May 17, 1949. I. A'COURT FARR 2,470,692

PERPETUAL CALENDAR

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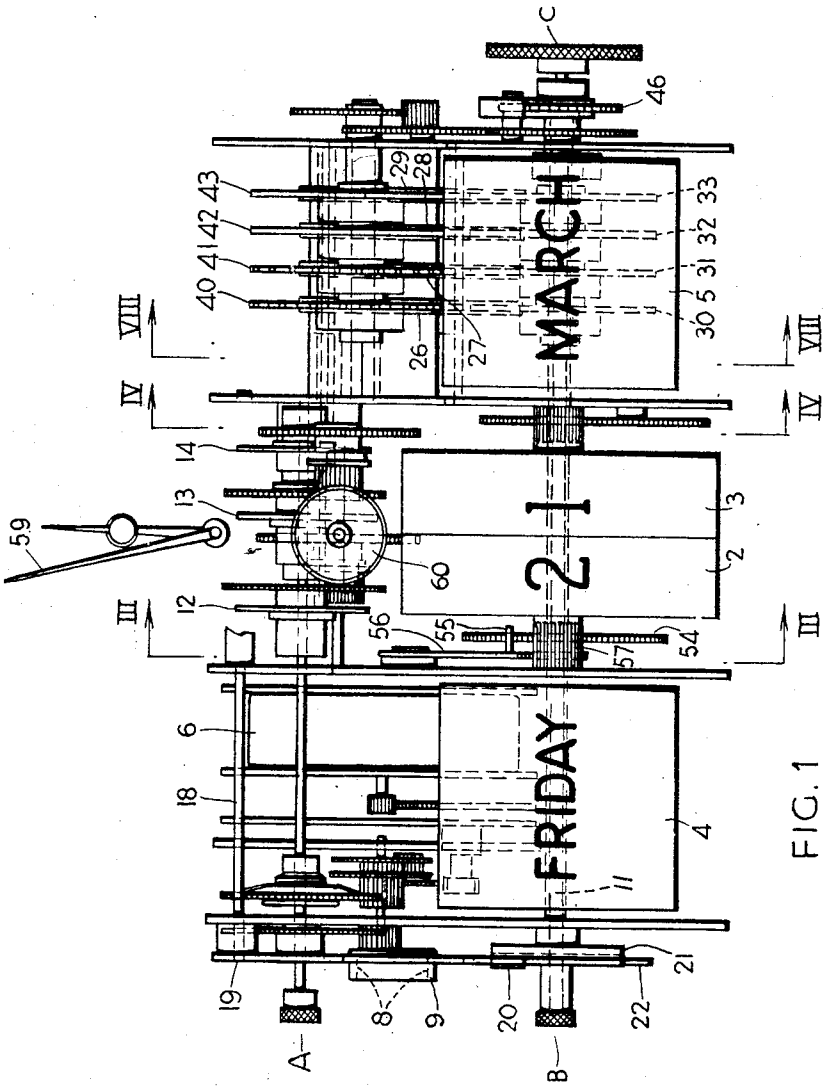


FIG. 1

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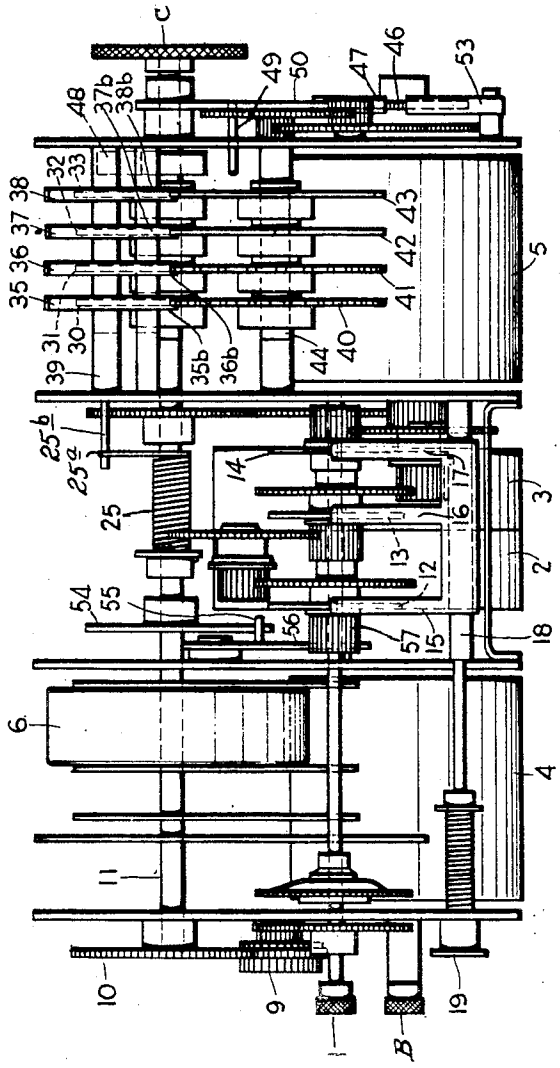


