

[54] DIRECT CHARGE-RATE INDICATOR

[72] Inventor: George A. Barnard, III, 12223 Northeast
32nd Street, Bellevue, Wash. 98005
[22] Filed: Feb. 25, 1971
[21] Appl. No.: 118,889

[52] U.S. Cl.....58/152 R, 58/145 K, 179/7.1 R,
235/61 C
[51] Int. Cl.....G04b 47/00, G07c 1/00
[58] Field of Search.....179/7.1 R; 235/61 C; 58/145 K,
58/152 T, 141

[56] References Cited

UNITED STATES PATENTS

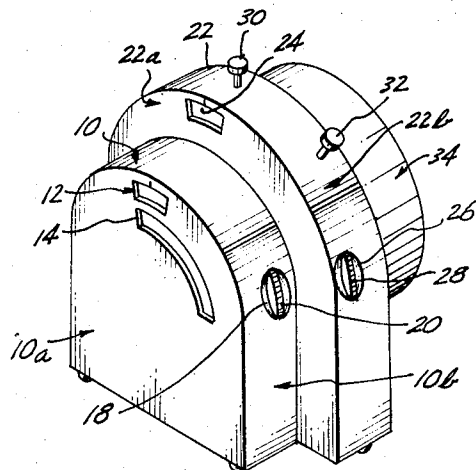
2,797,863	7/1957	Shepard	58/141 X
3,555,193	1/1971	Brand	58/152 T
3,390,395	6/1968	Gamburd et al.	278/42
2,911,144	12/1955	Lee et al.	235/61
2,797,863	7/1957	Shepard	58/141 X
3,555,193	1/1971	Brand	58/152 T

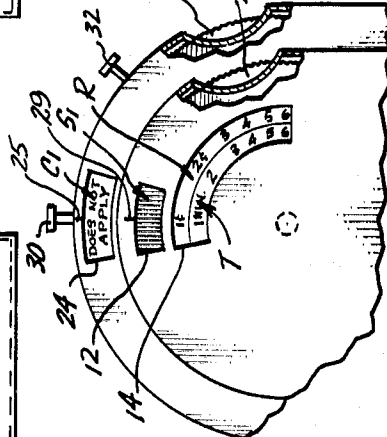
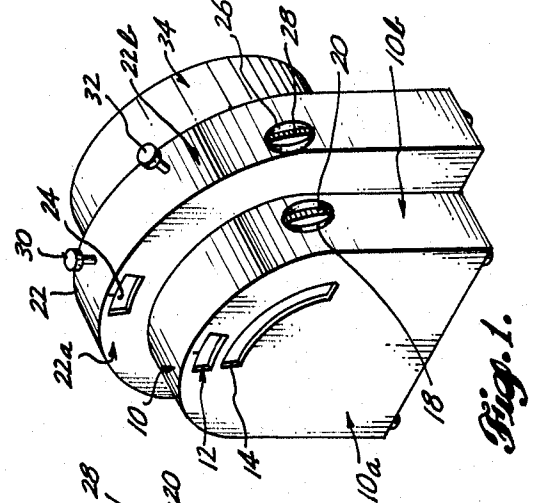
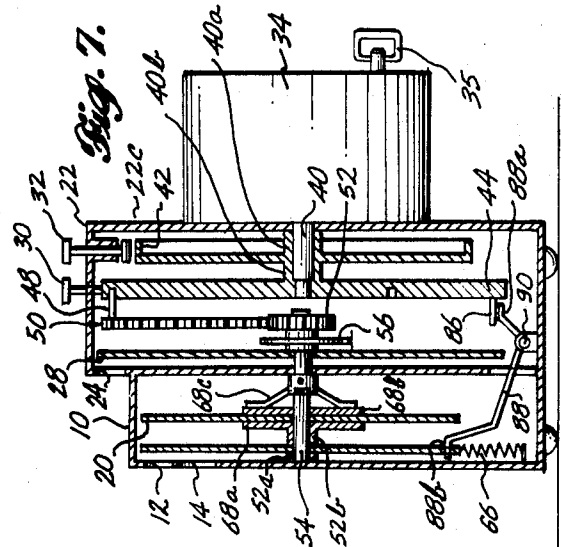
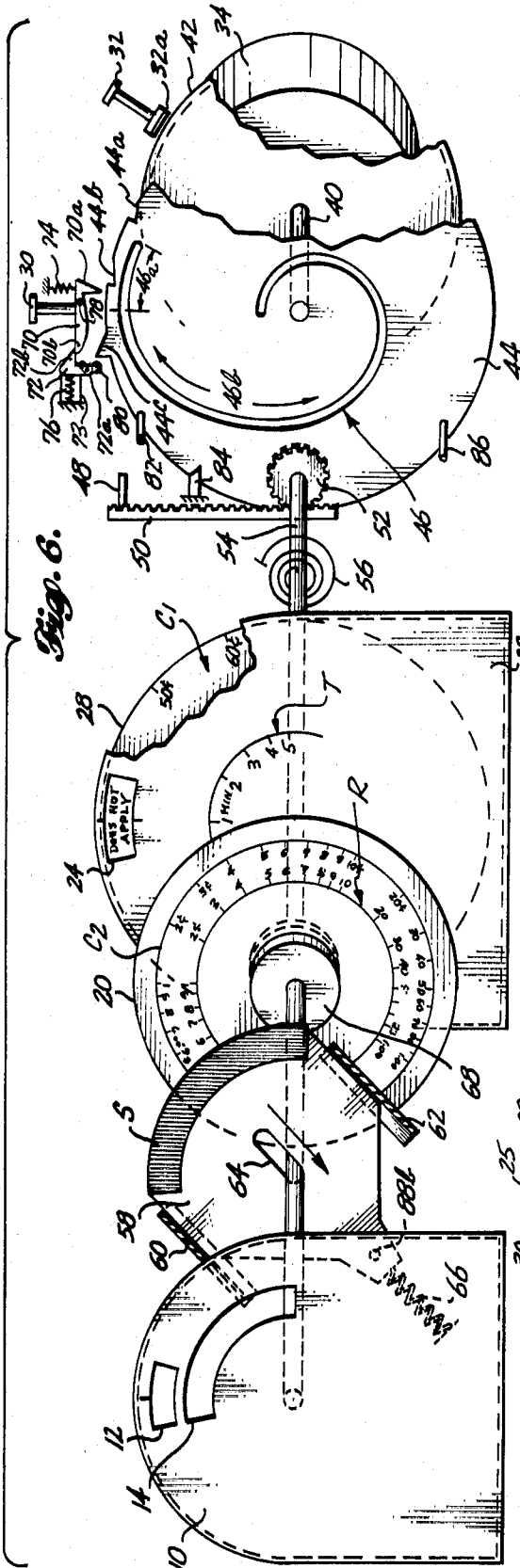
Primary Examiner—Richard B. Wilkinson
Assistant Examiner—Edith C. Simmons
Attorney—Christensen & Sanborn

