Oct. 7, 1941. C. GOLDTHWAIT 2,257,947

AUTOMATIC CALENDAR

Filed Sept. 26, 1940 5 Sheets-Sheet 1

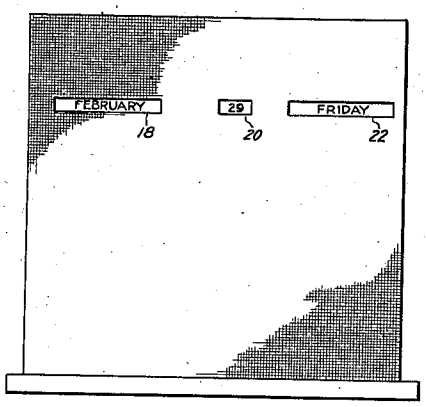


Fig 1

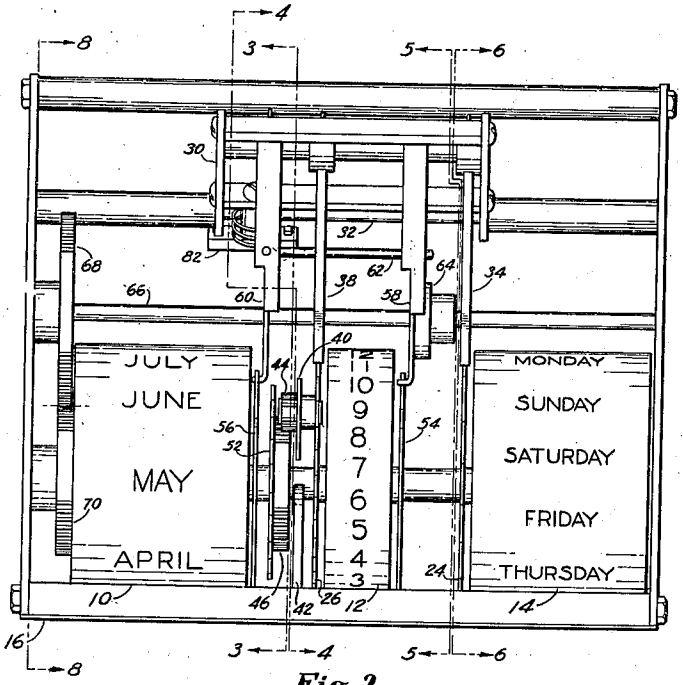


Fig 2

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Oct. 7, 1941. C. GOLDTHWAIT 2,257,947

AUTOMATIC CALENDAR

Filed Sept. 26, 1940 5 Sheets-Sheet 2

Fig 3

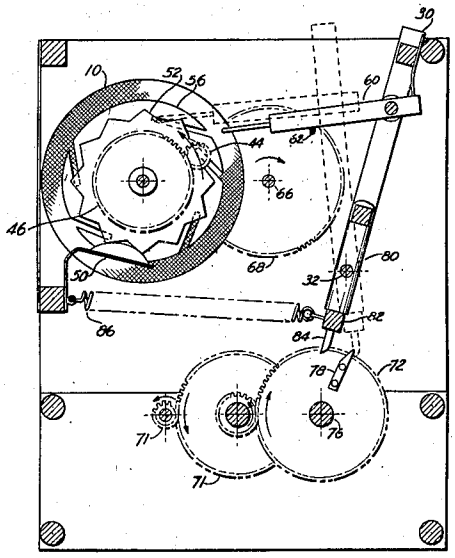
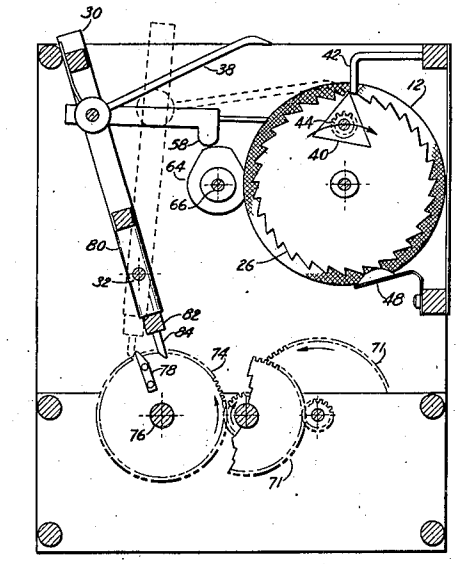