FIG. 2

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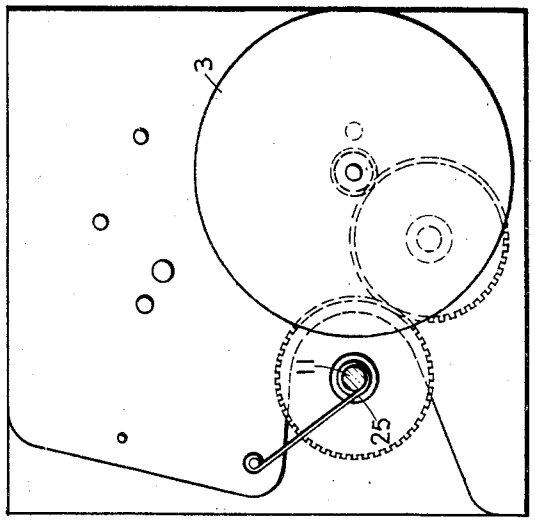


FIG. 4

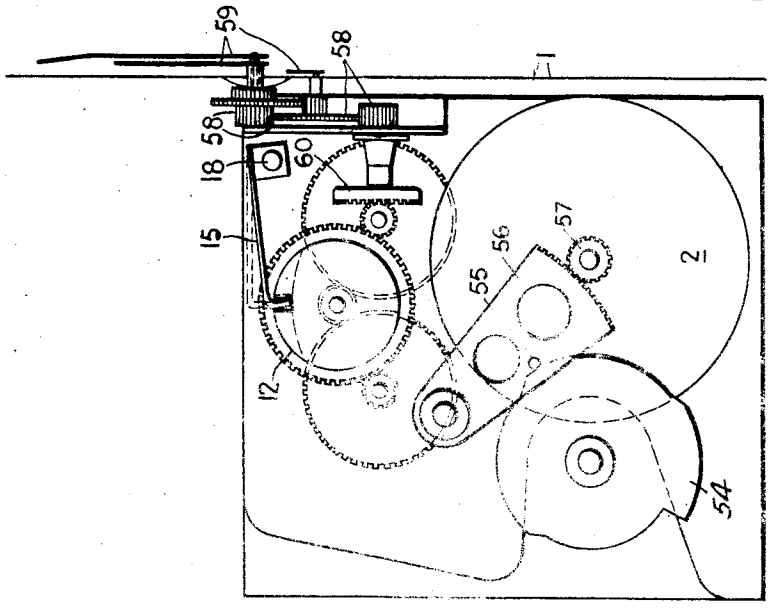


FIG. 3

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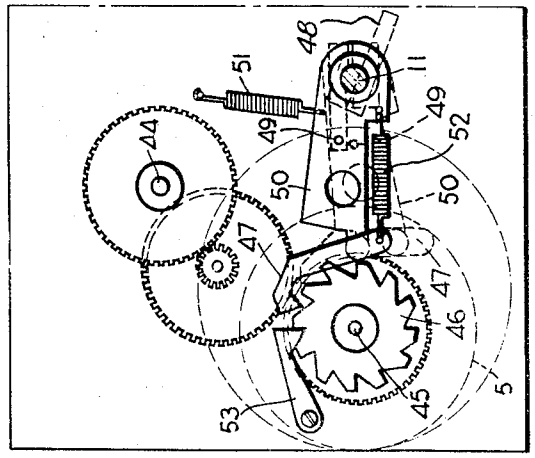


