

Oct. 2, 1934.

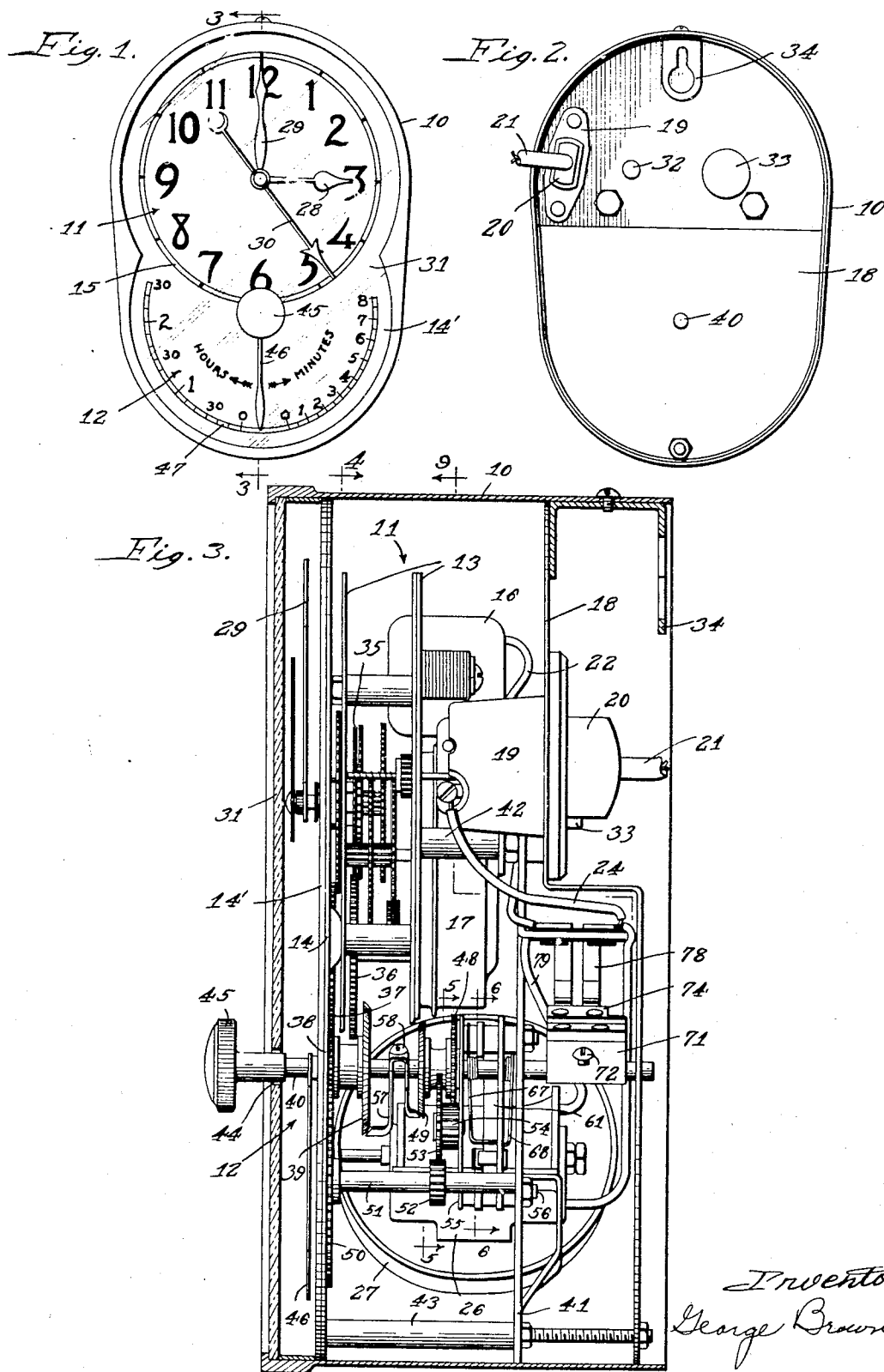
G. BROWNING

1,975,347

INTERVAL TIMER

Filed July 30, 1931

4 Sheets-Sheet 1



Inventor
George Browning

By
Wilson, Dowell, McCanna & Rehm
Attys.

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Fig. 4.