Fig 4



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Oct. 7, 1941. C. GOLDTHWAIT 2,257,947

AUTOMATIC CALENDAR

Filed Sept. 26, 1940 5 Sheets-Sheet 3

Fig 5

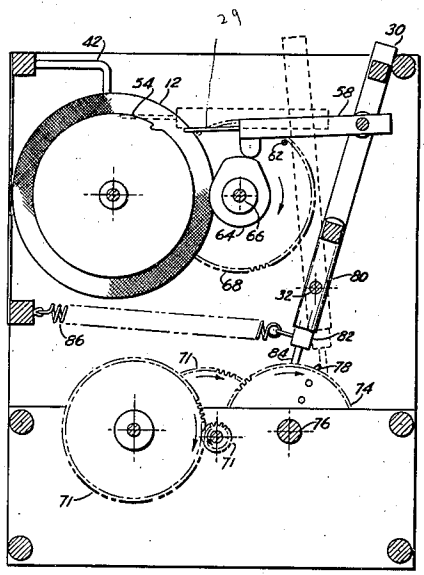
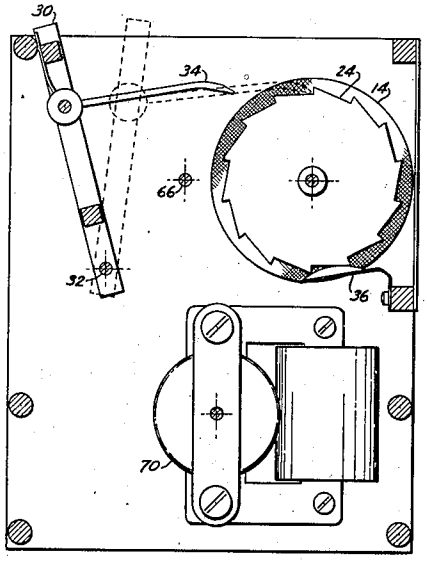


Fig 6



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Oct. 7, 1941. C. GOLDTHWAIT 2,257,947