FIG. 7

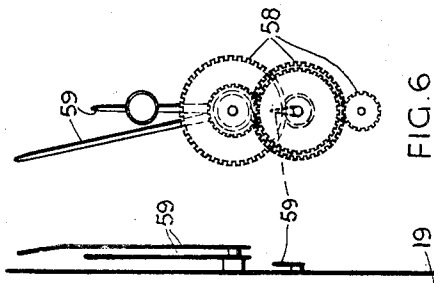


FIG. 6

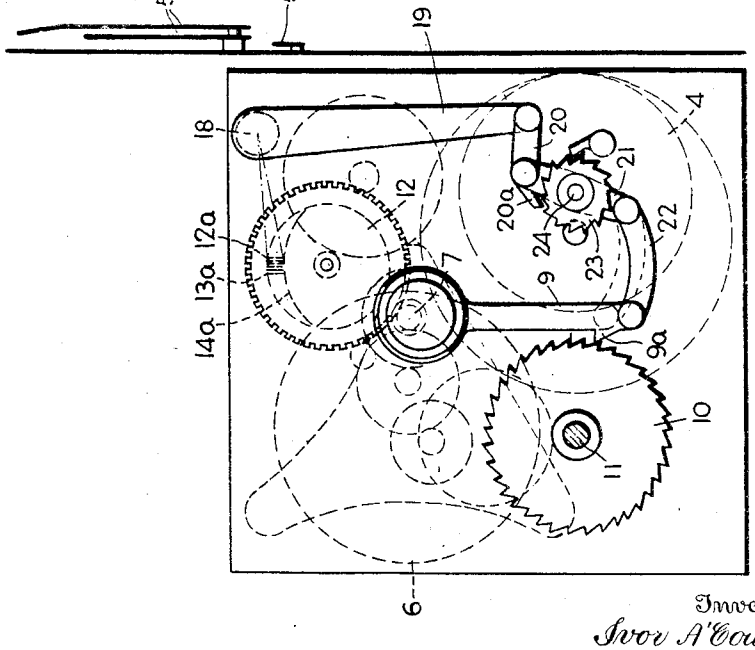


FIG. 5

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PERPETUAL CALENDAR

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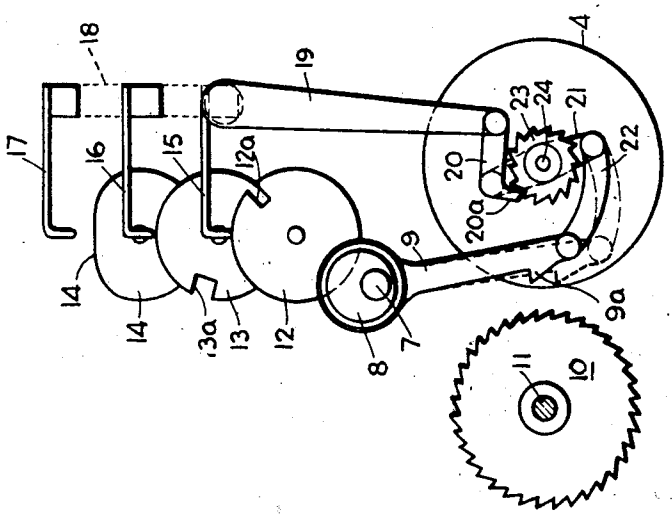