[57] ABSTRACT

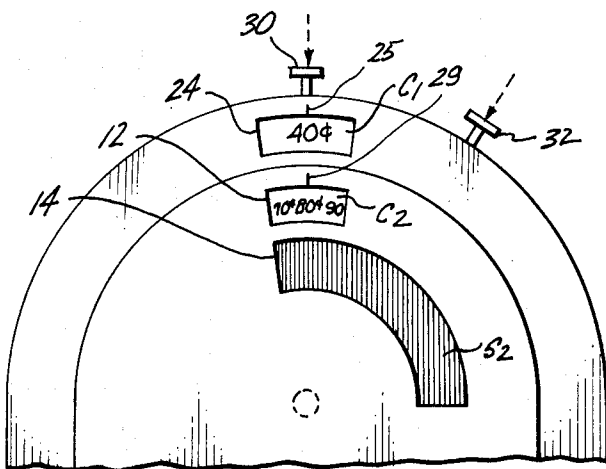
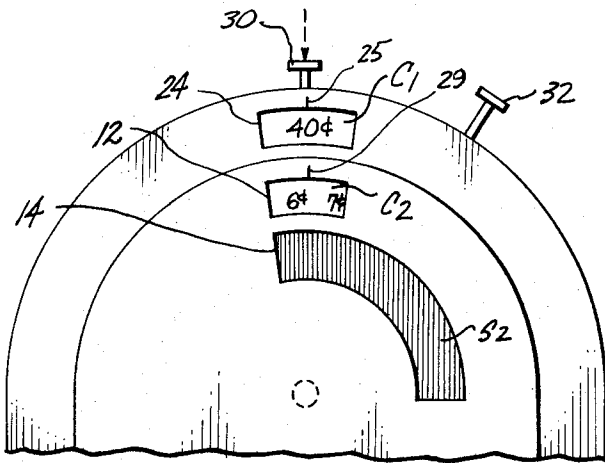
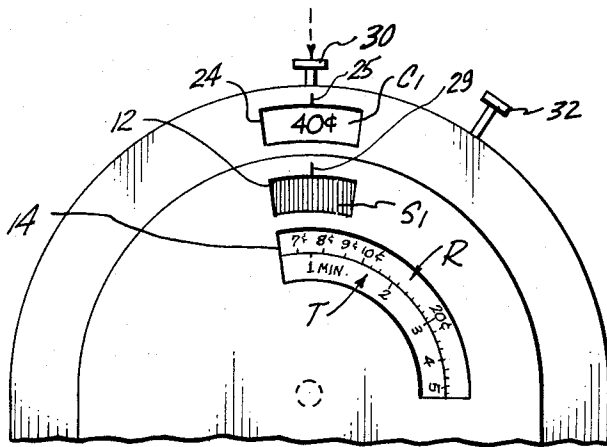
A device for indicating the cost of an operation having at least one charge-rate applicable thereto comprises a compound dial including fixed and movable dial surface which have inscribed thereon logarithmic time and charge scales. A clutch arrangement is provided to allow pre-setting of an applicable charge-rate by manipulation of the dial surfaces. To effect multiplication of that charge-rate by the operation's elapsed time, a timer is included having start and stop controls which provides an output movement proportional to elapsed time. A drive linkage couples this output movement to the movable dial surface so that relative movement between the scales proceeds logarithmically with respect to elapsed time. An embodiment of the device for use as a telephone long-distance call charge indicator is described, including various embodiments of the compound dial and drive linkage therefor.