AUTOMATIC CALENDAR

Filed Sept. 26, 1940 5 Sheets-Sheet 4

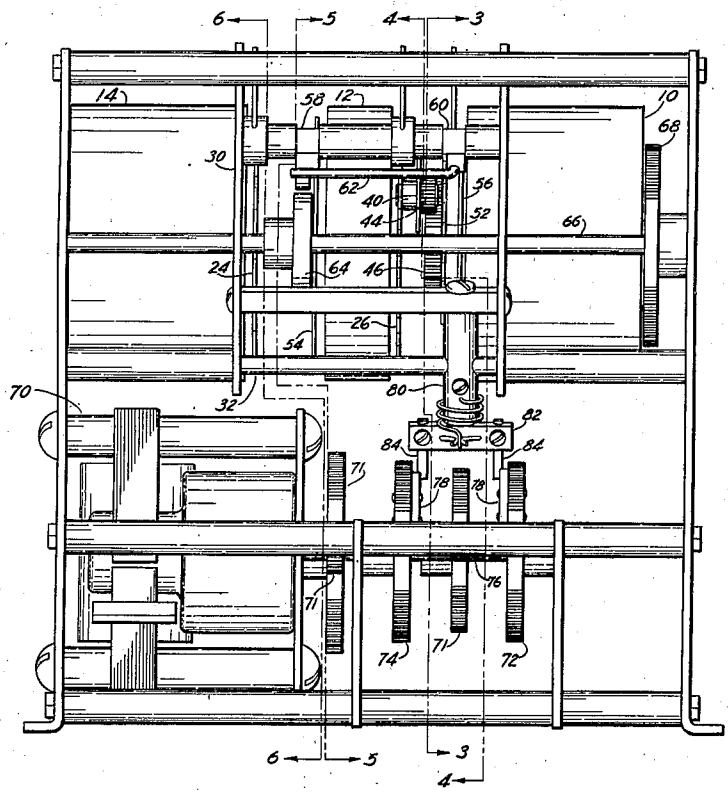


Fig 7

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Oct. 7, 1941. C. GOLDTHWAIT 2,257,947

AUTOMATIC CALENDAR

Filed Sept. 26, 1940 5 Sheets-Sheet 5

Fig 8

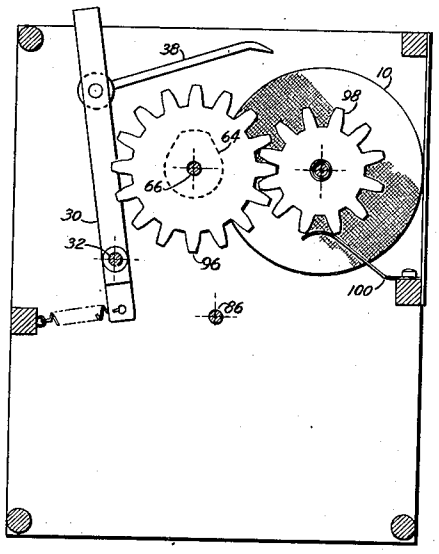
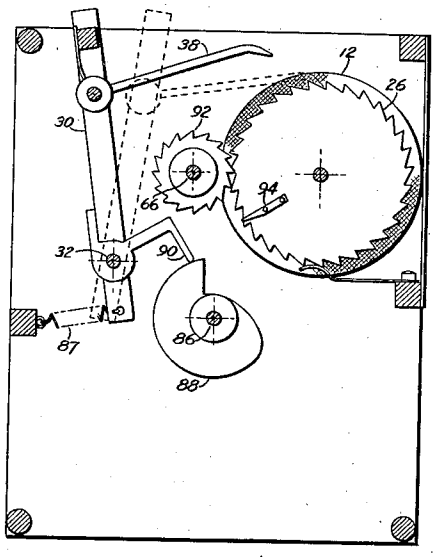


Fig 9



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Patented Oct. 7, 1941

2,257,947

UNITED STATES PATENT OFFICE

2,257,947

AUTOMATIC CALENDAR

Crawford Goldthwait, Winchester, Mass.

Application September 26, 1940, Serial No. 358,379

14 Claims. (Cl. 40—114)

This invention relates to improvements in automatic calendars.

More especially it relates to calendars operated at a regular rate, by electric, mechanical or other propulsion, having a plurality of differentially-driven drums for indicating the current month, day of the month, and day of the week, and having provision for automatic change at twenty-four hour intervals, and means to indicate the current day correctly notwithstanding variant lengths of months and of years.

The invention provides improvements in mechanism for step-advances of the respective drums, and especially for causing the first day of a new month to be indicated at the proper time, whatever may be the length of the month then ending.

It is an object of the invention to provide an actuating mechanism, for such a calendar, having features of simplicity, compactness and certainty of operation, surpassing in these respects the accomplishments of prior proposals.

The mechanism herein illustratively shown is arranged for operating in conformity with the Gregorian calendar, although the utility of the invention is not limited to that, but may be applied to other calendar systems. The apparatus thus shown, having been once properly set for that calendar, will change the indicated name and number of day at each midnight, and will change the name of month at the end of the last day of each month of whatever length, without error before the year A. D. 2100, at which time the routine of the Gregorian calendar omits a leap year, and the apparatus would require to be reset by one day,—assuming, of course, that the apparatus now set should be operated so long as that at a correct rate of time.