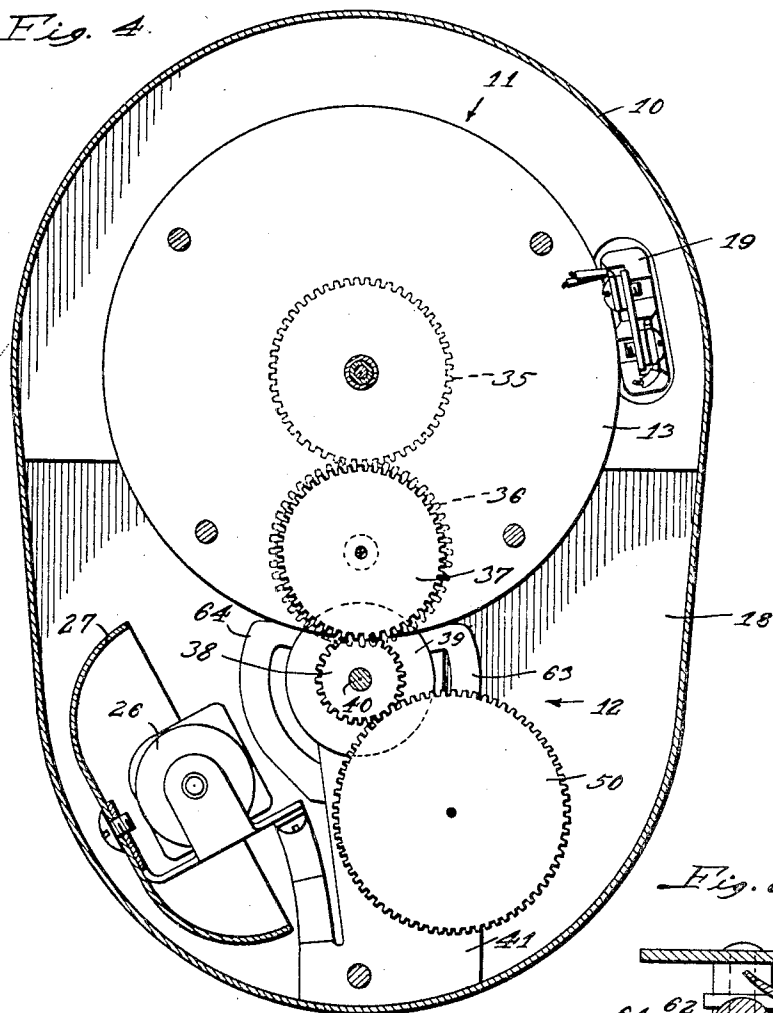


Fig. 5

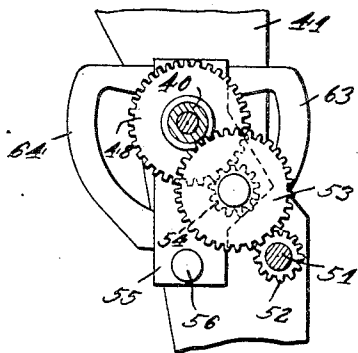


Fig. 6

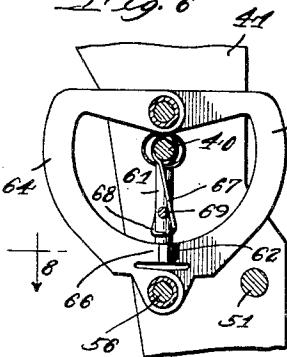


Fig. 7

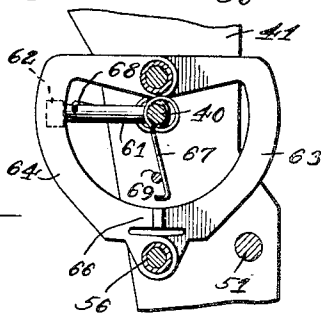
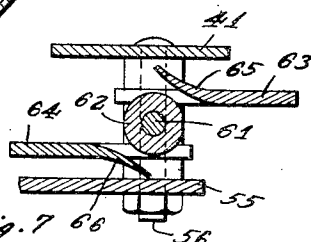


Fig. 8



Inventor:

By George Browning
Wilson, Dawell, McCann & Rehm,
Attys.

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Fig. 9.

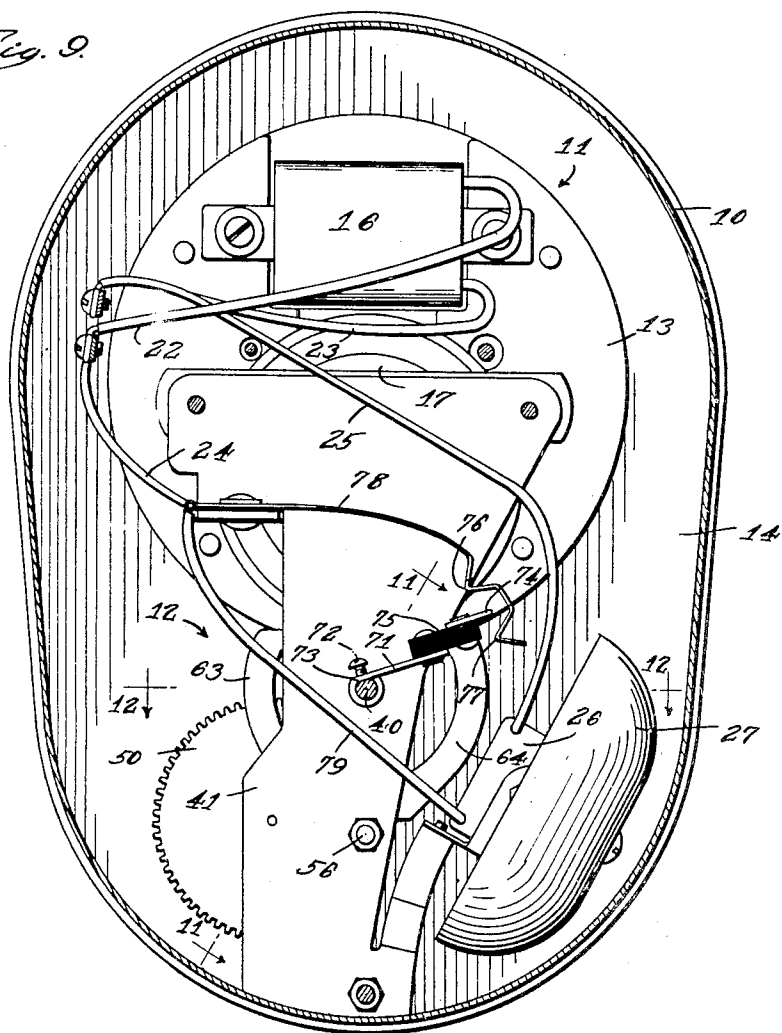
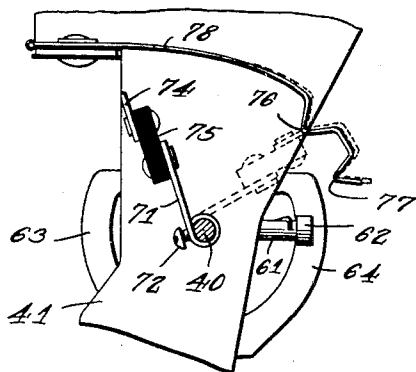


