month dial having equally spaced ratchet teeth around the periphery thereof, one for each of the maximum number of days that can occur in a month and including indicia indicating the days of the month thereon, a rotatable day-of-the-week dial having ratchet teeth fixed with respect thereto corresponding to the number of days in a week and including indicia indicating the days of the week thereon, a rotatable month-of-the-year dial having a ratchet wheel rotatable therewith, including twelve equally spaced teeth defined in the periphery of said wheel corresponding to the number of months in the year, said month-of-the-year dial having indicia thereon indicating the months of the year, said twelve ratchet teeth being defined by twelve spaced recesses in the periphery of said wheel five of which are of a different depth than the other seven, said five recesses representing the five months during the year having thirty days or less while said other seven recesses of different depth than said five representing the thirty-one-day months during the year, said five recesses and said seven recesses being orientated around said wheel in the orientation of the thirty-day or less and thirty-one-day months of the year, a support, means for rotatably mounting said three dials about spaced parallel axes disposed perpendicularly to said support and arranged essentially at the apexes of a triangle, a main lever pivotally mounted about one of said apexes, and pawl means secured to said main lever

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for engaging the ratchet teeth associated with each of said dials to cause incremental movement of said dials at predetermined times.

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