FIG. 9

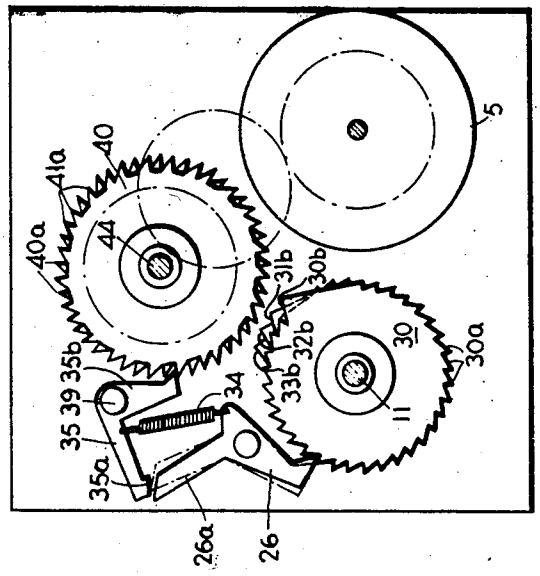


FIG. 8

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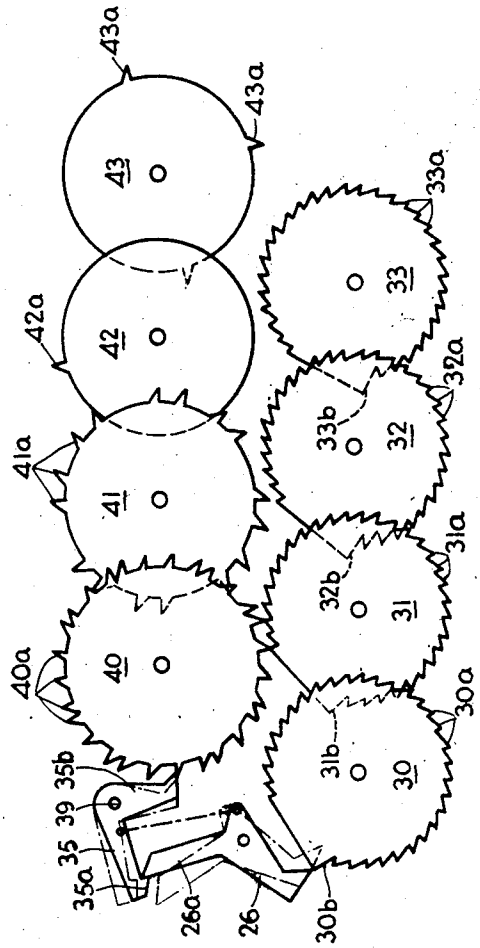


FIG. 10

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UNITED STATES PATENT OFFICE

2,470,692

PERPETUAL CALENDAR

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Application February 11, 1947, Serial No. 727,886
In Great Britain February 13, 1946

2 Claims. (Cl. 58—6)

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This invention relates to perpetual calendars, by which is to be understood apparatus of the general character comprising a timing element, whether a clockwork mechanism, a synchronous A. C. electric motor, means generating timed electric impulses or any other device capable of causing a rotary or other element to be actuated at a predetermined constant speed, an indicator capable of adjustment to display, in succession, the names of the months, an indicator capable of adjustment to display, in succession, the numbers of the days in the months, and mechanism operatively connecting the constant speed element to the indicators at appropriate intervals to cause the latter to register the correct sequence of dates automatically throughout a four-year period, the sequence then recommencing.

It is the object of the invention to provide an improved construction of the mechanism for controlling the indicators, in apparatus of this general character, which shall be robust, reliable in operation and relatively simple and cheap to produce.

According to the invention, in a perpetual calendar, the indicator-controlling mechanism comprises a setting shaft, means effectively actuated by the constant speed element once per day to advance the setting shaft, against the action of a returning spring, by a fraction of a revolution, gearing connecting the setting shaft to the day-number indicator so that each such fractional advance changes the day-number upwards by one unit, a set of four toothed discs secured on the setting shaft and respectively formed with a series of 27, 28, 29 and 30 equally spaced operative teeth, all the series of teeth commencing at corresponding points on the disc peripheries, a fixed tooth of larger size formed on each disc at the end of the respective series of operative teeth, a detent associated with each disc and normally held in an inoperative position (out of engagement with the tooth thereof), means operated by a return of the setting shaft to its normal position to advance the month-name indicator by one step, and selector means actuated at each month-name change to render operative the detent appropriate to the month-name then indicated so that it co-operates with the teeth of its associated disc to hold the setting shaft against the returning action of its spring for 27, 28, 29 or 30 fractional advances thereof, as the case may be, a further fractional advance causing the final or larger tooth of the disc to displace the detent to its inoperative position and thus allow the setting shaft to be returned to its normal position.

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The selector means actuated at each month-name change preferably comprises a set of four interconnected selector discs each controlling one of the detents and having 48 operating elements distributed between them, one disc carrying elements corresponding in location to the occurrence of the 31-day months in a four year cycle, and the other discs respectively carrying elements corresponding in location to the occurrence of the 30-day, 29-day or 28-day months in the same cycle, only one element being operative (to cause a detent to move to its operative position) at any one advance of the selector means.