Fig. 10.



Inventor.
George Browning
By
Wilson, Dacwell, McCann & Rehn
Atty.

Oct. 2, 1934.

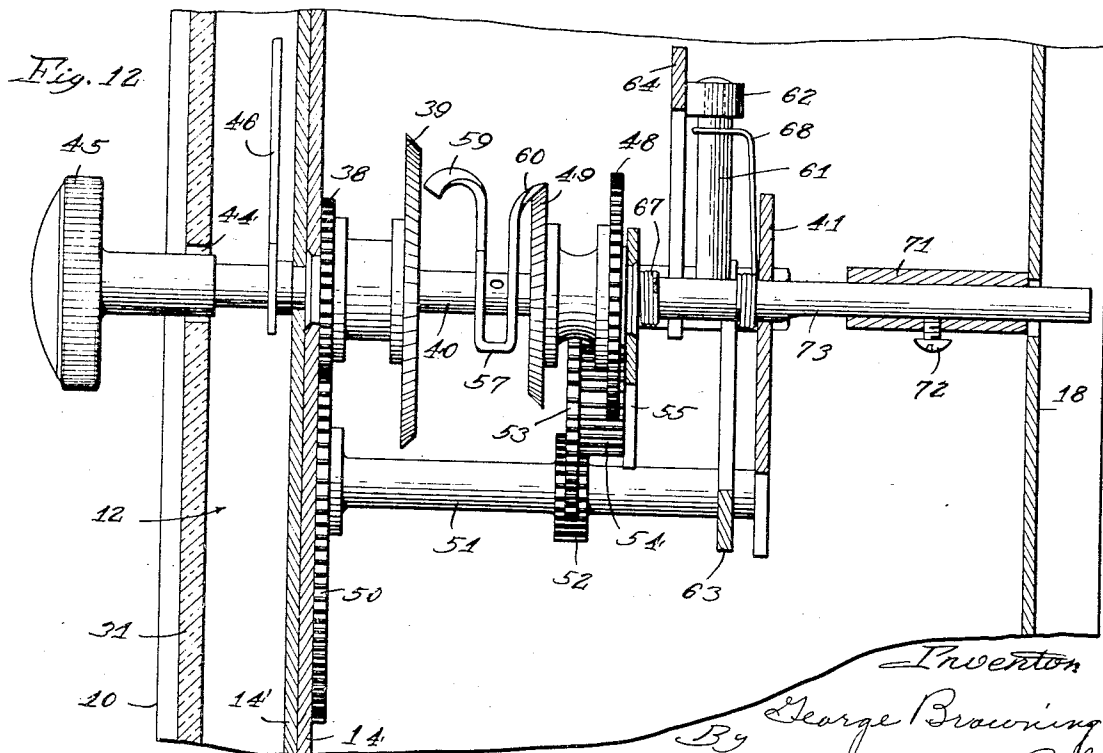
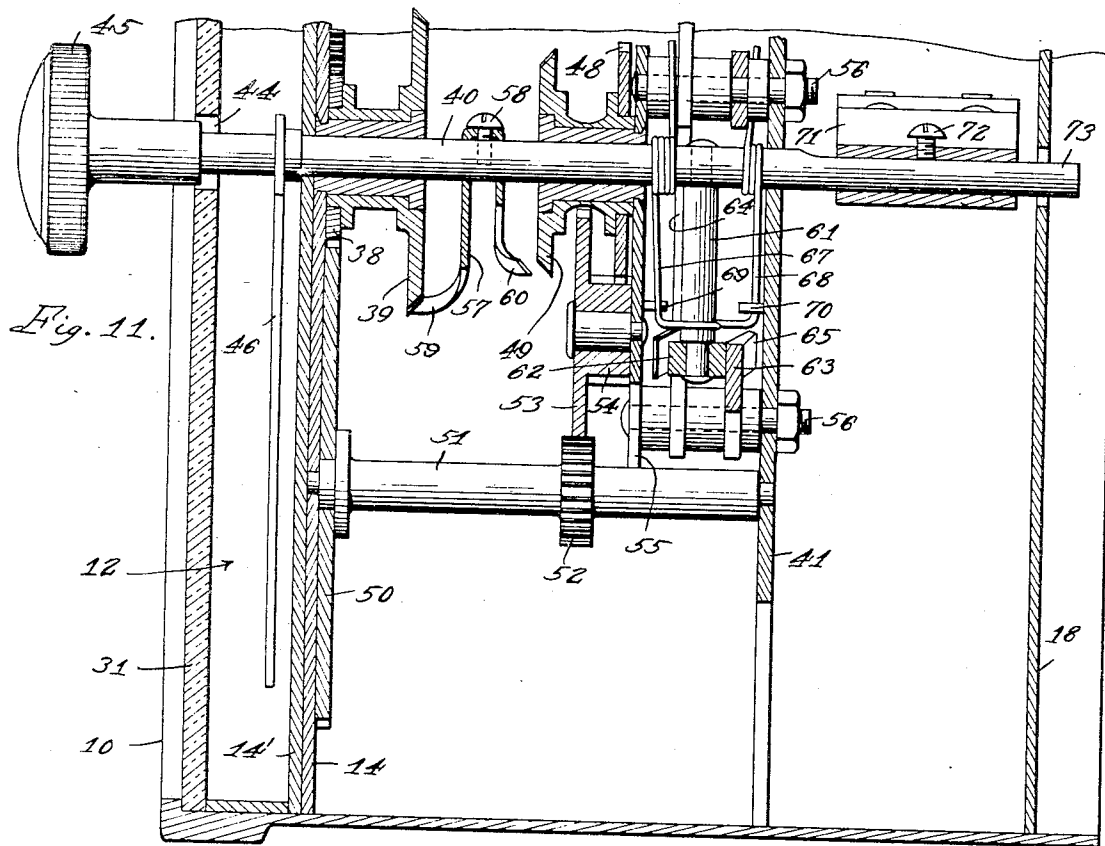
G. BROWNING