For brevity the drum indicating the name of the day of the week is herein called the "day drum;" the drum indicating the number of the day in the month is herein called the "date drum;" and the drum indicating the name of the month is herein called the "month drum."

A frame, which may be swung forward by any suitable clock mechanism at twenty-four hour intervals, carries pawls which it thrusts horizontally forward for turning the day and the date drums one step; and the date pawl, subject to a hit-or-miss control, in which other elements coact, selects the proper day and length of step to shift the date drum, and thereby the month drum, so as to indicate the first day of a new month. The selection is made, at each month-end, between a one day step from the 31st day of the month; a two days step from a thirty-day month; and a three or four days step from a twenty-nine or twenty-eight day month.

The distinctions, by which the month-end pawl action is adapted to months of different lengths, are made with aid of a "date disk" whose timing is that of the date drum, having thirty-one daily positions around its axis, and whose smooth edge has a single notch for engagement by the pawl. On the first day of each month this disk stands with its notch in a certain position, herein called "initial." In the embodiment herein illustrated this is vertically over the axis. Consequently on the 28th day of each month this notch, near the end of its thirty-one day circuit, is just below the top of the disk. The month-end pawl operates at a level where it can engage in this single notch only when the notch is in the position which it occupies on the 28th day of the month, herein called "level-28," or at the higher level of a later day. The pawl's approximately horizontal stroke is of such length as can move the disk to initial position, but no further, when it hits into the notch; but the invention provides a device which lifts the pawl and causes it to strike above level-28, and so to miss the notch at the 28th day level in every month which is not February. The completing of the last February stroke therefore makes a step of four days' length; except that in each leap year a cam, having a four year rotation period, cooperates to lift the pawl to the level of the 29th day position and so the length of step is three days in leap years.

A slotted disk, fast with the month drum and herein called the "month disk," cooperates to lift the pawl so that in months other than February it does not engage the single notch either on the 28th or 29th day, but in proper months this disk permits engagement on the 30th day. In thirty-one-day months it is immaterial whether the month-end pawl engages, for the date pawl serves to advance the date drum by a step of single day lengths. The month disk stands stationary with the month drum through each month, and therefore in each month presents a different 30° sector toward the swinging frame. Each of the five several month sectors which are thus presented, pertaining to months having less than thirty-one days, has a slot running deeply into the disk from its edge, into which there can penetrate a feeler at the tip of a month-end-pawl support. This support is separately pivoted on the swinging frame, projects toward

the month disk, and has a lateral bar on which the pawl rests loosely. A back stop prevents the feeler tip of this support from descending below the level at which the slot entrance in the month disk stands throughout each ordinary February, and its lateral bar holds the month-end pawl up to level-28, which the single notch in the date-disk reaches on the 28th day of each month. In a twenty-eight-day month at each daily stroke throughout the month the feeler enters the slot in the disk. Before the 28th day the month-end pawl strikes the smooth edge of the date-disk and is thereby deflected upward from its support, and proceeds idly to the end of its stroke. But when the notch has reached the 28th day position, the month-end pawl strikes into the notch, and the completing of its stroke turns the date disk and date drum through a step of four days' length, to initial position of the date disk. Thus the date drum is turned to the first day of the next month; and this turning, by connected mechanism shifts the month drum so as to expose the name of the next month; and turns the month-disk so as to present the 30° sector corresponding to the next month. In leap years the date-pawl, being in that year held at level-29, strikes above the 28th day position of the notch, and slips idly upward on the edge of the disk, until the 29th day arrives, when it strikes into the notch and so shifts all parts to a fresh month.

For each thirty-day month, the slot sector pertaining to that month has its slot entrance a little above the operating level of the feeler, so that the feeler rides upward a little on the smooth edge of the disk before it enters the slot. Thus it lifts the month-end pawl so that that pawl strikes the month-disk and rides idly above the single notch therein, until that notch occupies its 30th day level.