The nature of the invention will be more clearly understood from the following description, given as an example only, of one practical way in which the invention may be carried into effect, reference being made to the accompanying drawings, wherein—

Fig. 1 is a front elevation of the mechanism of a perpetual calendar according to the invention, the casing being removed and some of the indications of day names, day numbers and months and some parts of the gearing being omitted,

Fig. 2 is a plan view of the mechanism with the clock omitted,

Fig. 3 is a section taken on the line III to III of Fig. 1,

Fig. 4 is a sectional view taken on the line IV to IV of Fig. 1,

Fig. 5 is an end view taken from the left of Fig. 1, with some parts omitted,

Fig. 6 is a fragmentary rear elevation showing the motion work of the clock,

Fig. 7 is an end view taken from the right of Fig. 1, with some parts omitted,

Fig. 8 is a sectional view taken on the line VIII to VIII of Fig. 1,

Fig. 9 is a somewhat diagrammatic end view illustrating the operation of the mechanism for advancing the setting shaft, and

Fig. 10 is a diagrammatic exploded view illustrating the month-change selector mechanism.

In the example illustrated, a suitable casing 1 (partly shown in Fig. 3) is provided to enclose the mechanism and has apertures therein (not indicated) behind which day-number drums 2 and 3, a day-name drum 4 and a month-name drum 5 are rotatably arranged, these drums being driven (in a manner to be described) from the timing element employed, suitably a synchronous

electric motor 6 (Fig. 1). This motor is arranged to rotate a spindle 7 (Fig. 5) at a constant speed and, by means of an eccentric 8 thereon, to cause a pawl 9 to be continuously reciprocated at a suitable speed with its driving tooth 9a close to, but normally out of contact with, the teeth of a ratchet wheel 10 keyed on a setting shaft 11.

Means is provided to move the pawl tooth 9a into contact with the teeth of the ratchet wheel 10 once per day and comprises (see Figs. 3, 5 and 9) a set of three co-axial cams 12, 13 and 14 each driven from the motor 6 at a different speed and formed with a trough or depression 12a, 13a or 14a, respectively. The speeds of the cams and the lengths of the troughs are so arranged that only once per day do all the troughs come at the same time beneath a set of three spring-pressed cam followers 15, 16 and 17 each co-operating with one cam and all rigidly secured on a common rocking shaft 18. The length of the trough 14a and the speed of rotation of the cam 14, which is the fastest running cam, together determine the period for which the followers 15, 16 and 17 may remain displaced towards the cam axis and while they are so displaced an arm 19 (Fig. 5) on the rocking shaft 18, through a link 20, a rocking lever 21 and a curved link 22, holds the continuously reciprocating pawl 9, 9a in engagement with the ratchet wheel 10, as shown in Fig. 5. The next reciprocation of the pawl thus advances the ratchet wheel 10 by one step. Conveniently, the link 20 referred to also carries a pawl 20a which is drawn back over one tooth of a ratchet wheel 23 secured on the shaft 24 of the day-name drum 4 by the displacement of the link 20 so that the return of the link to its normal position, which is that shown in Fig. 9, (as the cam followers 15, 16 and 17 are again displaced outwards) causes the day-name to be changed.

The ratchet wheel 10 on the setting shaft 11 has a number of teeth in excess of 31, say 36, so that it is only advanced a fractional part ($^1/_{36}$th) of a revolution each day. A spring 25 (Figs. 2 and 4) whose end 25a is anchored to a fixed pin 25b is tensioned by the advance of the setting shaft 11 and the free return of the latter is prevented solely by the operative one of a set of four detents 26, 27, 28 and 29 (Figs. 1, 8 and 10) arranged in co-operating relationship each with one of a set of four toothed discs 30, 31, 32 and 33 secured on the shaft 11. Each disc (see Fig. 10) is formed with a series of teeth spaced from each other by $^1/_{36}$th of the periphery and, commencing from a corresponding location on each disc, the disc 33 has 27 operative small teeth 33a and a final larger tooth 33b and the other discs 32, 31 and 30 have, respectively, 28, 29 and 30 operative small teeth 32a, 31a and 30a and a final larger tooth 32b, 31b and 30b. In the normal positions of the discs 30 to 33 and detents 26 to 29, i. e. when a month-change has just occurred, the operative ends of the detents are all located just in advance of the first operative teeth of the several series but only the detent which is to co-operate with the disc having the same number of teeth as the new month has days is sufficiently close to be displaced by the operative small teeth as the setting shaft 11 is advanced. The detents 26 to 29 are all pressed towards their discs by springs (such as that shown at 34 for the detent 26 in Fig. 8) but have tails (such as that shown at 26a for the detent 26 in Figs. 8 and 10) which co-operate with spring latch members. The latch member