10 Claims, 10 Drawing Figures





INVENTOR
 GEORGE A. BARNARD, III
 BY *Christensen & Sanborn*
 ATTORNEYS



INVENTOR
GEORGE A. BARNARD, III
BY *Christensen & Sauer*
ATTORNEYS

Fig. 8.

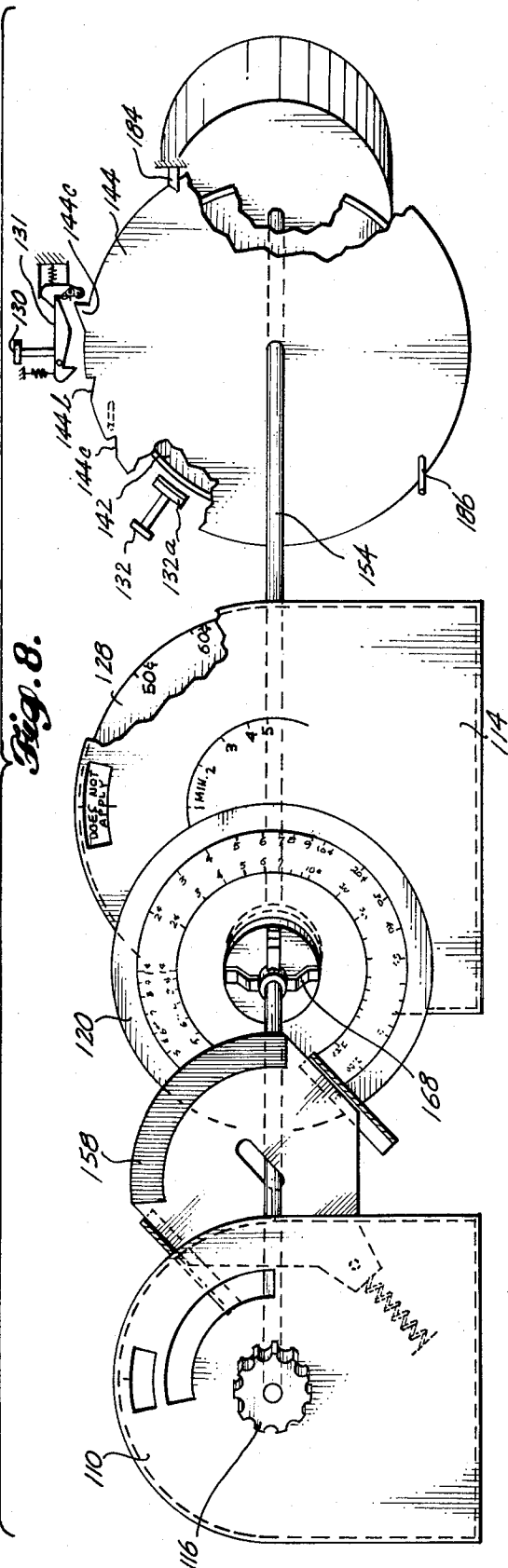


Fig. 10.