Thus by missing the single notch every day until the last day of the month, as predetermined by the respective levels of operating parts, and then making the step be of appropriate length, the apparatus can maintain a correct showing of the calendar by month, date and day. To this there might be added an indication of the year, if desired, by a simple train of gearing causing a shift at each complete revolution of the month drum.

Details of construction, involving other features of novelty will appear in the apparatus herein described.

It is intended that the patent shall cover, by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawings, which represent one embodiment of the invention in an illustrative way, although the invention is not limited to the particular embodiment here shown,

Figure 1 may be considered a front elevation of the completed apparatus;

Figure 2 is a plan of the same, with the casing removed, upon a larger scale;

Figure 3 is an end elevation in section on the line **3**—**3** of Figure 2 and Figure 7;

Figure 4 is an end elevation looking in the opposite direction on the line **4**—**4** of Figure 2 and Figure 7, omitting thrust member **60** and rod **62**;

Figure 5 is an end elevation on the line **5**—**5** of Figures 2 and 7, omitting pawl **38** and thrust member **10**;

Figure 6 is an end elevation in the opposite direction on the line **6**—**6** of Figures 2 and 7;

Figure 7 is a rear elevation of the apparatus with the casing removed, upon a larger scale;

Figure 8 is an end elevation of a modified form, in section on a line corresponding to **8**—**8** of Figure 2, but showing the gears of relatively large pitch, for the month drum gear to coact with a spring detent for perfecting and holding each monthly position; and

Figure 9 is a view looking in the same direction, as if sectioned at the location of **3**—**3** of Figure 2, showing a part of the same modification as in Figure 8.

In each of Figures 2–7 some parts of the apparatus that might be expected to be within the field of view are omitted for the sake of avoiding complications and for showing more clearly the particular parts which are portrayed in those views.

Referring to the drawings, the calendar comprises three drums **10**, **12**, **14**, separately rotatable on a common horizontal axis behind a front wall **16** of a casing, having windows **18**, **20** and **22** through which the indications of the several drums are visible. The month drum **10** carries the names of the twelve months equally spaced. The date drum **12** has the day numbers "1" through "31;" and the day drum **14** has the names of the days of two successive weeks spaced around it.

As represented in the drawings, the spaces between the drums contain a fourteen tooth ratchet **24**, fixed to day drum **14**; and a thirty-one tooth ratchet **26** fixed to date drum **12**.

Behind the drums an actuating frame **30** which is mounted on a low horizontal shaft **32**, so that when any suitable clock mechanism acting through lugs **78** at each midnight swings the frame toward the drums and their ratchets for the operative stroke, the pawls at its top are about level with the upper parts of the ratchets. A pawl **34** is adapted to engage the day ratchet **24** at each swing forward, to make drum **14** indicate a next day name. A spring-pressed detent **36** engages successive notches of this ratchet **24**, to set the new day indication in good registration with the window **22** in the front wall, and to hold it so until the next stroke.

A date pawl **38** on frame **30** coacts with the date ratchet **26** to advance the date drum **12** one date space when frame **30** swings forward. As this ratchet has thirty-one teeth, the change to the first day of a new month occurs without the intervention of other mechanism at the end of each thirty-one-day month. The advance of the month drum one step, to show the name of the next month, is effected by means hereinafter described as the date drum passes to the displaying of its day number "1." At the end of every thirty-day month and at the end of each February, other means intervene to make the month-end advance of the date drum **12** have a longer step, viz, the proper number of date spaces to bring its date number "1" opposite window **20**.

The advancing of month drum **10** so as to show the name of the next month at the end of the last day of each month, is accomplished by any of several suitable means. That which is herein shown in Figures 2, 4 and 7 is by gearing from a three-point star-wheel **40** which is rotatably mounted on date ratchet **26**, near the latter's periphery, so that when the number "1" is supplanting the number "31" at the date-window this star wheel encounters a fixed lug **42** reaching

into the path of the star-wheel from the frame of the casing. This turns the passing star wheel a little, in direction opposite to that in which the ratchet is turning. A pinion **44** on the star-wheel meshes with a spur gear **46** which is fast on the month drum **10**. Therefore the star wheel turns this latter to move the month drum **10**.