for the detent 26 is shown at 35 in Figs. 8 and 10. Those detents which are inoperative have their tails engaged in the associated latches, as indicated in Fig. 10, to be held clear of the teeth on the respective discs 30 to 33. The operative detent (shown as the detent 26 in Fig. 8) has its tail 26a lodged on a face 35a of the associated latch 35 of such length that displacements of the detent by the operative small teeth 30a of the disc 30 are insufficient (see the chain-dotted position in Fig. 8) to bring the tail off the face 35a into the latch proper whereas the larger displacement of the detent (see the two positions shown in Fig. 10) caused by the larger tooth 30b of the disc is sufficient to bring the tail 26a into the latch 35 proper and thus cause the detent 26 to be held in the inoperative position. The latch members for the detents 27, 28 and 29 are indicated at 36, 37 and 38 in Fig. 2.

Each latch member 35 . . . 38 is freely rotatable on a shaft 39 and has an arm 35b . . . 38b secured thereon at a location such that it may co-operate with the respective one of a set of four selector discs 40, 41, 42, 43. The four selector discs are secured together and fixedly mounted on a shaft 44 (Figs. 2 and 8) disposed parallel with the setting shaft. Each selector disc is formed with one or more radial projections (40a, 41a, 42a or 43a) each of a height sufficient to cause displacement of the associated arm 35b . . . 38b (when a projection is moved past the latter) to the requisite degree for disengaging the corresponding latch member 35 . . . 38 from its detent-tail. There are 48 such projections distributed between the four selector discs, see Fig. 10, the selector disc 40 controlling the detent 26 associated with the 31-toothed disc 30 having as many projections 40a as there are 31-day months in a cycle of four years and having these projections arranged in those locations in a circumferential series of 48 equally spaced positions which correspond to the occurrences of the said months in the four-year cycle. The selector disc 42 controlling the detent 28 associated with the 29-toothed disc 32 only carries one projection 42a, to correspond with the leap-year February of the four-year cycle, and the other two selector discs 41 and 43 carry projections 41a and 43a, respectively, corresponding to the occurrences of 28-day and 30-day months, respectively, in the four-year cycle, as will be understood.

The group of selector discs 40 . . . 43 is advanced by $^1/_{48}$th of a revolution each time the setting shaft 11 is returned to its normal position by its spring 25 which occurs, as will be clear from the preceding description, after the setting shaft 11 has been fractionally advanced as many times as there are operative small and large teeth on the disc co-operating with the operative detent. The driving connection between the shaft 44 carrying the selector discs and the setting shaft 11 is shown in Fig. 7. The shaft 44 is appropriately geared to a counter-shaft 45 carrying the month-name drum 5 and having secured thereon a ratchet wheel 46 adapted to be advanced by one tooth by the displacement of a pawl 47 which is brought about when a stop or abutment 48 secured on the setting-shaft 11 strikes a pin 49 secured in a face of a spring-supported lever 50 carrying the pawl 47 as the setting shaft reaches its normal position. The lever 50 is freely rotatable about the shaft 11 at its one end and carries the pawl at its other end. A spring 51 normally supports the lever in the

full-line position of Fig. 7 and the lever is displaced to the broken-line position of Fig. 7 when the abutment **48** strikes the pin **49**. **52** is a spring urging the pawl **47** into engagement with the ratchet wheel **46** and **53** is a spring-urged detent preventing reverse rotation of the ratchet wheel after each advance thereof. Each such advance is by one tooth, the pawl **47** abutting against the end face of the lever **50** as it completes a stroke and thereby locking both itself and the lever against further displacement which might overfeed the ratchet wheel. The ratchet wheel **46** has 12 teeth so that each stepwise advance of the former will cause the month-name drum **5** to advance through $\frac{1}{12}$th of a revolution. Moreover, the gearing between the shafts **45** and **44** is such that a stepwise advance of the former will cause the latter shaft with its selector discs **40** . . . **43** to advance through $\frac{1}{48}$th of a revolution.

The operation of the mechanism described will be clear from the foregoing description but the following brief outline will cover the main points.