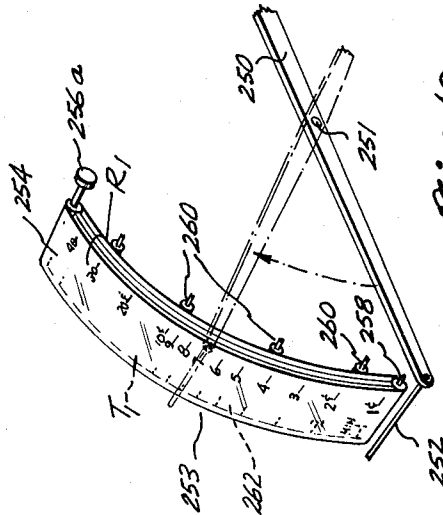
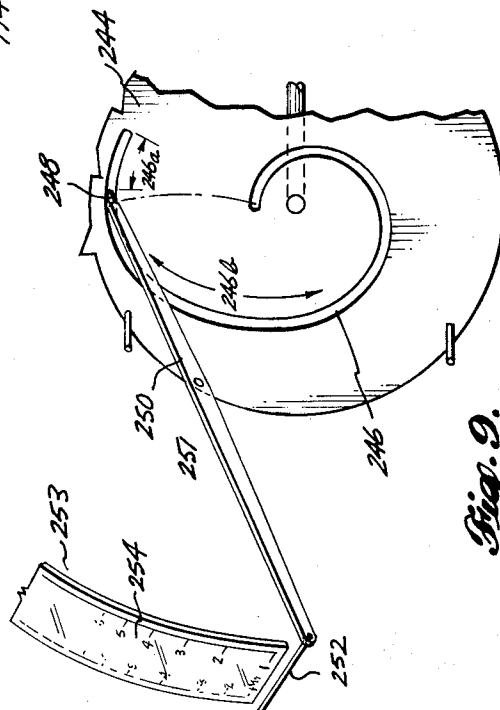


Fig. 9.



INVENTOR
GEORGE A. BARNARD, III
BY *Christensen & Sanborn*
ATTORNEYS

DIRECT CHARGE-RATE INDICATOR**FIELD OF THE INVENTION**

This invention generally relates to charge-rate indicators, and, more particularly, to devices for providing a direct indication of the cost of an operation while in progress.

BACKGROUND OF THE INVENTION

For many operations, the cost thereof can be determined from a predetermined charge-rate. The charge-rate is expressed in terms of a certain number of monetary units, such as cents, per a certain number of time units, such as minutes. The cost of the operation then equals the product of the operation's elapsed time and the applicable charge-rate.

One example of such an operation is a telephone long-distance call. In the United States, a distinct charge-rate schedule is applicable for each point-to-point long-distance call. The charge-rate schedule includes a basic or fixed charge for the first 3 minutes of the call's elapsed time, plus a charge-rate applicable for subsequent elapsed time of the call.

Because of the large expense generally involved in making these calls, it is desirable to have a direct and instantaneous indication to the person making the call of the cost thereof. Since the charge-rate schedule is complex, it is not feasible for the telephone user to keep a running account of the cost of the call while in progress.

There have been proposed devices which indicate to the telephone user the accumulated or total cost of a long-distance telephone call. However, these devices have not found widespread acceptance, as they are expensive to construct, clumsy to use, and inflexible in that their mechanisms are not readily adaptable to different charge-rate schedules.

Therefore, it is an object of this invention to provide an apparatus for directly indicating the cost of an operation having a charge-rate schedule, while in progress.

It is a further object of this invention to provide an apparatus for directly indicating the instantaneous and total cost of a long-distance telephone call.

It is yet another object of this invention to provide a telephone long-distance call charge indicator which is self-contained, simple of construction, and independent of existing telephone equipment.

It is a further object of this invention to provide a telephone long-distance call charge indicator which calculates the cost of the call, while in progress, from an applicable charge-rate schedule and which allows the user to pre-set any charge-rate schedule therein.

SUMMARY OF THE INVENTION

These objects and others, which will be realized through consideration of the following portion of the specification, are achieved, briefly, by a controllable timer providing an output movement which is related to elapsed time of the operation, a compound dial including first and second relatively movable dial surfaces having inscribed thereon first and second, logarithmic scales representing monetary units and units of time, respectively, and a drive linkage coupling said output movement to one of said surfaces so as to effect relative movement therebetween at a rate proportional to the logarithmic rate of change of said scales.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention can perhaps best be understood by reference to the following portions of the specification, taken in conjunction with the accompanying drawings, in which:

FIG. 1 is an isometric view showing an embodiment of the invention for use as a telephone long-distance call charge indicator;

FIGS. 2, 3, 4 and 5 are views illustrating the operation of the indicator of FIG. 1;

FIGS. 6 and 7 are exploded orthographic and section views, respectively, of the indicator of FIG. 1;

FIG. 8 is an exploded orthographic view of a telephone long-distance call charge indicator including a timer providing a logarithmically varying output movement, and,

FIGS. 9 and 10 are partial schematic views of yet another embodiment of the indicator.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With particular reference now to FIG. 1, a telephone long-distance call charge indicator comprises a housing including a first housing portion 10 having a front surface 10a which defines first and second, arcuate windows 12, 14. Housing portion 10 also has a generally lateral surface 10b which defines an apertured recess 18 through which projects the knurled edge of a first rotatable dial 20.

The indicator also includes a second housing portion 22 having a front surface 22a which defines an arcuate window 24. Housing portion 22 has a generally lateral surface 22b which defines an apertured recess 26 through which projects the knurled edge of a second rotatable dial surface 28. Also projecting through surface 22b are push buttons 30 and 32 which are used to initiate and terminate the operation of the indicator.

