April 16, 1935. E. E. BALDWIN 1,997,570

TIMEPIECE

Filed March 23, 1934 4 Sheets-Sheet 1

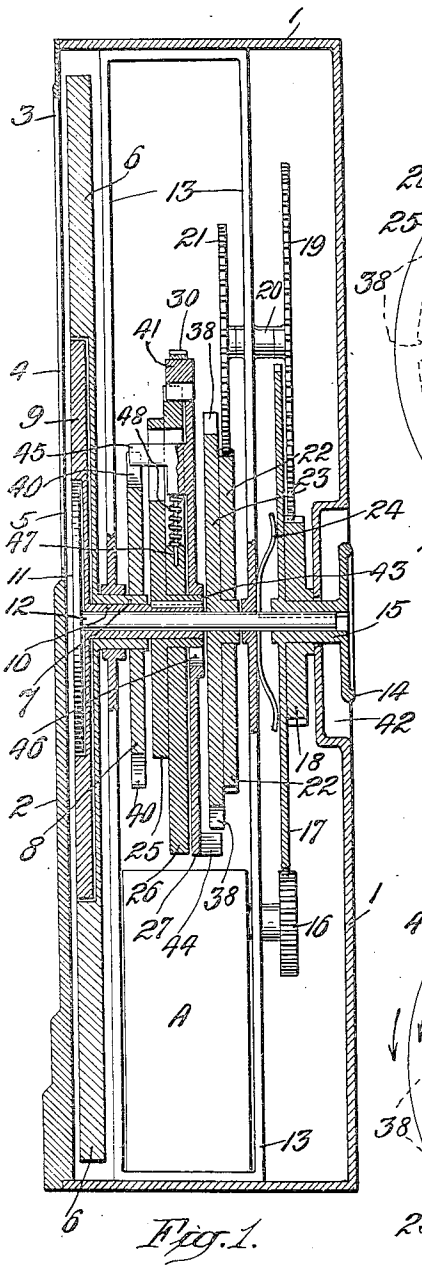


Fig. 1.

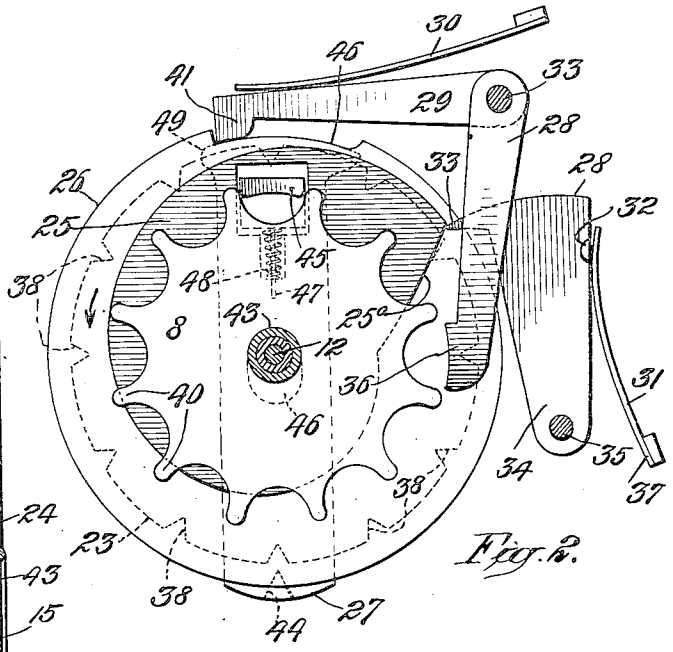


Fig. 2.

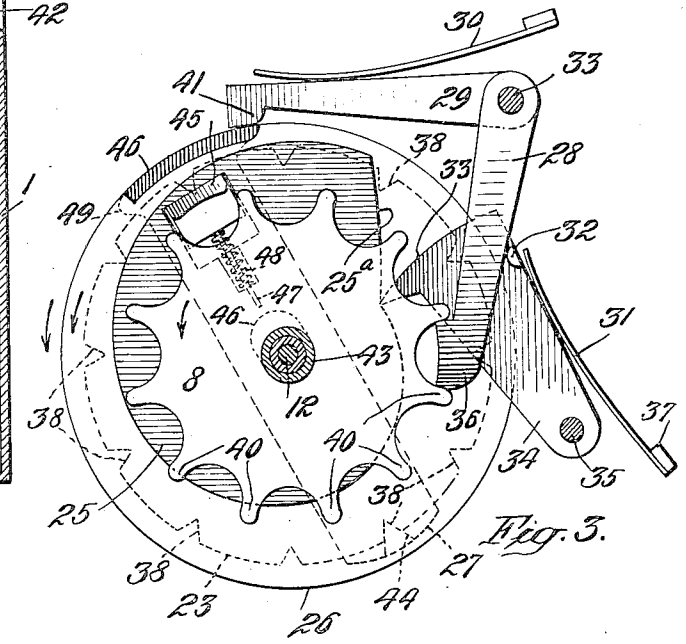


Fig. 3.

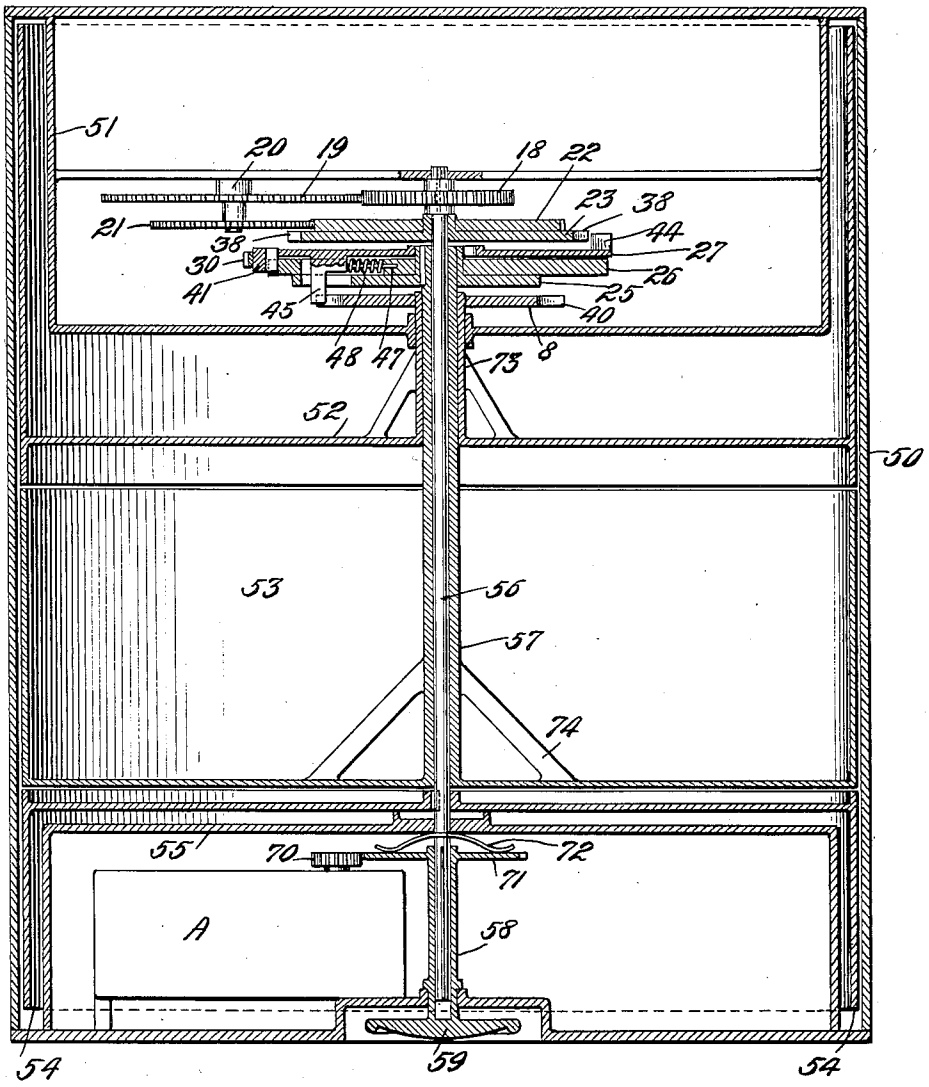
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Fig. 4.