Initially, the setting shaft **11** is in its normal position and the detent **26**, **27**, **28** or **29** cooperating with the disc **30**, **31**, **32** and **33** having the same number of operative teeth as the new month has days is in the operative position. As the motor **6** runs, the continuously reciprocated pawl **9**, **9***a* is brought into operative engagement with the ratchet wheel **10** on the setting shaft **11** once per day (usually at or just after midnight). Each such engagement causes the setting shaft **11** to advance by $\frac{1}{96}$th of a revolution and the day-number drum **3** to be advanced by one unit, the day-name drum **4** also being operated. The day-number drum **2** is advanced one step at each tenth advance of the setting shaft **11** by means of a cam **54** (Fig. 3) mounted on the shaft and actuating the drum **2** through a pin **55** secured in a toothed segment **56** that gears with a pinion **57** secured to the drum. When the setting shaft has already been advanced one fewer times than there are days in the month, the next such engagement of the pawl **9**, **9***a* advances the setting shaft **11** to bring the large tooth **30***b*, **31***b*, **32***b* or **33***b* of the operative disc beneath the associated detent **26** . . . or **29**. The latter is displaced to cause its tail to be latched and is thereby rendered inoperative. As soon as the continuously reciprocated pawl **9**, **9***a* disengages from the ratchet wheel **10** on the setting shaft, therefore, the latter is no longer held against the pressure of its spring **25** and is returned to its normal position, re-setting the day-number drums **2** and **3** at the same time to show "1" through the appropriate casing-aperture. At the end of the return movement of the shaft **11** the abutment **48** thereon strikes the pin **49** on the lever **50** carrying the pawl **47** operating on the counter-shaft ratchet wheel **46** and feeds the latter by one step to cause the selector discs **40** . . . **43** to advance through $\frac{1}{48}$th of a revolution, the month-name drum **5** also being advanced by $\frac{1}{12}$th of a revolution.

This advance of the selector discs causes the appropriate latch member to be displaced and, thereby, the release of the correct detent into engagement with the disc carrying the same number of teeth as there are days in the new month. The cycle just indicated then repeats up to the next month-change and so on.

The mechanism according to the invention has, among other advantages, the features that

the date may be shown in a conventional manner, the change of date-indication is effected within a very short space of time, and resetting after a period of non-use (as when held in stock) may be effected in a convenient and rapid manner. Re-setting knobs are indicated at A, B and C in Fig. 1. The example illustrated has a clock embodied therein, the drive to the motion work **58** of the hands **59** (see Figs. 3 and 6) being derived from the gearing driving the cams **12**, **13**, **14**, through a crown wheel **60**.

It will be understood that detailed description of the gearing and gear ratios has been avoided because these items are readily determined by those skilled in the art and do not per se constitute part of the present invention.

What I claim is:

1. A perpetual calendar comprising a setting shaft, a constant speed driving element, means actuated thereby once a day to advance the setting shaft by a fraction of a revolution, a returning spring acting on the setting shaft tending to return it to an initial position, a day-number indicator, gearing connecting the setting shaft and the day-number indicator so that the fractional advance of the setting shaft changes the day-number indicator upward by one unit, a set of four toothed discs secured on the setting shaft and respectively formed with a series of **27**, **28**, **29** and **30** equally spaced operative teeth, all the series of teeth commencing at corresponding points on the disc peripheries, a final tooth of larger size formed on each disc at the end of the respective series of operative teeth, a detent associated with each disc and normally held in an inoperative position out of engagement with the teeth thereof, a month-name indicator, means operated by a return of the setting shaft to its initial position to advance the month-name indicator by one step, and selector means actuated at each month-name change to render operative the detent appropriate to the month-name then indicated so that it co-operates with the teeth of its associated disc to hold the setting shaft against the returning action of its spring for **27**, **28**, **29** or **30** fractional advances thereof, as the case may be, a further fractional advance causing the final and larger tooth of the disc to displace the detent to its inoperative position and thus allow the setting shaft to be returned to its initial position.

2. A perpetual calendar according to claim 1, wherein the selector means actuated at each month-name change comprises a set of four interconnected selector discs each controlling one of the detents and having 48 operating elements distributed between them, one disc carrying elements corresponding in location to the occurrence of the 31-day months in a four year cycle, and the other discs respectively carrying elements corresponding in location to the occurrence of the 30-day, 29-day or 28-day months in the same cycle, only one element being operative to cause a detent to move to its operative position at any one advance of the selector means.

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