A timer 34 is affixed to the rear of housing portion 22 and may be either mechanically or electrically powered to provide the desired output movement.

To fully understand the operation of the indicator, a discussion must be made of the types of charge-rate schedules for which it is applicable. In the United States, the basic or fixed charge is levied whenever the elapsed time of the call is equal to or less than an initial amount of time. For example, the basic charge may equal X cents for the first 3 minutes of the call. After the initial time period has elapsed, the charge is computed from the product of an applicable charge-rate and the elapsed time of the call, subsequent to the initial period. For example, the charge-rate may equal Y cents for every 3 minutes thereafter. In all cases, the elapsed time of the call is measured from the time when the connection is made between the calling and called parties, to the time when one of these parties places his telephone receiver on-hook.

The charge-rate schedule applicable to a specific long-distance call can be ascertained from any telephone company if the points between which communication is desired are known, as the tariffs including these charge-rate schedules are matters of public record.

Once the particular charge-rate schedule applicable to the call has been determined, the schedule may be pre-set into the indicator in the following manner. With particular reference now to FIG. 2, a portion of a first charge scale C1 is viewable through window 24. Scale C1 includes a plurality of charge markings and the wording "Does Not Apply" which may be brought individually into correspondence with window 24 by rotation of the dial 28. The portion of scale C1 that can be viewed through window 24 serves as a reminder of the basic charge for the call. A fixed index 25 is located on surface 22a adjacent window 24 so as to aid the user in setting the basic charge.

The user must then pre-set the applicable charge-rate. The window 12 is closed from view by a shutter surface S in position S1. As the window 14 is open, first and second scales R and T are viewable therethrough. In a preferred embodiment, scale R is inscribed on dial 20 and movable therewith, and scale T is inscribed on surface 22a. Scale R includes a plurality of charge markings. Scale T includes a plurality of time markings. The charge-rate is pre-set by rotating dial surface 20 so that the marking appearing on scale R corresponding to the cost unit of the charge-rate is opposite the marking appearing on scale T corresponding to the time unit thereof.

For example, the charge-rate schedule for a particular long-distance call may be 40 cents for the first 3 minutes, and 20 cents for every 3 minutes thereafter. With reference now to FIG. 3, the user has rotated dial 28 so that the marking "40¢" on scale C1 appears opposite the index 25, and has rotated

dial 20 so that the marking "20¢" on scale R is opposite the marking "3" on scale T.

When the connection is made and the call begins, the user depresses push button 30. Thereafter, the indicator continues to appear as shown in FIG. 3 until the initial 3-minute period has elapsed. At the end of the initial period, the indicator appears as shown in FIG. 4. The shutter surface S has been removed from position S1 behind window 12, thus revealing a portion of second charge scale C2 therethrough, and the window 14 has been closed by shutter surface S in a position S2. Scale C2 includes a plurality of charge markings similar to those of scale R and is read by comparison with a fixed index 29 on surface 10a. At this time, the user may determine the total charge for the call in progress by taking the sum of the charges appearing in windows 24 and 12. In FIG. 4, the untaxed charge for the call in progress is 46 cents.

The scale C2 is inscribed on a dial which does not begin to rotate until the initial time period plus an amount of time equal to one increment of the scale T has elapsed. Since scale T is inscribed in minutes, scale C2 in FIG. 4 remains stationary throughout the 4th minute of the telephone call. At the end of the 4th minute, the dial on which scale C2 is inscribed begins to rotate at a rate related to the rate of change of the markings thereon. The user may then continuously monitor the charge accruing from his telephone call by reading the scale C2. He may also determine the total charge by summing the readings of scales C1 and C2.

At the termination of the call, the user depresses push button 32 to stop the rotation of the dial on which scale C2 is inscribed. The indicator then appears as shown in FIG. 5. The call has been terminated after an elapsed time of 15 minutes, and the total untaxed charge is "80¢" plus "40¢", or \$1.20.

In the United States, long-distance telephone calls are subjected to an excise tax expressed in terms of a percentage. The indicator can provide a direct indication of the taxed charge for the telephone call, if the user pre-sets a basic charge and charge-rate which are equal to the untaxed basic charge and charge-rate, multiplied by the excise tax percentage.

If the applicable charge-rate schedule only consists of a charge-rate, dial 28 is rotated so that the "Does Not Apply" marking of scale C1 appears in window 24. After pre-setting the applicable charge-rate by manipulation of dial 20, the user depresses push button 30 at the initiation of the call. The surface S is then moved from position S1 to position S2. Thereafter, the dial having scale C2 inscribed thereon begins to rotate after one time increment has elapsed. In other words, the operation of the indicator is identical to that previously described, with the exception that the time delay between the depression of push button 30 and the rotation of scale C2 does not include a component equal to the initial time period.