A spring-pressed detent **48** coacts with the date ratchet **26** to center the date in its window **20**; and a similar detent **50** may coact with a twelve-point star wheel **52** which is rigid with drum **10**, for centering the month name in its window **18**.

For dealing with months having less than thirty-one days, a month-end disk **54**, fixed on date drum **12**, has a single notch; and a month disk **56** fixed on month drum **10** has five slots each extending deeply inward from its edge, distributed about the periphery in positions corresponding to those five months of a year which have less than thirty-one days. A month end pawl **58** pivotally mounted on frame **30** is thrust approximately horizontally by the swinging stroke and is adapted to strike the periphery edge of the month-end disk **54**, and to ride idly up on the smooth upper curve thereof, except that, if the single notch of this disk happens to be there, at or above the level struck, the pawl **58** can engage in that notch, and so can move the date drum to register the first day of a month. The pawl **58** is normally held at a level to engage the notch when that notch is at level-28, but the invention further provides means to prevent the pawl from actually striking into the notch at that level except in February; and for the February of each leap year the rise in the four-year cam **64** holds the pawl at level-29, so that it does not engage until the 29th day of the month. This is represented in Figure 5.

To operate properly for thirty-day months the feeler tip on a thrust member **60**, pivotally mounted on frame **30**, is adapted for striking and riding up on the peripheral edge of month disk **56**, or for entering a slot which extends deeply inward from the edge of that disk, whenever such a slot is in position to receive this feeler. A rod **62** extends sidewise from this thrust member **60** and engages under date pawl **58** for supporting that pawl, and for lifting it whenever the member **60** rides up on the peripheral edge of disk **56**. At each month the disk **56** has a different 30° sector in position to be struck by the feeler. The sectors corresponding to thirty-one-day months have no slots, and so for each of these the tip of member **60** rides up on the disk edge, and rod **62** lifts pawl **58** so that the stroke of pawl **58** is too high to enter the single notch at the levels where it is on the 28th, 29th and 30th days of each month. The sectors corresponding to thirty day months each have a slot of disk **56** in position to receive the feeler **60**, after that has ridden up the disk a little, thus lifting the pawl to a level at which it engages the notch of disk **54** at the level occupied by that notch on the 30th day of each month, and the completing of the stroke on those days advances the notch and drum **12** two date spaces, to bring date number "1" opposite the window **20**.

Each ordinary February the feeler **60** enters directly a slot of disk **56**, with no elevating of the date pawl **58**. The latter therefore engages the notch of month-end disk **54** when the number "28" is at window **20**; and the single stroke of frame **30** advances date drum **12** the long step of four date spaces, to bring number "1" opposite the window.

Each leap year February the date pawl **58** is held at level-29, by a cam **64** on a horizontal shaft **66**. The connections are such that this cam **64** comes to its position of Figure 4, with February opposite the window **18**, only at one February in forty-eight months, its shaft **66** being driven through a spur gear connection **68**, **70** with month drum **10**. It is immaterial whether shaft **66** makes but a single revolution in forty-eight months, or several revolutions, so long as the cam does not assume its position of Figure 4 during an intervening February. The ratio of gearing **68**, **70** in Figures 1–7 is three to four, so that the cam shaft **66** revolves exactly three times while the month drum revolves exactly four times in forty-eight months. The date pawl therefore misses the notch on February 28th, in leap years, but engages in it on February 29th and advances drum **12** three date-spaces, to bring number "1" opposite window **20**.