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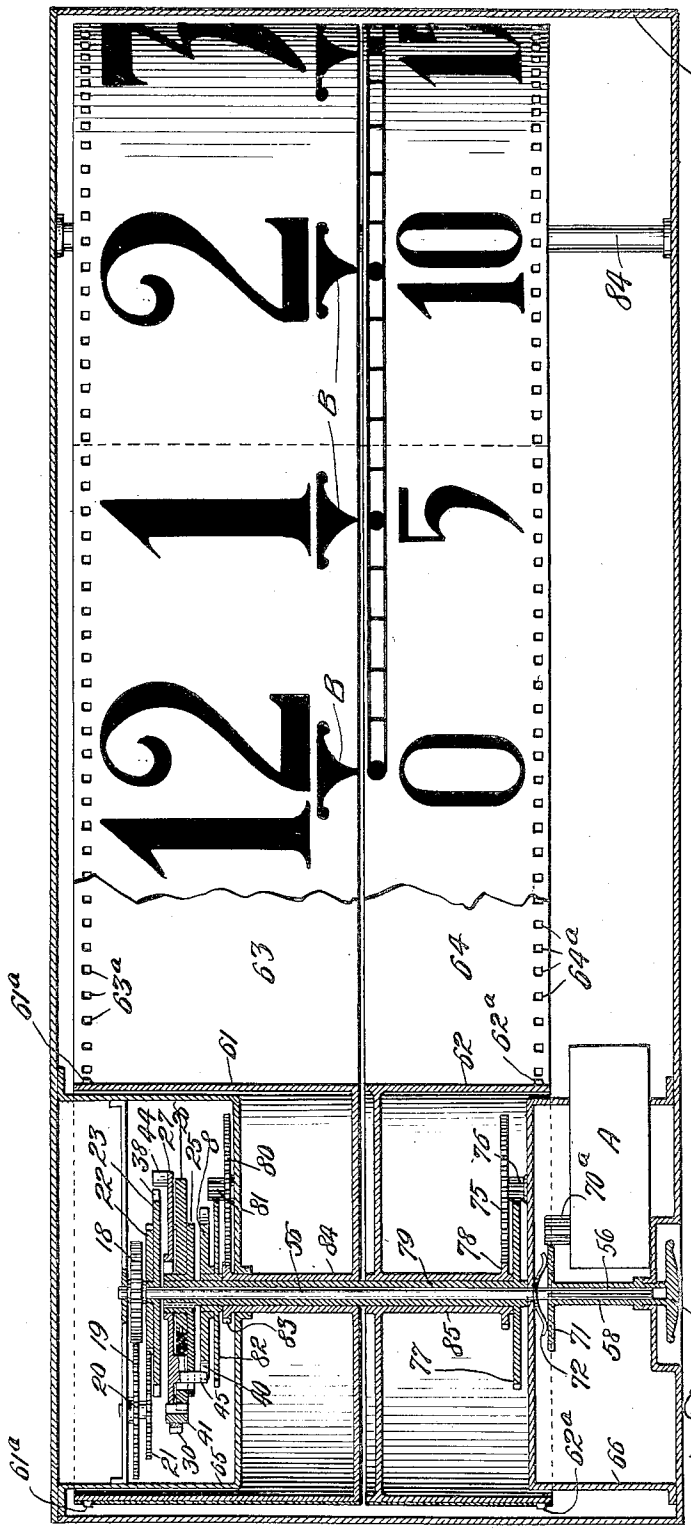
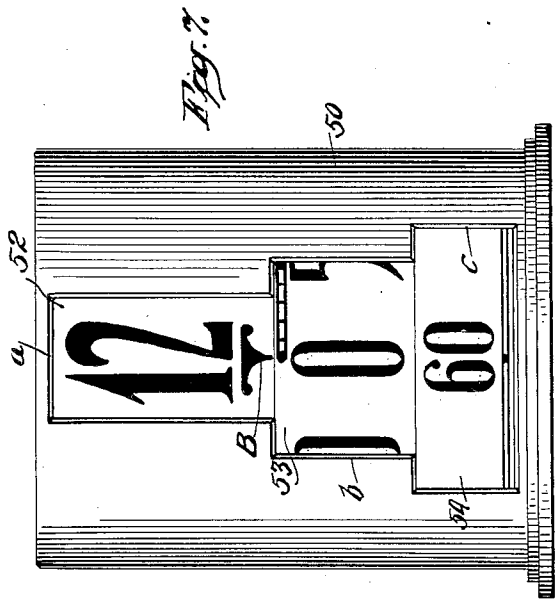