An embodiment of the indicator for providing this operation is seen in FIGS. 6 and 7.

The timer 34 provides an output movement which is proportional to time. More specifically, timer 34 is wound by rotation of key 35 so that a shaft 40 thereof rotates in a clockwise direction with respect to time. Shaft 40 is rotatably journaled in a rear surface 22c of housing portion 22, passes through a braking drum 42, and is terminated in a disc 44. Both drum 42 and disc 44 are attached rigidly to shaft 40 and maintained in spaced relation thereon by spacers 40a, 40b.

The time-related rotation of shaft 40 accordingly appears as a clockwise rotation of disc 44. A linkage means is provided between disc 44 and the movable dial so as to convert the linear, time-related movement of disc 44 into a movement of the dial which varies with respect to time at a rate corresponding to the rate of charge of the scale inscribed thereon. For multiplication to occur, this rate of change must be logarithmic such that the rate of rotation of dial 20 decreases with clockwise rotation of shaft 40.

In detail, disc 44 defines a spiral slot 46. A rack 50 is supported within housing portion 22 by a guide means not illustrated for vertical, translative movement and includes a pin 48 at one end thereof which rides in slot 46. A plurality of teeth

on rack 50 engage corresponding teeth on a pinion gear 52 which is mounted at one end of a rotatable shaft 54, rotatably journaled in housing walls 10a and 22a. The portion of shaft 54 within housing portion 22 has a return spring 56 attached thereto and loosely supports dial 28.

The portion of shaft 54 within housing portion 10 supports movable dial 20 which is rotatable with shaft 54 but whose relative position is adjustable by means of a friction clutch arrangement including first and second washers 68a, 68b, a spring spider 68c, and a spacer 52a. A movable, transparent shutter 58 is supported for translative movement within housing portion 10 by a pair of guides 60, 62 affixed thereto. Shutter 58 includes a longitudinal aperture 64 through which passes shaft 54 so that shutter 58 is movable independent of shaft 54. A tension spring 66 maintains shutter 58 in a normally retracted position.

The scale C1 is inscribed on movable dial 28 and viewable through window 24 as heretofore described. The scale T is inscribed on surface 22a of housing portion 22. The movable dial 20 is preferably composed of a transparent material and includes scales R and C2 inscribed thereon. In assembly, scales R and C2 are directly viewable through transparent shutter 58 and windows 14 and 12, respectively, and scale T is viewable in register with scale R through window 14, shutter 58 and transparent dial 20. Shutter positions S1 and S2 are both provided by an opaque shutter surface S on shutter 58.

The spiral slot 46 is configured to (a) provide the necessary linear-logarithmic translation between shafts 40 and 54, and (b) provide a time delay between the initiation of operation of the indicator and initiation of revolution of dial 20 on which scale C2 is inscribed. To accomplish these functions, slot 46 is divided into portions 46a and 46b. Portion 46a is circular and the length thereof determines the duration of the initial period, plus one increment of the time scale T. Portion 46b is a spiral whose length determines the maximum duration of the remainder of the period of operation and which is configured to provide, in conjunction with rack 50 and pinion 52, the required linear-logarithmic translation.

The periphery of disc 44 has a plurality of notches 44a, 44b and a finger 44c which allow control of the starting point of operation in conjunction with push button 30 and an associated latch-spring arrangement.

In detail, push button 30 is attached at one end to the latch 70 which is pivotable about a pivot 78 secured to the housing portion 22. Latch 70 includes a first finger 70a which is adapted to coact with notches 44a and 44b. A second finger 70b thereof is adapted to coact with a finger 72b of a second latch 72 which is slidable in a channel 73 also secured to the housing portion 22. A finger 72a is pivoted on latch 72 and has rotatable thereon a roller 80 which is adapted to coact with finger 44c of disc 44. A compression spring 76 within channel 73 normally forces latch 72 against latch 70, a compression spring 74 tends to force finger 70a of latch 70 into engagement with the periphery of disc 44, and a leaf spring 75 normally forces finger 72b against a shoulder 72' of latch 72.

The latch-spring arrangement associated with push button 30 is shown in a running position in FIG. 6. When the indicator is to be set for operation, the user winds timing means 34 by key 35 so that shaft 40 rotates in a counter-clockwise direction, as viewed in FIG. 6. During this rotation, finger 44c first comes into engagement with the pivoted roller 80. Further rotation of disc 44 in a counter-clockwise direction then pushes latch 72 back along channel 73, against the force of compression spring 76, so that finger 72b thereof is released from engagement with finger 70b of latch 70. At this time, compression spring 74 forces finger 70a against the periphery of disc 44.