Any suitable means may be provided for causing frame **30** to swing toward the drums at midnight of each twenty-four hour day. The drawing represents, for Figures 1–7, an electric clock mechanism at **71** which, through suitable reducing gearing **71**, drives the two spur gears **72**, **74** which are independently rotatable on a common shaft **76**. The gear **72** may have one less tooth than the gear **74**; and each has a side lug or pin **78** fixed thereon. Thus the gear **72** may make exactly sixteen complete revolutions in a twenty-four hour day while gear **74** makes fifteen complete revolutions. The lugs **78** therefore come into alignment only once in the twenty-four hours. By locating the lugs so that they come into alignment at the tops of the gears, these lugs can time the forward swinging of frame **30**.

Cooperating with the lugs **78** for this swinging is a depending element **80** on frame **30**, at whose lower end is swivelled a cross bar **82**, its ends having two pins **84**, projecting downward in position to be engaged each respectively by one of the lugs **78**. A coil spring yieldingly holds the cross-bar in parallelism with shaft **76**. With this arrangement, either single lug **78** of a gear **72** or **74** can engage a pin **84** and swing the cross-bar a little to get past it without affecting frame **30**. But when the two lugs **78** are in alignment as they approach pins **84**, preferably at midnight, the lugs engage the two pins simultaneously, one at each end of the cross-bar **82**, and the lugs cannot get by without swinging the entire frame **30** forward about its pivot. As soon as the lugs get past the pins, the spring returns frame **30** to its normal inactive position.

Figures 8 and 9 indicate a modification for moving the frame **30** daily, and so the day drum **12**; and for moving the month drum **10** one step at the end of each month. In these a cam shaft **86**, driven by the clock mechanism, has a cam **88** for engaging a finger **90**, reaching out from the frame **30** or its shaft **32**. The sudden drop in the cam lets the spring **87** swing the frame **30** to move the pawl **38**.

Also in this modification the leap year shaft **66** is driven more directly. The date drum **12** carries a lug **94** which, by monthly engaging a toothed wheel **92** on the leap year shaft **66**, moves the cam **64** thereon a little, as well as moving a gear **96** thereon which meshes with a gear **98** on the month drum **10** and so advances the month drum to indicate the next month.

To make the cam crest be elevated under the date pawl **58** each fourth February the number of teeth in the gear **96** may be 16 or any other whole number factor of the forty-eight months intervals at which February 29 recurs. A spring detent **100** coacts with the gear **98** to assure a proper setting of each month indication opposite the window **18**.

I claim as my invention:

1. In an automatic calendar for showing the day of the month currently through a succession of years, each of which years has a fixed succession of months of varying length, being a calendar of the type wherein there is a rotary date-ratchet and a pawl for advancing it daily, said ratchet carrying the successive numbers of the days of a maximum month distributed circularly; that combination, for dealing with irregularities in lengths of months, in which a rotary ratchet having a single notch is fast with the date-ratchet; and there is a month-end pawl having a daily stroke and having location and pivotal mounting permitting its stroke to enter the position occupied by that notch on the last numbered day of each month which is of less than maximum length; said stroke of the pawl being one which terminates with that notch in its first-day-of-a-month position; and a month-disk, with a follower, driven thereby and having a position-controlling connection to the month-end pawl; said month-disk having, for each less-than-maximum month, means to guide its follower so as to direct the month-end pawl to the position occupied by the notch on the last numbered day of the respective month; there being a rotatable element embodying one said guiding means in each of a number of equal sectors which correspond individually to the several months of a year and are arranged in said rotatable element with the less-than-maximum months in the order and spacing of their respective months in the said yearly fixed succession of months; each said guiding means which pertains to a less-than-maximum month having a follower-driving surface whose position and course in its respective sector is determined by the length of the particular month which that sector represents; and whose said driving surface and the follower driven thereby constitute the said means to guide the month-end pawl to that position which the notch will occupy on the last numbered day of the month so represented; and means at each complete rotation of the date-ratchet to rotate the said month-disk one step to the position which pertains to the next succeeding month.

2. An automatic calendar as in claim 1, wherein the said means to actuate each said pawl and the month-disk follower is a swinging element, on which they are pivotally mounted.