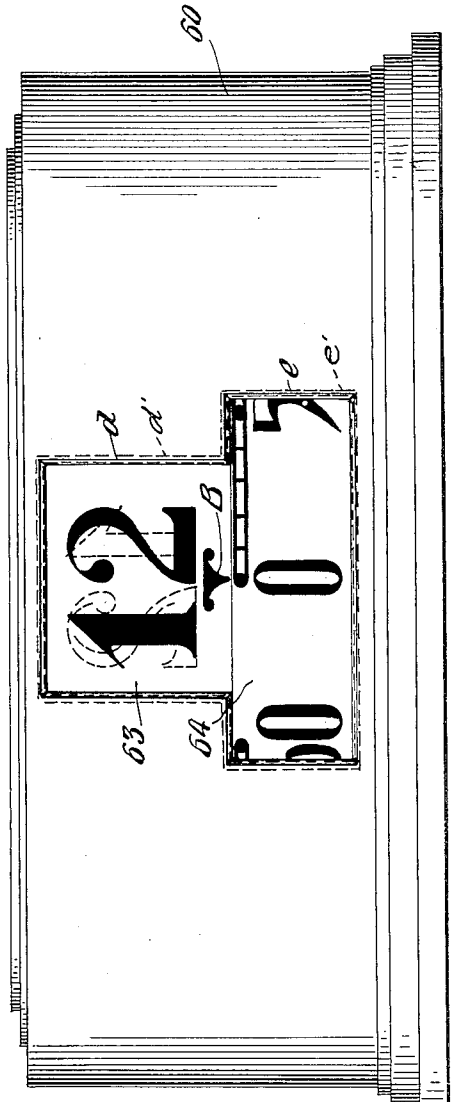
Fig. 5.

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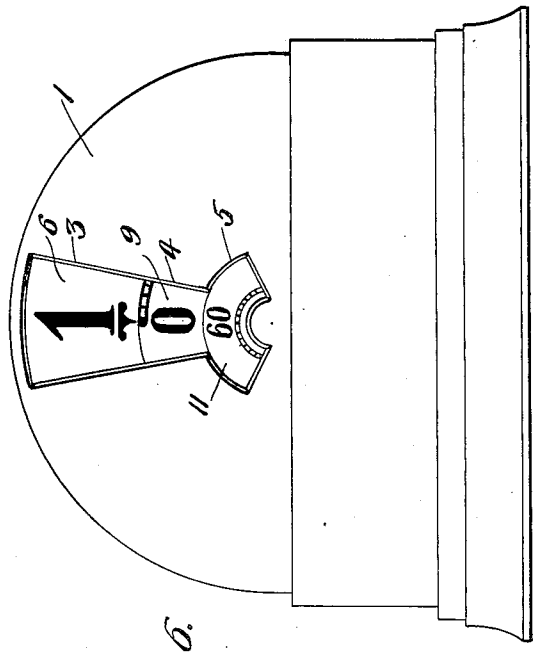


Fig. 6.

Fig. 8.

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UNITED STATES PATENT OFFICE

1,997,570

TIMEPIECE

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Application March 23, 1934, Serial No. 716,925

13 Claims. (Cl. 58—125)

My present invention relates to certain new and useful improvements in timepiece movements, particularly of the class employing dials, which may consist of drums, disks, bands, or other revolving members, in place of the more common hands, which dials, except the dials of the disc type, may expose their time-indicating figures or symbols through more than one opening in the clock face or casing, so that only one hour symbol is exposed to view at one time, and only one or a very few minute numerals at one time, and if any second numerals, only a few, although the number of each kind may vary, so long as the main purpose is fulfilled of enabling the time to be read more quickly and accurately from a clock face that shows figures or numerals marking the time at the moment of observation, in relation to a pointer on the dial.

The improvements herein set forth comprise essentially, in one of the preferred embodiments of the invention, a series of parallel disks constituting clock or timepiece dials, one being an hour dial marked with hour symbols, another being a minute dial which is marked with minute symbols, and another a second dial which is marked with second symbols. The hour dial makes a complete revolution in twelve jumps, each numeral thereon remaining exposed to view through the opening in the clock face for one hour; and said numeral which is so exposed to indicate the hour being the only hour numeral visible through the hour opening in the clock face at any one time. The minute dial revolves continuously while it is driven by the motor, but at the expiration of the 60th minute it jumps ahead when disconnected from the motor and after it is placed under the action of a lever mechanism, the jumping action of the minute dial being together with that of the hour dial, and then the graduated lines of the minute dial pass the stationary pointer or arrow on the hour dial while the latter remains stationary; and a portion of the moving minute dial is shown through the same opening that displays the hour numerals, or through another opening adjacent thereto. A similar construction may apply to the third dial telling the time in seconds, though usually the second dial revolves continuously all the time without any jumping action. Instead of disk dials I may substitute drums, bands, or other revolving or moving members, for exhibiting time readings, as I shall explain in my discussion of modified or alternative forms. Electric motors and other appliances and appurtenances are utilized for actuating the movable elements in their proper relation and sequence, in so far as such devices may be required in the measuring of time.

A fundamental idea of my improved clock mechanism is the way the time-indicating numerals are displayed, one primary object being to avoid the disadvantage found in many clocks and watches of the jump-numeral variety of leaving doubt in the mind of the observer when he is reading time near the end of the hour as to whether the hour numeral has just changed or is just about to change. In my improved combination there is no doubt on this point, but absolute certainty, because hour and minute dials or flexible bands or other forms jump in unison at the expiration of each rotative period. For at the expiration of the 60th minute in every hour, both hour and minute disks, or other dial devices jump away from the opening in the clock face, and the next hour numeral or symbol and its corresponding zero point of the minute dial or disk or element take their places in front of the opening or openings. A blank space separates the 60th minute of a preceding hour from the zero point of the next hour as registered by the minute dial, drum, or flexible band, and this blank space, shows a definite starting point for the hour, and definitely and certainly separates it from the preceding hour, leaving no confusion in the mind of the person reading the time as to whether the hour has just changed or is just about to change.

In the essential mechanism of my present improvements employed for reaching the specified objectives of the invention, the hour dial is normally locked in a stationary position while the minute dial is revolving continuously. At the end of each hour, at the time when the jump is taking place from the end of one hour to the beginning of the next, the hour disk is released from its stationary position and is connected to the minute dial, so that they jump together, because at the instant of the jump the minute dial is released from the driving train which actuates it continuously, and the hour and minute dials being then connected together jump in unison. At the completion of the jumping action, the hour disk is released from the minute disk and locked again in a stationary position for another hour, while the minute disk is re-connected to the continuous drive so that it will resume its continuous revolution for another period of sixty minutes until again interrupted by the arrival of the next jump period when the hour numeral must again change.

The invention therefore comprises all these essential features, and moreover consists also in numerous details and peculiarities in the construction, combination, and arrangement of parts, and in various modifications, alternative and equivalent forms, novel extensions of underlying mechanisms, substantially as will be hereinafter described, and then more fully pointed out in the ensuing clauses of claim.

In the accompanying drawings illustrating my invention:

Figure 1 is a vertical section of one leading form of my improved clock mechanism, which is shown in Figure 6.

Figure 2 is a detail side elevation of the main essential operating parts whereby the hour and minute dials are locked together during the jump, and shows their interlocking relation during the jump period when they are jumping in unison.

Figure 3 is a similar view of the same parts, but showing the relative position of the same when they are unlocked from each other, the hour disk being held stationary and the actuating mechanism of the minute disk being connected with the continuous drive.