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4 Sheets-Sheet 4



Inventor
George Browning
By
Wilson, Dawell, McConse & Rehm
Attys.

UNITED STATES PATENT OFFICE

1,975,347

INTERVAL TIMER

George Browning, Wilmette, Ill., assignor to Chicago Flexible Shaft Company, Chicago, Ill., a corporation of Illinois

Application July 30, 1931, Serial No. 553,925

16 Claims. (Cl. 200—38)

This invention relates to clocks, and is principally concerned with an improved interval timing mechanism therefor.

The principal object of my invention is to provide a timing mechanism in which a single knob is provided for setting the clock to time a predetermined interval, the said knob cooperating with a single pointer arranged to be turned in one direction from a zero point for a setting of hours, or in the other direction for a setting of minutes, both scales being provided on a single dial reading both ways from the zero point. This greatly facilitates the matter of setting since the same knob is operated for either kind of setting and there is no possibility whatsoever of confusion, it being necessary to turn the knob in one direction for an hour setting and in the opposite direction for a minute setting.

Another object is to provide a mechanism in which practically all of the operating parts are concentrically disposed on one stem that is arranged to be turned by the aforesaid knob, thus making for the best compactness obtainable, so that the mechanism together with the clock associated therewith can be made to fit in a relatively small case of neat and attractive appearance.

Still another object is to provide a mechanism embodying spring means arranged to be loaded in the turning of the knob in setting, whereby to relieve the clock mechanism of any appreciable drag in its operation of the mechanism. The spring means is furthermore so arranged that it becomes disassociated with the parts with which the same is otherwise arranged to cooperate when the pointer of the timing mechanism is between the two zero points of the hours and minutes scales, thereby avoiding any danger of the spring means interfering with the clock keeping accurate time.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a face view of a clock embodying the interval timer of my invention;

Fig. 2 is a back view;

Fig. 3 is a central longitudinal section as indicated by the line 3—3 of Figure 1, the view being on a larger scale;

Fig. 4 is a cross-section in the plane of the line 4—4 of Fig. 3;

Figs. 5 and 6 are sectional details on the correspondingly numbered lines of Fig. 3;

Fig. 7 is a view similar to Fig. 6 showing certain parts in a shifted position;

Fig. 8 is an enlarged horizontal sectional detail on the line 8—8 of Fig. 6;

Fig. 9 is a cross-section similar to Fig. 4 on the line 9—9 of Fig. 3;

Fig. 10 is a view corresponding to a portion of Fig. 9 showing the parts in shifted position;

Fig. 11 is an enlarged sectional detail on the line 11—11 of Fig. 9 showing the mechanism on a minute setting, and

Fig. 12 is a section on the line 12—12 of Fig. 9 showing the mechanism on an hour setting.

The same reference numerals are applied to corresponding parts throughout the views.

The invention is herein illustrated in connection with an electric clock, but it will soon appear that any form of clock mechanism could be used, although there is, of course, the advantage with the electric clock of utilizing the same circuit for the electrically-operated alarm of the interval timer. Furthermore, while an alarm as herein illustrated is arranged to be sounded at the predetermined interval for which the clock may be set, it should be understood that any other device could be arranged to be operated instead or at the same time, depending on what the interval is being timed for. For example, doctors, research engineers, housewives, and others engaged in work frequently requiring accurate measurement of predetermined time intervals, are ordinarily satisfied with the sounding of an audible alarm at the end of a predetermined time interval for which the clock may be set. In some cases, however, especially in certain industries, clocks of this kind are frequently desired to throw some device into or out of operation automatically at a predetermined interval, and in such cases it will be obvious that instead of the electrically-operated alarm, or, in addition to it, an electric relay or the like will be provided to control the device in connection with which the clock may be provided.