Upon further counter-clockwise rotation of disc 44, finger 70a falls into and rides out of notch 44b, then falls into and rides out of notch 44a. The amount of counter-clockwise rotation is limited by a pin 82 affixed to disc 44 which engages, at a degree of rotation past the coincidence of finger 70a and notch 44a, a projection 84 affixed to housing portion 22.

When the key 35 is then released, timer 35 begins to rotate shaft 40 in a clockwise direction. However, the rotation is stopped when finger 70a again drops into notch 44a. At this time, the indicator is ready for operation.

When the long-distance call connection is made, the user depresses push button 30. This action rotates latch 70 about pivot 78 so as to raise finger 70a out of notch 44a. Thereafter, the timer rotates disc 44. At some point of depression of push button 30, finger 70b slips under finger 72b and accordingly latch 70 is maintained in the position shown in FIG. 6 by latch 72 and compression spring 76.

The relative positions of slot portion 46a and notches 44a and 44b are chosen so that when finger 70a is resting in notch 44a, pin 48 of rack 50 is at a point some distance from the extreme right edge of slot 46a. Similarly, when finger 70a is resting in notch 44b, pin 48 is at a point corresponding to 1 minute's rotation of shaft 40 from the junction of slot portions 46a and 46b.

Because slot portion 46a is circular, that is, the radius thereof with respect to shaft 40 does not change throughout its length, the initial rotation of disc 44 when pin 48 is in a slot portion 46a produces no corresponding movement of rack 50.

If the charge-rate schedule includes a basic charge, accordingly, the disc 44 should be rotated upon winding of timer 34 so that finger 70a comes to rest in notch 44a. Thereafter, rotation of shaft 54, and thus of the scales on dial 20, occurs only after the initial 3-minute period has elapsed, plus one minute. If the charge-rate schedule includes only a charge-rate, the disc 44 should be rotated upon winding of timer 34 so that finger 70a comes to rest in notch 44b. Thereafter, the pin 48 is in the slot portion 46 only for 1 minute's rotation of shaft 40.

As disc 44 continues to rotate, pin 48 enters the slot portion 46b. Accordingly, further rotation of disc 44 moves rack 50 in a downward direction. The locus of slot portion 46b with respect to shaft 40 is chosen so that rack 50 is moved downwardly at a logarithmic rate. The movement of rack 50 is transmitted, via pinion gear 52, shaft 54 and clutch 68, to movable dial 20.

As previously described, the user will have turned movable dial 20 so as to pre-set the applicable charge-rate. It can be noted from FIG. 6 that scale C2 is identical to scale R. Accordingly, rotation of dial 20 provides a direct indication of the charge attributable to the charge-rate, by comparison of the markings of scale C2 against index 29.

The shutter 58 is operable in the following manner. When the timer 34 is wound so that finger 70a engages either notch 44a or 44b, a pin 86 on disc 44 engages first end 88a of an arm 88 which is pivotable about a pivot 90 secured to housing portion 22. A second end 88b of arm 88 rides in a corresponding aperture in shutter 58. Accordingly, when pin 86 depresses end 88a, as best seen in FIG. 7, end 88b is raised to move shutter 58 upwardly against the force of tension spring 66 so that shutter surface S is in the position S1. When disc 44 has rotated so that pin 48 has traversed the length of slot portion 46a corresponding to the initial time period, pin 86 disengages end 88a so as to allow shutter 58 to return to its normally retracted position such that shutter portion S is in position S2.

To allow the linkage including rack 50 and disc 44 to operate smoothly without binding, the pin 48 must be slightly less in diameter than the width of slot 46. Spring 56 is needed to maintain one edge of pin 48 in engagement with the only one edge of slot 46 to prevent changes in register between shafts 54 and 40.

The purpose of finger 72a is to allow finger 44c to pass latch 72 without disengagement of latch 70 as the disc 44 rotates during the call. In detail, the front edge of finger 44c engages roller 80, and rotates finger 72a against the force of spring 73 until clear.

Disc 44 and dial 20 continue to rotate for the duration of the telephone call. When the call is terminated, the user depresses push button 32 so as to bring a braking shoe 32a attached thereto into contact with braking drum 42. If desired,

push button 32 may be maintained in the depressed position by a latch-spring arrangement similar to that used for push button 30.

When the indicator is to be reset, the user brings braking shoe 32a out of engagement with braking surface 42, then winds the timer 34. The subsequent clockwise rotation of disc 44 resets the push button 30 upon engagement of finger 44c with roller 80 in a manner identical to that previously described.