Figure 4 is an enlarged vertical section of the mechanism when modified to be used with drum dials.

Figure 5 is an elevational view showing a modification that utilizes drums and endless bands, a part being in section.

Figure 6 is a front view of a clock casing for the form of clock mechanism using parallel disks for dials, as in Figure 1.

Figure 7 is a front view of a clock casing for clock mechanism using a drum dial.

Figure 8 is a front view of a clock casing for clock mechanism using drums and endless bands.

Similar characters of reference denote like parts throughout all the different figures of the drawings.

The stationary arrow or pointer at B, adjacent to the hour and minute graduation marks, indicates the exact moment of time being indicated and is an important feature.

The main frame 1 of my improved clock, watch, or other timepiece, (see Figures 1 and 6) may have any dimensions, shape, quality, material, special function, and use; and that specimen shown in section in Figure 1 is simply for explanatory purposes, being a case as shown in Figure 6 with a rounded top and an ornamental base, wherein is secured an inner supplemental skeleton frame 13 for properly mounting in various relations to each other some of the gearing, wheels, shafts, etc. that make up certain of the trains of gearing and drive gearing and other actuating devices for the dials and the rest of the time-indicating mechanism.

An electric motor, as A, in this example of the invention, is localized within frame 13, at the base, where it can be held securely, as shown in Figure 1. Motor A drives its shaft on which is a driving pinion 16 that meshes with a large gear wheel 17, whose hub 15 is mounted revolubly in the rear wall of casing 1, at some suitable point in the rear side thereof, and said hub 15 projects behind the rear wall of the case 1 into an enveloping recess 42 in the form of a manual disk, handle, or knob 14, which can be manipulated to turn hub 15 and gear wheel 17 a greater or less number of revolutions as may be needed to set the dials of the clock so they will indicate or mark the correct time, or otherwise. The hub 15 is also horizontally slidable in and out so as temporarily to disengage the gear wheel 17 from the pinion 16 to enable wheel 17 to be freely turned one way or the other in setting the dials. A flat spring 24 tensioned between the inner frame 13 and gear wheel 17 acts to return the wheel 17 to its normal position in mesh with pinion 16 after a correction or change in the position of the time-marking mechanism by resetting has been made.

On the hub 15 of gear wheel 17, and fast with said hub and gear, is a reducing gear wheel 18 of much smaller diameter than gear wheel 17, which smaller gear wheel 18 revolves with wheel 17 and engages and drives a gear wheel 19 on a short shaft mounted in a bearing 20 fast in frame 13, which shaft also carries a gear wheel 21 that engages and drives a gear wheel 22 that is fast on the hub of a disk 23, having at equidistant intervals the V-shaped notches 33, which divide the circumference of disk 23 into twelve equal parts corresponding to the requirements of the twelve-hour system of reckoning time.

A horizontal shaft 12, serving as the main drive shaft or spindle for the dials or disks, is supported in bearings in the front and rear parts of frame 13 so that it may revolve easily, the bearing for the rear part of shaft 12 being directly in the rear part of frame 13, while the bearing for the front end of shaft 12 is directly in the sleeves or hubs of disks or other parts that have their revoluble support in the front part of frame 13. And further the shaft 12 enters a central bore in hub 15 of gear wheel 17 to which hub the shaft is splined or feathered to permit the aforesaid horizontal adjustment of wheel 17 in setting the dials; and also the splining of these parts together makes it possible for the wheel 17 and gear 18 to continuously rotate the shaft 12 when the motor A is in operation. The front end of shaft 12 carries the second disk 11 which is therefore continuously revolved.

Further, the combined wheels 22 and 23 are supported loosely on shaft 12 and revolve thereon when driven by the described train of gearing, and they are driven continuously, and actuate other associated parts while connected therewith and at all times except at certain stop and jump periods at the end of each hour as will be presently explained. Therefore the combined wheels 22 and 23 may be treated as the main gearing of the continuous drive, and their construction and combination may vary within wide limits, and made in one or two parts, provided one part is actuated by gear wheel 21, while the other and larger part has a series of V-shaped peripheral notches 33 that divide the circumference of wheel 23 into twelve parts corresponding to twelve hours. As one-twelfth of the circumference of wheel 23 is skipped at each hour, when the jump at one o'clock, two o'clock, three o'clock, and so on takes place, wheel 22 must have an additional number of teeth so that eleven-twelfths of one revolution will equal one hour in time. The jump takes perhaps one, two, or three seconds, and is taken care of by the wedge or V-shaped angle of the teeth 33 in periphery of wheel 23, and V-lug 44 on slide 27 which when snapping into place brings the dials to correct alinement and correct time.

On the front of the clock casing 1 is an opening 3, through which the hour numerals are exposed on the hour disk 6, said numerals running from 1 to 12, for example. The clockcase also has an opening 4, which may be a part of opening 3, or a separate one, as preferred, through which opening 4 the minute disk 9 exposes a portion of

its face as it revolves, said minute disk having a series of figures running from 0 to 60 to indicate sixty minutes. There also may be or may not be a third opening 5 in the face of casing 1, either separate from or a part of the other openings, through which the second disk 11 shows itself, a part at a time, the symbols thereon running from 1 to 60 in a circular series. Said second-marked dial 11 is secured to the end of drive spindle 12 by which it is continuously driven while the clock is running, the train of gearing from motor A effectuating this revolution of spindle 12 as already explained.

The disk 9 which carries the series of figures from 0 to 60 forming the minute dial, functioning like the ordinary minute hand, has a central hub 10 loose on shaft 12 and revolving within a hub or sleeve 7 on the hour disk 6, which hub thus furnishes a bearing for the hub 10. The hubs 7 and 10 thus telescope within each other, and hub 7 on hour disk 6 revolves loosely in a bearing in the front part of inner frame 13. Furthermore hub 7, thus a part of hour disk 6, carries fixedly on its inner end the wheel 8, shown in front outline in Figures 2 and 3, having twelve teeth 40, corresponding to the twelve hour divisions of time, between which teeth 40 are preferably the curved or concave recesses in the periphery of wheel 8.

The hub 10 of the minute dial 9 is relatively long and extends for some distance into frame 13 to a point close to wheel 23, so that spindle 12 is surrounded and enclosed thereby for a substantial distance, as shown in Figure 1. And on the inner portion of hub 10 is keyed or otherwise secured rigidly thereto the cam 25, on whose hub 43 is secured a single-notched disk 26.

It is quite possible that the cam 25 and disk 26 may be made in a single piece, for they unite together into a single entity, and when made as two elements they are closely united as shown, the hub 43 having disk 26 mounted firmly thereon, and as said hub is keyed to the minute dial hub 10 they will revolve in unison or will stop their joint revolution when the agent that revolves them intermits driving them. The combined disk and cam are driven continuously by the driving mechanism, so long as wheel 23 is connected to the said combined cam and disk, the connection being made by means of slide 27 and connection being broken at the end of each hour by the action of said slide.