Referring generally to Figs. 1—3, the numeral 10 is applied to the case for the clock, indicated generally by the reference numeral 11, and the interval timer indicated generally by the reference numeral 12. The clock 11 is herein illustrated as being an electric clock of conventional construction having its frame plates 13 suitably supported on the front plate 14 immediately behind a separate face plate 14' on which the regular clock dial 15 is provided. 16 is the field coil of the electric clock 11 carried on one of the frame plates 13 and cooperating with the usual armature provided in the housing appearing at 17. The back plate 18 carries a receptacle 19 for an electrical attachment plug 20 having an extension cord 21 thereon. Wires 22 and 23 are ex-

tended from the terminals of the receptacle 19 to the coil 16, as best appears in Fig. 9, for the operation of the clock. Other wires 24 and 25 are extended from the same terminals to the interval timer 12 for the operation of the electrical clapper mechanism 26 of the alarm bell 27, as will soon appear. In passing, it will be observed that the clock 11 has the usual hour hand 28 and minute hand 29, and also a second hand 30, all cooperating with the dial 15 and protected by the glass front 31. 32 is a starter stem, and 33 a setting stem accessible on the back of the clock in the usual way. The clock is arranged to be suspended on the wall by means of the lug 34 provided on the back.

The mechanism of the interval timer 12 depends for its operation upon a minute gear 35 which meshes with a gear 36 fixed on the same shaft with a gear 37. A pinion 38 meshing with the gear 37 is thereby arranged to drive a peripherally serrated friction drive wheel 39, which will hereinafter be referred to as the minute wheel. The pinion 38 and minute wheel 39 have a common hub and are mounted for rotation on the stem 40 which extends through the case 10 from front to back and finds bearing support in the face plate 14' at its front end, and at its rear end in another plate 41 supported, as appears at 42, from the frame 13 at its upper end and at its lower end from the front plate 14, as at 43. The stem 40 projects through a hole 44 in the glass front 31 and has a knob 45 fixed on the projecting end thereof, this knob being hereinafter referred to as the setting knob of the interval timer. A pointer 46 is fixed on the stem 40 to cooperate with a dial 47 of substantially semi-circular form provided on the face plate 14' below the regular clock dial 15. The dial 47, as will be noticed, is graduated half in hours and half in minutes reading in opposite directions from the two zero points at the middle of the dial. Any suitable number of hours and any suitable number of minutes may, of course, be provided for on the dial 47. Another gear 48, similar to the gear 38, is provided for driving a peripherally serrated friction drive wheel 49, hereinafter to be referred to as the hour wheel. The gear 48 and wheel 49 have a common hub mounted for rotation on the stem 40. The gear 48 is driven through reduction gearing by the gear 38 so that the speed of the hour wheel 49 is in proper proportion to the speed of the minute wheel 39, and so that the hour wheel is turned in a counter-clockwise direction as viewed from the face of the clock, whereas the minute wheel turns in a clockwise direction. Thus a large gear 50 meshes with the gear 38 to turn the shaft 51 on which a small pinion 52 is provided. The latter meshes with gear 53 which in turn drives the small pinion 54 meshing with the gear 48. The gear 53 and pinion 54 are in a cluster mounted on a suitable spindle on a plate 55 supported by bolts 56 from the plate 41. Now, the stem 40 is arranged to be turned by means of the setting knob 45 in a counter-clockwise direction for a minute setting, and in a clockwise direction for an hour setting, and when so turned is arranged to be automatically clutched with the proper friction drive wheel, whereby to turn the stem back under clock power to the zero position to sound the alarm. The clutching means comprises a U-shaped leaf spring 57 fastened as at 58 to the stem 40 and having one hooked end 59 for frictional driving engagement with the periphery of the minute wheel 39

and another hooked end 60 for frictional driving engagement with the periphery of the hour wheel 49. When the stem 40 is in a mid-position, that is, with its pointer 46 between the two zero points at the middle of the dial 47, the clutch 57 is in a mid-position disengaged with relation to both of the wheels 39 and 49, as shown in Fig. 3, but when the stem 40 is turned to make a setting, it is also shifted endwise automatically in the proper direction to engage the clutch with the proper wheel. The clutch shifting means comprises a pin 61 projecting radially from the stem 40 and having a roller 62 on the outer end thereof which is arranged to run on a track provided on a plate 63 disposed on one side of the pin, or on a track provided on another plate 64 disposed on the opposite side of the pin. The plates 63 and 64 are of segmental form, as best appears in Figs. 6 and 7, and are supported on the bolts 56 between the plates 41 and 55, small spacers being provided on the bolts 56, as best illustrated in Figs. 8 and 11, to hold the plates 63 and 64 in proper spaced relation to the plates 41 and 55, respectively, and also in proper spaced relation to one another. When the stem 40 is turned in a counter-clockwise direction, the roller 62 on the pin 61 encounters a cam surface on a rearwardly bent lug 65 provided on the plate 63 and shifts the clutch 57 with the stem 40 forwardly, whereby to engage the minute wheel 39. The end 59 of the leaf spring forming the clutch 57 is bent in the proper direction with relation to the direction of rotation of the wheel 39 so that the same will ride idly over the serrated periphery as the stem 40 is turned to bring the pointer 46 to whatever setting is desired on the minute section of the dial 47. On the other hand, when the stem 40 is turned in a clockwise direction, the roller 62 on the pin 61 encounters a cam surface provided on a forwardly bent lug 66 on the plate 64 and causes the clutch 57 to be shifted rearwardly with the stem 40 to engage the hour wheel 49. The end 60 of the leaf spring forming the clutch 57 is bent in the opposite direction with respect to the end 59 so that it is arranged to ride idly over the serrated periphery of the hour wheel as the stem 40 is turned to bring the pointer 46 to the desired setting on the hour section of the dial 47. While the ends 59 and 60 are arranged due to their resilience to ride idly over the peripheries of the wheels 39 and 49, respectively, in setting, there is no likelihood of slippage in the driving of the stem 40 through the clutch 57 by said wheels, due to the fact that the stem 40 is given enough movement in the camming of the pin 61 to bring the clutch 57 into engagement with the minute or hour wheel with sufficient pressure to insure a good friction drive.