3. An automatic calendar as in claim 1, wherein the said date-ratchet has thirty-one teeth for day by day advance and the rotary ratchet, with the said single notch, is a disk having a smooth periphery on which its pawl rides.

4. An automatic calender as in claim 1 wherein for each successive month except the thirty-one day months there is means for guiding the month-end pawl to a stroke position and permitting stroke for engaging the said notch in the last-day-of-the-current-month position of the notch; the sectors for the thirty-one day months having means which guide that pawl away from such engagement.

5. An automatic calendar as in claim 1, wherein for a twelve month year the said guiding means for the month-end pawl includes the said month-disk and means, including said month-disk follower, to advance the disk thirty degrees of angular measure for each month; each thirty degree-sector of disk which pertains to a less-than-maximum month having a slot, open from the disk's edge inward, for positioning and permitting the stroke; and said month-disk follower having stroke actuated in unison with said pawls, for riding on the edge of the disk to and into the slots thereof; there being means on the follower engaging the month-end pawl, whereby the course of the said follower, guided by the disk, guides the stroke of the month-end pawl to hit or to miss the single notch.

6. An automatic calendar as in claim 1, wherein the said guiding means of said month-disk are smooth sections of its periphery, standing at a glancing angle from the stroke of the follower, and slots open at the periphery and extending thence inward of the disk.

7. An automatic calendar as in claim 1, wherein the said single notch ratchet is a disk set, relative to the location of the month-end-pawl, so that that pawl strikes the smooth edge of the disk at a glancing angle, except when it strikes the notch.

8. An automatic calendar as in claim 1, wherein the said rotary single notch ratchet and month-disk are set on a horizontal axis, with the positions of the notch for the last days of the month near the top of the curve of the ratchet; and wherein the month-end pawl and the month-disk follower have a stroke approximating horizontality, at a level near the said top, whereby upon impingement each glances upward along the disk edge.

9. An automatic calendar as in claim 1, wherein the relation of the month-disk, its follower, and the month-end ratchet and pawl, is that, in each stroke, the month-disk positions its follower, and the pawl, for the pawl to strike at end-of-the-month position, before the pawl impinges on the ratchet.

10. An automatic calendar as in claim 1, wherein the month-disk, rotatable yearly and containing the month sectors, has, for thirty day months, an edge for camming its follower to last-day-of-the-month position, and has at that position a slot extending deeply inward for receiving the full remainder of the daily stroke of the follower; said follower being adapted for running on the edge of the disk and into the slots thereof, and having means engaging said month-end pawl, whereby the controlled path of said follower controls the incidence of said month-end pawl on the month-ratchet.

11. An automatic calendar as in claim 1, wherein the said single-notch ratchet is a disk fast with the said date-ratchet, and there is a display surface carrying the said day-numbers which is fast with the said date-ratchet and the said disk.

12. An automatic calendar as in claim 1, wherein said guiding means for the month-end pawl, and the slotted guiding element and means visually indicating the several months are in a group fast together, and there are coacting means on the date-ratchet and the said group whereby the group is advanced one month step at the end of each complete rotation of the date-ratchet.

13. An automatic calendar as in claim 1, wherein there is also a cam shaft with cam thereon and means for turning the cam shaft a fraction of a complete revolution at the end of each month; this cam having a rise with teeth ratio for its

coacting with the month-end pawl at the end part of each forty-eighth month, to hold that pawl in position not below the twenty-ninth day position of the notch of said single notch ratchet.

14. An automatic calendar as in claim 1, wherein there is also a cam shaft with cam thereon, and means on the cam shaft and on the said ratchet which has the days of a maximum month, coacting to advance the cam each month; this cam having a rise coacting with the month-end pawl, at the end part of each forty-eighth month, to hold that pawl in position not below the twenty-ninth day position of the notch of said single notch ratchet; and means indicating the names of the months, geared to the cam shaft to advance one month step at each said advance of the cam.

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