Alongside of disk 26, and supported diametrically across the same, so as to be endwise movable, is the sliding member or bar 27, (shown in dotted outline in Figures 2 and 3, and in section in Figure 1), having a V-shaped right-angled lug 44 at one end adapted at times to take into one of the V-notches 38 of the periphery of disk 23, and thus connect the continuously driving mechanism with the combined disk and cam, and adapted at the proper times to engage these notches 38 successively at intervals an hour apart. Slide 27 has a long slot 46 in the middle part thereof that encloses sleeve 43 therein of cam 25, so that the travel of slide 27 may thereby be guided, controlled and limited, as shown in Figures 2 and 3, where its different positions appear. Slide 27 moreover has a lug 45 thereon, near the head of slide, which projects at right angles and passes through substantially coincidental slots in the cam 25 and disk 26, whereby the slide 27 is still further guided, limited and controlled in its movement. The projecting lug 45 is long enough to enable it to engage the teeth 40 of the toothed hour wheel 8 when the slide is in one of its positions as shown in Figure 2, at which time the continuous drive is disconnected and the hour and minute dials are connected together at the moment of the jump action. At this time the slide is in its inner or depressed position, not only with the lug 45 engaged with wheel 8, but with the V-shaped lug 44 on the other end disengaged from the toothed wheel 23. Also the slide 27 is provided under the lug 45 with a pin 47 that enters a recess in the disk 26, and is provided with an enclosing spring 48 that is tensioned between the bottom of the recess and the lug 45, so as to have the effect to normally urge the slide upwardly or outwardly into the position shown in Figure 3, where the lug 45 is disengaged from wheel 8 and the V-lug is engaged with one of the notches 38 in disk 23, and where obviously the continuous driving gear is connected up for dial rotating purposes. Also the slide at the end that carries lug 45 has a head 49 curved in an arc of the periphery of disk 26 to which it is adjacent.

When the continuous drive is hooked up, as in Figure 3, the head 49 of slide 27 is protruded far enough into its outer position so that its arc will coincide with the periphery of wheel 26 adjacent to notch 46 in the circumference of wheel 26, so that the head 41 of a lever 29 to be described will ride on the curved arc of head 49 and depress the same so as to move the slide 27. When the lever head 41 depresses the slide head 49, as shown in Figure 2, the slide 27 is moved lengthwise against the tension of spring 48, during the movement of wheel 26 for the length of notch 46, but when the end of the notch is reached and another agency acts to lift the lever head 41 into its raised position as shown in Figure 3, the retracted spring 48 expands and lifts on the slide to restore it to its former position where the V-lug 44 engages wheel 23 again and the continuous drive again actuates the minute dial continuously.

In the operation of my improved clock mechanism of the class described and for the purpose stated, to drive the minute dial continuously except at the end of each hour the minute dial and the hour dial are connected together so that they can make jointly a jump that will advance the hour dial by one hour, changing the hour number to the next successive number and simultaneously advancing the minute dial from its 60th minute graduation to a zero graduation removed therefrom by a blank space, the jump of the disks belonging to the two dials being identical in length for at this time the two dials are locked together for joint movement. These functions and relative movements are made possible by the provision of the means for interlocking the minute and hour dials, and for unlocking them, and for controlling the functioning with these dials of the continuous driving means.

The features contributing to these results are clearly indicated in Figures 2 and 3. A lever 29 is secured fast on a rotary stud or pivot 33, on which at a short distance from lever 29 is secured another lever 28, projecting in another direction at an angle to lever 29, the device being of bell-crank form. Against lever 29 bears a spring 30 which urges lever 29 towards wheel 26 and slide 27, so that the head 41 of lever 29 may bear normally on the periphery of disk 26, and may drop into notch 46 of disk 26, when it arrives at the notch, at which movement said head 41 will bear on the head 49 of slide 27 and depress the slide while the head 41 of the lever is in the notch

and the wheel 26 is revolving, the notch 46 being one-twelfth of the circumference of disk 26, plus the width of head 41. While lever 29 has the head 41 that bears on wheel 26 and slide head 49, the lever 28 that forms a bell-crank with lever 29 has a head 36 of a proper width and shape to enter between two teeth 40 of wheel 8, and this engagement holds the wheel 8 stationary for the time being. Obviously when lever 29 depresses slide 27 head 36 will be disengaged; and when head 36 is engaged as in Figure 3 lever 41 will be outside of notch 46. When lever head 41 is in notch 46 the slide is depressed, the slide is disconnected from continuous drive wheel 23, and the hour and minute dials are interlocked so as to make the jump at the end of an hour, the lever head 36 at this time being set free from its stationary hold on the hour wheel 8, so that the latter may jump with the minute dial.

Another lever or catch 34 is pivoted at 35, and has a pointed tooth 33 that rides on the periphery of cam 25. Lever 34 is pressed against the cam by spring 31, held rigidly at 37 on some part of the frame. The salient part of cam 25 is adjacent to a section 25*a* having a length sufficient to permit lever 34 to act against the cam to rotate it while the hour and minute dials are interlocked while making the hourly jump. When the head 41 of lever 29 has reached the end of notch 46, the tooth 33 has acted against the cam sufficiently to throw the lever 34 over far enough to cause a projecting lug 32 thereon to act against lever 28 and push its head between two of teeth 40 of hour wheel 8, bringing the latter to stationary position, simultaneously with which the head 41 is lifted out of notch 46 so that it can travel on the periphery of wheel 26. The spring 43 restores the slide 27 to a position where its lug 44 engages a V-notch 38 in wheel 23, thus again connecting the continuous drive with the minute dial, and placing the other parts in the positions that enable the orderly sequence of movements to occur until the next jump period arrives and finds the lever head 41 again ready to drop into notch 46, and the toothed lever ready to drop off the salient part of the cam, and the other changes ready to take place to permit another hourly jump to be perfected in the routine already detailed.

The cam 25 has its salient part reached in its revolution by the tooth 33, before said tooth reaches the section 25*a* extending from the periphery of the cam at its highest part to a point inward and near to the center. When point 33 is thus pressing against the cam and slide-carrying wheel, now free to revolve because disconnected from the continuous drive, it will rotate the united hour and minute dials due to the pressure of spring 31 thereagainst, thus causing what is heretofore denoted as the jump. When the point 33 of lever 34 is traveling on the periphery of cam 25, except the portion 25*a*, the lever 34 will hold its lug 32 retracted away from lever 28, but when point 33 drops off the high point of the cam and rides on section 25*a* the lug 32 approaches and acts against arm 28, as shown in Figure 2, and the spring 31 forces lever 34 inwardly and its lug presses lever 28 towards the clock center and holds the head 36 in engagement with wheel 8 to anchor same in its stationary position, until head 41 of lever 29 is again allowed to drop onto the circumference of disk 26 due to the rising portion of the cam acting on point 33, keeping head 36 of arm 28 in the locked position with wheel 8 until head 41 of lever 29 again enters notch 46 of disk 26, thus timing the jump to one hour intervals.