When the pointer 46 is in the mid-position shown in Figure 1, between the two zero points, the pin 61 is in the position shown in Fig. 8 and the clutch 57 is, of course, disengaged, so that there is obviously no perceptible drag imposed on the operation of the clock 11. The wheels 39 and 49 in that case are simply turning idly. However, as soon as the stem 40 is turned for either an hour or a minute setting, a load is imposed which, though light, might be enough to interfere with the clock keeping accurate time. This load is due to the frictional resistance of the roller 62 riding on the track on either of the plates 63 and 64 under the spring pressure of the clutch 57. To offset this load, I provide two coiled torsion springs 67 and 68, the former of

which is arranged to act in a clockwise direction to aid in the return of the stem 40 to zero position when the same has been turned in a counter-clockwise direction for a minute setting, and the other of which is arranged to act in a counter-clockwise direction to aid in the return of the stem 40 to zero position when the stem has been turned in a clockwise direction for an hour setting. The two springs are coiled about the stem 40, as best appears in Fig. 11, with their one ends in abutment with the upper one of the two bolts 56. A pin 69 projects from the plate 55 to serve as a stop for the other end of the spring 67, and in a similar manner a pin 70 projects from the plate 41 for cooperation with the spring 68, whereby to hold the springs under an initial tension while they are inactive, namely, when the pin 61 is in mid position, as shown in Fig. 6, and so that either spring is arranged to be rendered active depending on which way the pin 61 is moved from mid position. In other words, the two springs 67 and 68 are disassociated with relation to the timing mechanism except when the stem 40 has been turned by means of the setting knob 45 for any given time interval setting, and the spring pressure of either of these springs against the pin 61 is enough to offset the frictional resistance to the riding of the roller 62 on the tracks provided therefor, so that the clock mechanism has no perceptible drag imposed on its operation, and the clock will keep accurate time.

The stem 40, in addition to carrying the pointer 46, the clutch 57, and the driving wheels 39 and 40 cooperating with the latter, as well as the clutch shifting means at 61, carries a swinging contact arm 71 fastened as at 72 onto the flattened rear end portion 73 of the stem. A contact 74 is carried on the arm 71 on the insulation indicated at 75, and is arranged to brush against the sharply bent portions 76 and 77 of a pair of leaf spring contacts 78 carried on the plate 41 in insulated relation thereto. The wire 24 previously referred to is connected with one of the leaf spring contacts 78, and another wire 79 extending from the clapper mechanism 26 of the alarm bell 27 is connected with the other of said contacts, so that when the contact 74 rides over the bend 76 or 77, the circuit through the clapper mechanism is completed to sound the alarm. When the pointer 46 is in mid position between the two zero points of the dial 47, the contact 74 is midway between the bends 76 and 77, as illustrated in Fig. 9. However, turning of the knob 45 in either direction for an hour or minute setting causes the contact 74 to sweep past either of the bends 76 and 77 as the pointer passes the zero point, and then the contact 74 is slowly returned as the pointer 46 slowly returns to its initial position, until finally the contact 74 comes into engagement with the bends of the contacts 78 at the moment that the pointer 46 reaches the zero point, whereupon the alarm is sounded by reason of a circuit being completed through the clapper mechanism 26. In the setting of the pointer 46, as the contact 74 brushes past the bend 76 or 77, as the case may be, there is, of course, a momentary sounding of the alarm, but the contact moves more slowly in its return and makes contact at 76 or 77 for several seconds so as to give a good alarm. It is shortly after breaking of contact at 76 or 77 that the clutch 57 is disengaged by reason of the roller 62 riding off the track on the plate 63 or 64. In Fig. 10 the arm 71 is illustrated in full lines holding the contact

74 in a position corresponding to an hour setting of the pointer 46. The way in which the contact 74 makes engagement with the contacts 78 at 76 is indicated in dotted lines.

It is believed the foregoing description conveys a good understanding of the objects and advantages of my invention. The appended claims have been drawn so as to cover all legitimate modifications and adaptations. It should be understood that while I have disclosed an interval timer designed for the timing of intervals in minutes or hours, the device could be changed easily for the purpose of timing intervals in minutes or seconds. The term "minutes" should, therefore, be construed broadly as meaning a small time interval, and the term "hours" a larger time interval. In other words, "hours" and "minutes" are purely relative terms and are not to be regarded in a limiting sense.