The invention I am now describing may be applied for use in many cases besides those in which dials marked on disks are substituted for ordinary clock hands to mark time in like manner. Thus far in my description I have been speaking of dials consisting of numeral-marked disks and the mechanism for operating them. But it will be obvious that in lieu of a disk I may utilize a rotary drum on which the time figures are marked, one or more drums as shown in Figure 4, and as indicated with a clock casing in Figure 7; or I may utilize flexible bands marked with time figures, which bands pass around a pair of drums that are electrically or mechanically driven so as to propel the continuous bands or belts past slots or openings through which the time marks are displayed in the same manner as in Figures 1 and 6, this endless belt form being shown in Figures 5 and 8. Other equivalent carrier devices for the time symbols to enable them to be successively displayed through windows in a casing may be originated and adapted for use on the same principles as govern the forms I am illustrating and describing, it being understood that the same actuating mechanism as that given in Figures 1, 2, and 3 for driving and controlling the operation of the disk dials, will be used for the drum dials, the endless bands, and other equivalent forms, with only such changes, variations, or modifications as may be essential to adapt the said mechanism for proper and successful cooperation with the driven dial devices in the correct marking of time by these several equivalent means.

Proceeding now to describe that alternate form of the invention shown in Figures 4 and 7, where the dial has its graduations marked on a cylindrical drum, 50 denotes the casing for the clock, which may be of any desired form, if suitable to allow a drum, or plurality of drums or cylinders, to be mounted revolvably within, so as to be able to revolve and show their symbols or markings through openings or windows, as *a* for the hour figures on the hour drum or dial, *b* for the minute figures on the minute drum or dial, and *c* for the second figures on the second drum or dial. The hour dial has a series of numbers from 1 to 12 marked on the hour drum 52; the minute dial has a series of numbers from 0 to 60 marked on the minute drum 53; and the second dial has a series of numbers from 1 to 60 marked on the second drum 54. Within casing 50 near the top is an inner frame 51 securely placed, and near the bottom is another inner frame 55, securely placed, said frames 51 and 55 being to hold and support the various parts of the operating mechanism. The three drums or cylinders 52, 53, and 54 revolve within the window-provided casing 50 and expose their numerals to view through the window or windows in like manner as the dials show their figures through the openings, in connection with the mechanism shown in Figures 1, 2, and 3; and this same operating mechanism, somewhat rearranged to adapt it to operate the drums of Figure 4, is employed in this form of the invention.

Located within lower inner frame 55 is an electric or other motor A, on the shaft of which is a driving pinion 70 that engages and drives a gear wheel 71, formed integral with a vertical sleeve

58, revolving in a bearing in the bottom of frame 55, and having on its lower end a button or knob outside of frame 50 by which it can be rotated to set the clock dials and other mechanism in correcting the time, etc. By pushing inward on knob 58 the gear wheel 71 can be temporarily disengaged from pinion 70, so that the flat spring 72 will be compressed and then the sleeve 58 can be turned by hand to set the parts, and when this is done the spring 72 will return the gear 71 into mesh with drive pinion 70. The sleeve 58 is splined to the main spindle 56 that runs into it, which permits it to be movable endwise in making adjustments and also connects the gear wheel 71 to the spindle so that it will actuate it.

This spindle is long and extends vertically through all the drums 52, 53, and 54. On its upper end near where it is journaled in a bearing in frame 51 is a drive gear wheel 18 which forms a part of the train for the continuous drive of the minute drum 53. Shaft 56 is also secured centrally within the seconds drum 54 and imparts a constant revolution thereto as it is driven by the motor. The minute drum 53 has a central hub 57 held firm by braces 74, within which the spindle 56 runs and revolves, said hub having secured thereto near its upper end the slotted cam 25 and single-notched disk 26 carrying lug-provided and spring-controlled slide 27, said slide being contiguous to the continuous drive disk 23 having V-notches 38 entered successively by the V-shaped lug 44 on slide 27, whereby the jump at the end of each hour is provided for. And further, the hour drum 52 has a central integral hub 73 that carries fast thereon the twelve-toothed hour wheel 8, having teeth 40, in connection with which operates the lug 45 on slide 27, the latter having pin 47 and returning spring 48.

It will also be seen that the gear wheel 18 on drive spindle 56 engages and drives gear wheel 19, carried on stud 20 on frame 51, which stud 20 also carries a smaller gear 21 that engages and drives a gear wheel 22 secured to or made a part of V-notched disk 23. The combined gear wheel 22 and disk 23 form a part of the continuous driving mechanism that actuates the minute drum continuously. The operation of all these parts is the same as that of the similar parts in Figures 1, 2, and 3, and the jump made at the end of each hour when the hour drum and minute drum are temporarily locked together, and they are disconnected from the continuous drive is the same, and I do not find it necessary to describe or repeat here in detail what I have presented at length in describing the operation of the parts in Figures 1, 2, and 3.

Passing now to describe the endless band form of dial running over actuating drums I refer to the details brought out clearly in views in Figures 5 and 8. The drums are arranged and actuated in very much the same way as in Figure 4, with some differences of detail of which I will speak, but whereas in the form of the invention in Figure 4 there are hour, minute, and second drums, on which the numerals are marked, in this last alternate form the drums, one or more, serve to drive or propel endless flexible bands or belts on which the numerals are marked. In the example I am describing I have represented only two bands, one for an hour dial, and one for a minute dial. The actuating drums may be at one or both ends of the clock, but it will usually be sufficient to actuate the bands at only one point. The bands may carry one or several series of figures or symbols, that is to say, the hour numerals may run from 1 to 12, and then again from 1 to 12, so that each of the parallel sides of a band will show a series of figures, and thus time can be read from two or more sides of the clock, it being easy to make suitable provision for this duplication. The opposite openings are shown at *d* and *d'* and at *e* and *e'* in Figure 8. As the bands or belts are so much longer than dials or drums and the time numerals have to travel further I provide in the actuating gearing trains some supplemental additions of multiplying gearing to speed up the movement, but do not wish to be confined thereto, as its use will depend on the size and function of such a clock.

60 represents a casing adapted to contain the mechanism of a clock having numeral-marked bands to serve as dials, of which I show two, an hour band 63 and a minute band 64. The hour band 63 is driven by the drum 61, which has a sprocket wheel formed on the outside thereof near the upper end and consisting of a series of teeth 61*a* that take into the holes 63*a* in the band 63 and thus drive the band; and the minute band 64 is driven by the drum 62, which has a sprocket wheel formed on the outside thereof near the lower end and consisting of a series of teeth 62*a* that take into the holes 64*a* in the band 64 and thus drive the band. Drum 63 is above band 64. In frame or casing 60, see Figure 5, near one end is an upper frame 65 and a lower frame 66, designed to permit the drums and the mechanism for driving them to be properly supported. In lower frame 66 is an electric or other motor A, on whose shaft is a pinion 70*a* that engages a gear wheel 71, the same as in Figure 4, on a sleeve 58 having a knob or handle 59, for use in setting the hands, the gear 71 being engageable with or disengageable from the pinion 70*a* and under the control of flat spring 72. Main spindle 56, the same as in Figure 4 is arranged very much the same as in Figure 4 and carries a drive gear that actuates a train of gearing as in Figure 4, being substantially the same parts, operating in the same way for the same purpose.

One difference however deserves to be mentioned and consists in the interposition of speeding up gearing to increase the speed of the travel of the bands. Instead of having the hour drum hub 64, (which is the equivalent of hub 73 in Figure 4) secured to the twelve-toothed hour wheel 8 I have inserted a train of gears between hub 64 and wheel 8, consisting of pinion 83 formed on hub 64, which meshes with gear wheel 80, on a stud on the frame 65, which wheel 80 carries a small pinion 81 that drives a gear wheel 82, whose hub is secured to the twelve-toothed wheel 8. And also, instead of having the minute drum provided with a vertical hub as 57 which is connected to the cam and slide-carrying members, said minute drum (in this instance drum 62) has a central downwardly extending sleeve or hub 85, which connects with the said cam and slide-carrying members through a train comprising pinion 78 on the hub 85, that engages gear wheel 75 on a stud on frame 66, which gear 75 carries an attached pinion 76, that engages a gear wheel 77 that is integral with or secured to the long sleeve 79 which is secured to the combined cam and slide-carrying elements aforesaid, by which interposed train the movement of the band 64 is speeded up the same as speed of band 63. While the drums at one end of this form of clock drive the bands or belts, drums at the other end may be suitably arranged, as with a spindle

84, to merely support the bands in their travel without driving.

Many other changes in the embodiment of the invention may be made within the purview of the claims, and I therefore reserve the liberty and privilege of rearranging the parts of the invention, substituting other mechanical equivalents and novel features designed to more effectually fulfill the requirements of my essential purposes, but not departing from the scope of the claims.

What I claim, is:

1. In a timepiece mechanism of the class described, a casing, an hour dial exposing only one symbol at a time, in combination with a minute dial that exposes only a portion at one time, the hour dial having a continuous series of symbols, and the minute dial having a series of symbols with a blank space between the marks 60 and 0, said hour and minute dials having central telescoping hubs, one of which is revoluble within the other, and both of which are revolubly mounted, means for locking the hour and minute dials together at the end of each hour and causing them jointly to jump ahead, the hour dial to the next hour symbol and the minute dial to its zero graduation, and means for holding the hour dial stationary and for continuously revolving the minute dial the rest of the time, said blank space between the marks 60 and 0 serving to definitely show that the hour has just changed.

2. In a timepiece mechanism of the class described, a casing, an hour dial exposing one symbol at a time, in combination with a minute dial exposing a portion only at a time, the hour dial having a continuous series of symbols, and the minute dial having a series of symbols with a blank space between the marks 60 and 0, said hour and minute dials having central telescoping hubs, one of which is revoluble within the other, and both of which are revolubly mounted, means for uniting the dials at the end of each hour and causing them jointly to jump ahead, so that the zero mark on the minute dial may be opposite an hour symbol at the end of the jump, and means for holding the hour dial stationary and for continuously revolving the minute dial except at the jump periods, said blank space between the marks 60 and 0 serving to definitely show that the hour has just changed.

3. In a timepiece mechanism of the class described, the combination of a casing having an opening therein, an hour dial exposing only one symbol at a time, a minute dial that exposes only a segment at one time, said minute dial having markings thereon and a blank space between the last and first graduation equal in length to one-twelfth of the circumference, actuating gearing for driving the minute dial continuously except at the end of each hour, the same including a plural-notched disk, a plural-toothed wheel rigidly secured to the hour dial, means for disconnecting the continuous drive gearing at the end of each hour and locking the hour and minute dial mechanism together at the same moment, the same including a single-notched disk, a rotary cam combined therewith, a lug-provided reciprocable slide diametrically supported on the single-notched disk, and operating in connection with the toothed hour wheel and the plural-notched disk, together with cooperating lever devices, all arranged to cause the hour and minute dials to jump ahead the length of said blank space when they are interlocked, so that a new hour symbol and the zero point on the minute dial may be exposed, said zero point being opposite to the hour symbol, and so that the hour dial may be held stationary and the continuous drive may be reconnected to the minute dial at the end of each jump period.

4. In a timepiece mechanism if the class described, the combination of an apertured casing, an hour dial having a single symbol exposure, a minute dial having a segmental exposure, the hour dial having a continuous series of symbols, and the minute dial having a series of symbols and a blank space between the last and first marking thereon equal in length to the distance between two adjacent hour symbols, said hour and minute dials having central telescoping hubs, means for locking the hour and minute dials together at the end of each hour and causing them to jointly jump ahead, the hour dial to the next symbol and the minute dial to the end of the blank space, and means for holding the hour dial stationary the rest of the hour and for continuously revolving the minute dial at the same time.

5. In a timepiece mechanism of the class described, the combination of an apertured casing, an hour dial having a single symbol exposure, a minute dial having a segmental exposure, the hour dial having a continuous series of symbols, and the minute dial having a series of symbols and a blank space between the first and last marking thereon equal in length to the distance between two adjacent hour symbols, means for locking the hour and minute dials together at the end of each hour and causing them to jointly jump ahead, the hour dial to the next symbol and the minute dial to the end of the blank space, and means for holding the hour dial stationary the rest of the hour and for continuously revolving the minute dial at the same time, said means consisting essentially of a continuous drive gearing, a twelve-toothed hour wheel, a single-notched disk, a cam combined with it, a slide that coacts with the hour wheel and the continuous drive, and cooperating lever devices.

6. In a timepiece mechanism of the class described, the combination of an apertured casing, an hour dial having a single symbol exposure, a minute dial having a segmental exposure, said hour and minute dials having central telescoping hubs, one of which is revoluble within the other, and both of which are revolubly mounted, means for locking the hour and minute dials together at the end of each hour and causing them jointly to jump ahead, the hour dial to the next hour symbol and the minute dial to its zero graduation, means for holding the hour dial stationary and for continuously revolving the minute dial the rest of the time, a main drive shaft on which the telescoping hubs are loosely mounted, and a dial marking seconds and having a segmental exposure, said seconds dial being secured to the drive shaft so as to revolve continuously all the time.