I claim:

1. In a clock, a dial having one section for smaller units of time reading in one direction from a zero point and another section for larger units of time reading in the opposite direction from another zero point, a pointer movable manually relative to the dial from a normal position between the two zero points selectively in either direction for a setting of larger or smaller units of time, a clock mechanism, pointer driving means normally disconnected from operative relation with the clock mechanism and means for connecting the pointer driving means with the clock mechanism in the setting of the pointer in either of the two dial sections, whereby to return the pointer toward the zero point of that section, in timed relation to the operation of the clock mechanism, said means automatically disconnecting the pointer driving means from the clock mechanism after the pointer has passed the zero point and arrived at its normal position between the two zero points.

2. In an interval timing clock, the combination with the conventional clock dial and hands therefor, and clock mechanism for operating the hands, of a secondary dial having a section for smaller units of time reading in one direction from zero and another section for larger units of time reading in the opposite direction from zero, a pointer arranged to be turned manually from a normal zero position selectively in either direction for a setting of larger or smaller units of time for any predetermined time interval, and means operated by the clock mechanism to move the pointer in timed relation to the operation of the clock back to the zero point in one direction for a setting of smaller units of time and in the opposite direction for a setting of larger units of time.

3. In an interval timing clock, the combination with the conventional clock dial and hands therefor, and clock mechanism for operating the hands, of a secondary dial having a section for smaller units of time reading in one direction from zero and another section for larger units of time reading in the opposite direction from zero, a pointer arranged to be turned manually from a normal zero position selectively in either direction for a setting of large or small units of time for any predetermined time interval, means operated by the clock mechanism to move the pointer in timed relation to the operation of the clock back to the zero point in one direction for a setting of the smaller units of time and in the opposite direction for a setting of the larger units of time, spring means active in one direction rendered operative in the setting of the pointer in the first

section of the secondary dial to assist the clock-operated means to return the pointer to zero whereby to proportionately relieve the clock mechanism of a drag on its operation, and

- 5 another spring means active in the opposite direction and rendered operative in the setting of the pointer in the other section of the secondary dial to assist the clock-operated means to return the pointer to zero whereby to proportionately relieve the clock mechanism of a drag on its operation.

- 10 4. In an interval timing clock, the combination with the conventional clock dial and hands therefor, and clock mechanism for operating the hands, of a secondary dial having a section for smaller units of time reading in one direction from zero and another section for larger units of time reading in the opposite direction from zero, a pointer arranged to be turned manually from a normal zero position selectively in either direction for a setting of large or small units of time for any predetermined time interval, means operated by the clock mechanism to move the pointer in timed relation to the operation of the clock back to the zero point in one direction for a setting of the smaller units of time and in the opposite direction for a setting of the larger units of time, and spring means rendered operative in the setting of the pointer on the secondary dial to assist the clock-operated means to return the pointer to zero whereby to proportionately relieve the clock mechanism of a drag on its operation.

5. In an interval timing mechanism, the combination of a dial having a section for smaller units of time reading in one direction from zero and another section for larger units of time reading in the opposite direction from zero, a setting stem having a pointer thereon cooperating with the dial and arranged to be turned in either direction from zero to set the pointer for a predetermined time interval of larger or smaller units of time, a first wheel related to the first section of the dial turning freely on the stem, a second wheel related to the other section of the dial turning freely on the stem, means for driving said wheels in opposite directions at different predetermined speeds, and means for clutching the stem to either wheel whereby to turn the pointer in one direction relative to the first section back to zero and in the opposite direction relative to the other section back to zero.

6. In an interval timing mechanism, the combination of a dial having a section for smaller units of time reading in one direction from zero and another section for larger units of time reading in the opposite direction from zero, a setting stem having a pointer thereon cooperating with the dial and arranged to be turned in either direction from zero to set the pointer for a predetermined time interval of larger or smaller units of time, a first wheel related to the first section of the dial turning freely on the stem, a second wheel related to the other section of the dial turning freely on the stem, means for driving said wheels in opposite directions at different predetermined speeds, a clutch element on the stem between the first and second wheels and arranged upon axial movement of the stem in one direction to clutch the first wheel and upon axial movement of the stem in the other direction to clutch the second wheel, and clutch shifting means cooperating with the stem so that when the stem is turned to set the pointer in the first section of the dial, the stem is moved in one direction to clutch the first wheel, and so that when the stem is turned in the opposite direction to set

the pointer in the other section of the dial, the stem is moved in the other direction to clutch the second wheel.

7. A mechanism as set forth in claim 6 wherein the clutch shifting means comprises a pin projecting radially from the stem, an abutment cooperating therewith in the turning of the stem in one direction to move the stem endwise in a certain direction, and another abutment cooperating therewith in the turning of the stem in the other direction to move the stem endwise in the opposite direction.

8. In a mechanism as set forth in claim 6 wherein the clutch shifting means comprises a pin projecting radially from the stem, an abutment cooperating therewith in the turning of the stem in one direction to move the stem endwise in a certain direction, another abutment cooperating therewith in the turning of the stem in the other direction to move the stem endwise in the opposite direction, the device including a torsion spring on the stem to cooperate with the pin upon movement thereof in one direction to urge the pin back to normal position, and another torsion spring on the stem to cooperate with the pin in the movement thereof in the opposite direction to urge the pin back to normal position.

9. In an interval timing mechanism, the combination of a dial having a section for smaller units of time reading in one direction from zero and another section for larger units of time reading in the opposite direction from zero, a setting stem having a pointer thereon cooperating with the dial and arranged to be turned in either direction from zero to set the pointer for a predetermined time interval of larger or smaller units of time, a first wheel related to the first section of the dial turning freely on the stem, a second wheel related to the other section of the dial turning freely on the stem, means for driving said wheels in opposite directions at different predetermined speeds, means for clutching the stem to either wheel whereby to turn the pointer in one direction relative to the first section back to zero and in the opposite direction relative to the other section back to zero, a stationary electrical contact, and a movable electrical contact carried on said stem and arranged to be turned with the stem in the setting thereof to a position spaced in either direction relative to the stationary contact according to the setting of the pointer, the movable contact being arranged to engage the stationary contact upon return of the pointer to zero.

10. In a mechanism as set forth in claim 6 wherein the clutch shifting means comprises a pin projecting radially from the stem, an abutment cooperating therewith in the turning of the stem in one direction to move the stem endwise in a certain direction, another abutment cooperating therewith in the turning of the stem in the other direction to move the stem endwise in the opposite direction, and spring means rendered operative in the setting of the pointer to cooperate with the pin to urge the same back to normal position.

11. In an interval timing mechanism, the combination of a dial graduated for smaller and larger units of time, both graduations reading from zero, a setting stem having a pointer thereon cooperating with the dial and arranged to be turned to set the pointer in a predetermined spaced relation to the zero point for a predetermined time interval of larger or smaller units of time, a first wheel related to the smaller units on the dial

turning freely on the stem, a second wheel related to the larger units on the dial turning freely on the stem, means for driving said wheels at different predetermined speeds, the ratio of which is proportional to the ratio of the smaller and larger units of time, and means for clutching the stem to either wheel whereby to turn the pointer quickly back to zero in a setting for smaller units of time and slowly back to zero in a setting for larger units of time.

12. In an interval timing mechanism, the combination of a dial graduated for smaller and larger units of time, both graduations reading from zero, a setting stem having a pointer thereon cooperating with the dial and arranged to be turned to set the pointer in a predetermined spaced relation to the zero point for a predetermined time interval of larger or smaller units of time, a first wheel related to the smaller units on the dial turning freely on the stem, a second wheel related to the larger units on the dial turning freely on the stem, means for driving said wheels at different predetermined speeds, the ratio of which is proportional to the ratio of the smaller and larger units of time, a clutch element on the stem between the first and second wheels and arranged upon axial movement of the stem in one direction to clutch the first wheel and upon axial movement of the stem in the other direction to clutch the second wheel, said stem being moved in one direction for a setting of smaller units and in the other direction for a setting of larger units, said pointer being thereby moved quickly back to zero in a setting for smaller units and slowly back to zero in a setting for larger units, and means for automatically disengaging the clutch element after the pointer has returned to zero.

13. In an interval timing mechanism, the combination of a dial graduated for smaller and larger units of time, both graduations reading from zero, a setting stem having a pointer thereon cooperating with the dial and arranged to be turned to set the pointer in a predetermined spaced relation to the zero point for a predetermined time interval of larger or smaller units of time, a first wheel related to the smaller units on the dial turning freely on the stem, a second wheel related to the larger units on the dial turning freely on the stem, means for driving said wheels at different predetermined speeds, the ratio of which is proportional to the ratio of the smaller and larger units of time, means for

clutching the stem to either wheel whereby to turn the pointer quickly back to zero in a setting for smaller units of time and slowly back to zero in a setting for larger units of time, and spring means rendered operative in the setting of the pointer to assist the wheel driving means to return the pointer to zero.

14. In an interval timer, the combination of a clock mechanism, a dial graduated for smaller and larger units of time, both graduations reading from zero, a pointer arranged to be turned to set the pointer in a predetermined spaced relation to the zero point for a predetermined time interval of larger or smaller units of time, said clock mechanism including fast and slow moving members related to the smaller and larger units on the dial, respectively, the speed ratio being proportional to the ratio of the smaller and larger units of time, and means for selectively clutching the pointer to either member to move the pointer relatively quickly back to zero in a setting for smaller units of time and relatively slowly back to zero in a setting for larger units of time.

15. In an interval timer, the combination of a clock mechanism, a dial graduated for smaller and larger units of time, both graduations reading from zero, a pointer movable manually to a predetermined spaced relation to the zero point for a predetermined time interval of larger or smaller units of time, and means operated by the clock mechanism for moving the pointer in timed relation to the operation of the clock back to the zero point relatively slowly for a setting of larger units of time and relatively quickly for a setting of smaller units of time.

16. In an interval timing clock, the combination with the conventional clock dial and hands therefor, and clock mechanism for operating the hands, of a secondary dial having a minute section reading in one direction from zero and an hour section reading in the opposite direction from zero, a pointer arranged to be turned manually from a normal zero position selectively in either direction for a setting of minutes or hours for any predetermined time interval, and means operated by the clock mechanism to move the pointer in timed relation to the operation of the clock back to the zero point in one direction for a setting of minutes and in the opposite direction for a setting of hours.

GEORGE BROWNING.

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