7. In a timepiece mechanism of the class described, the combination of a casing having an opening therein, an hour dial exposing only one symbol at a time, a minute dial that exposes only a segment at one time, said minute dial having markings thereon and a blank space between the last and first graduation equal in length to one-twelfth of the circumference, actuating gearing for driving the minute dial continuously except during the jump at the end of each hour, the same including a plural-notched disk, a plural-

toothed wheel rigidly secured to the hour dial, means for disconnecting the continuous drive gearing at the end of each hour and locking the hour and minute dial mechanism together at the same moment, the same including a single-notched disk, a rotary cam combined therewith, a reciprocable slide supported on the single-notched disk and operating in connection with the toothed hour wheel and the plural-notched disk, together with cooperating lever devices, comprising a pivoted bell-crank lever, one arm of which has its end riding on the single-notched disk and dropping into the notch, while the other arm has an end engaging the plural-toothed hour wheel to hold same stationary except in the jump period, and also another spring lever engaging and rotating the cam, all arranged to cause the hour and minute dials to jump ahead the length of said blank space when they are interlocked, so that a new hour may be exposed and simultaneously the zero point on the minute dial, said zero point being opposite to said hour symbol, and so that the hour dial may be held stationary and the continuous drive may be reconnected to the minute dial at the end of each jump period.

8. In a timepiece mechanism of the class described, the combination of an apertured casing, an hour dial having a single symbol exposure, a minute dial having a segmental exposure, the hour dial having a continuous series of symbols, and the minute dial having a series of symbols and a blank space between the last and first symbol equal in length to the distance between two adjacent hour symbols, said hour and minute dials having central telescoping hubs, one of which is revoluble within the other, and both of which are revolubly mounted, a main drive shaft which extends through the inner of said dial hubs, means for locking the hour and minute dials together at the end of each hour and causing them to jointly jump ahead, the hour dial to the next symbol and the minute dial to the end of the blank space, a pointer on the clock face for exactly marking the limit of the jump and the location of the dial figures at each period, and means for holding the hour dial stationary the rest of the hour and for continuously revolving the minute dial while the hour dial is stationary.

9. In a timepiece mechanism of the class described, the combination of an apertured casing, an hour dial having a single symbol exposure, a minute dial having a segmental exposure, and a seconds dial, said minute dial having a blank space between certain of the symbols, which space is equal to the space that the hour dial jumps at the end of each hour, and which space serves to definitely show that the hour has just changed and leaves no doubt in the mind of the person observing the time as to whether the hour has just changed or is just about to change, said hour and minute dials having central telescoping hubs, one of which is revoluble within the other, and both of which are revolubly mounted, a main drive shaft which runs loosely through the inner of the said dial hubs and is secured to the seconds dial so as to revolve it continuously, means for jumping the hour dial once an hour, means for jumping the minute dial at the same time for the same distance, means for revolving the minute dial continuously except at the jump period, and means for holding the hour dial stationary during the whole of each hourly period except when it is partly rotated to expose the next numeral.

10. In a timepiece mechanism of the class described, the combination of an apertured casing having a pointer thereon adjacent to the aperture, an hour dial exposing only one symbol at a time, a minute dial that exposes only a segment at once, the minute dial having a blank space in its circumference between the last and the first graduations, equal in length to the jump of the hour and minute dials, a continuous driving means for the minute dial having a V-notched disk, an hour wheel, means between the hour wheel and the continuous drive at the end of each hour and locking the hour and minute dials together, comprising a single-notched disk, a reciprocable slide diametrically supported on the disk and having a lug that engages the toothed hour wheel on the hour dial when the hour and minute dials are locked together in the jump period and having a V-lug to engage the V-notches in the plural notched disk of the continuous drive at other times than the jump period.

11. In a timepiece mechanism of the class described, a casing, a dial carrying the hour numerals, and exposing only one symbol at a time, in combination with a minute dial, a segment of which is blank, the other segment carrying minute numerals, of which a portion only are exposed at one time, means for causing said segments carrying minute numerals to revolve continuously while the exposed hour symbol remains stationary, and said blank segment at the expiration of the 60th minute of the exposed hour to jump ahead jointly with the hour dial, so that the next exposed hour symbol, and its pointer coincide with the zero point of said segment of the dial, which carries the minute numerals, said blank segment serving as means to definitely show that the hour symbol has just changed and definitely separates this hour from the preceding hour, said hour and minute dials having central telescoping hubs, one of which is revoluble within the other, and both of which are revolubly mounted, and a main drive shaft which runs loosely through the inner of the said dial hubs.

12. In a timepiece mechanism of the class described, the combination of a casing having two or more similar openings on opposite sides, a dial carrying hour numerals from 1 to 12 in series equal in number to said openings, so that at each jump of said hour drum a similar number is exposed in each opening at the same time, another dial carrying minute numerals divided into segments, the numerals being from 0 to 60 and blank spaces between 0 and 60 to coordinate with the jump of each hour so that at each change of the hour the zero point of each minute segment will appear simultaneously with its hour numeral in each opening, means to continuously drive each segment of the minute dial carrying numerals, while each hour member is locked in place, means for jumping each segment of the minute dial in unison with the change in the hour, so that the incoming hour and zero point of each minute segment may jump into place simultaneously, said blank space serving as means to definitely show that the hour has just changed and leaving no doubt in the mind of the person telling the time as to whether the hour has just changed or is just about to change, the aforesaid means for continuously revolving the minute dial and simultaneously holding the hour dial stationary, except at the jump periods, consisting essentially of a continuous drive gearing, a twelve-toothed hour wheel, a single-notched disk, a cam combined with it, a slide that coacts with the hour wheel

and the continuous drive, and cooperating lever devices.

13: In a timepiece mechanism of the class described, the combination of an apertured casing, an hour dial having a single symbol exposure, a minute dial having a segmental exposure, the hour dial having a continuous series of symbols, and the minute dial having a series of symbols and a blank space between the last and first symbols equal in length to the distance between two adjacent hour symbols, said hour and minute dials having central telescoping hubs, one of which is revoluble within the other, and both of which are revolubly mounted, means for locking the hour and minute dials together at the end of each hour and causing them to jointly jump ahead, the hour dial to the next symbol and the minute dial to the end of the blank space, a pointer on the clock face for exactly marking the limit of the jump and the location of the dial figures at each period, and means for holding the hour dial stationary the rest of the hour and for continuously revolving the minute dial while the hour dial is stationary, said blank space serving as means to definitely show that the hour has just changed and leaving no doubt in the mind of the person telling the time as to whether the hour has just changed or is just about to change.

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