The embodiment of FIGS. 6 and 7 incorporates a linear-logarithmic translation in its drive linkage because the majority of timers useful therefore provide an output movement which is linearly related to time. However, there are devices available whose output movements are non-linearly related to time. In such a case, the simplified embodiment of FIG. 8 may be used, with appropriate modifications to the timer if needed. One such timer is shown in the U.S. Pat. No. 2,610,683 to Beiser. This patent discloses an interval timer which is adapted to count down a desired period of elapsed time at an inverse logarithmic rate. The timer operation is initiated by winding a knob at the front thereof in a clockwise direction. The output movement then proceeds in a counter-clockwise direction at the aforementioned inverse logarithmic rate.

With particular reference now to FIG. 8, the timer 135 provides an output movement of a common shaft 154 having attached thereto a disc 144 which is a mirror image of disc 44 in FIG. 6. Also attached to and rotatable with shaft 154 are a movable dial 120 by a clutch arrangement 168, and a winding knob 116. Because the output movement of shaft 154 proceeds in a counter-clockwise direction with elapsed time, and since the linear-logarithmic translation takes place within timer 135, the relative positions of disc 144, start push button 130, stop push button 132 latch-spring arrangement 131 for push button 130, notches 144a, 144b, finger 144c, pin 182 and pin 184 are all reversed with respect to the corresponding elements 44, 30, etc., in FIGS. 6 and 7. Otherwise, the operation is identical.

If the device in the aforementioned Beiser patent is used, the relative position of the spiral gears should be inverted to provide an output movement of shaft 154 which has a true logarithmic variation whose rate decreases with time. For further details, reference should be made to that patent whose specification is fully incorporated by reference herein.

In operation, the user sets the indicator in FIG. 8 by winding knob 116 in a clockwise direction, pre-sets the applicable charge-rate schedule by appropriate manipulation of dials 128 and 120, and initiates and terminates operation by sequentially depressing push buttons 130 and 132.

Another embodiment of the indicator for use in providing a direct indication of the cost of practically any operation having an applicable charge-rate is seen in FIGS. 9 and 10. The indicator includes a timer, not shown, which may be similar to timer 34 of FIG. 6, and which provides an output movement of a shaft 240 having attached thereto a disc 244. In most respects, disc 244 is identical to disc 44 of FIG. 6 and thus may have associated therewith appropriate latch-spring arrangements for starting and stopping the rotation thereof. Disc 244 includes a slot 246 comprising a circular portion 246a and a modified logarithmic spiral portion 246b. A pin 248 attached to one end of a lever arm 250 rides in slot 246. Lever arm 250, which is pivotable about a pivot point 251, has attached to the other end thereof a cursor 252 which is movable past a curved dial 253. Dial 253 is shown in more detail in FIG. 10 and comprises an inner, curved dial 262 which has inscribed thereon a logarithmic scale T1 corresponding to scale T in FIG. 6. An endless tape 254, of transparent material, is supported from dial 262 by a plurality of rollers 260 and is relatively movable therewith by first and second end rollers 256, 258 and an adjusting knob 256a. Inscribed on transparent tape 254 is a logarithmic scale R1 corresponding to scale R in FIG. 6.

In operation, the user pre-sets the applicable charge-rate by manipulating knob 256a so that the marking on scale R1 corresponding to the cost unit of the charge-rate is opposite the

marking on scale T1 corresponding to the time unit thereof. Then, the starting mechanism, including a push button if desired, is activated. At some point in the elapsed time of the operation, cursor 252 is moved relative to scale R1 by lever arm 250 to directly indicate the cost of the operation in progress.

The portion 246b of slot 246 must provide movement of cursor 252 relative to scale R1 which is basically logarithmic but which is modified to compensate for the curvature of dial 253.

It is thus evident to those skilled in the art that the indicator of this invention has great versatility in providing a direct indication of the cost of an operation having an applicable charge-rate, while that operation is in progress, and for providing a direct indication of the total charge for the operation when completed. Although the invention has particular applicability to telephone long-distance call charge indicators, it is to be clearly understood by those skilled in the art that the invention is not limited thereto, but rather is intended to be bounded only by the appended claims.

What is claimed is:

1. An apparatus for indicating the cost of an operation having an applicable charge-rate comprising:

- a. a timer for providing an output movement related to the operation's elapsed time,
- b. first and second dials having placed thereon logarithmic time and charge scales, respectively,
- c. means for adjusting the relative positions of said time and charge scales by displacement of said first and second dials,
- d. an index aligned with an increment of said time scale,
- e. drive means for providing relative logarithmic movement between said charge scale on said second dial and said index in response to said output movement.

2. An apparatus as recited in claim 1, wherein said drive means includes means providing a time delay between the initiation of said output movement and the initiation of said relative movement.

3. An apparatus as recited in claim 1, wherein said timer provides an output movement which varies linearly with respect to elapsed time, and wherein said drive means includes means for translating said linear output movement into an output movement which varies logarithmically with elapsed time.

4. An apparatus as recited in claim 1, wherein said timer provides an output movement which varies logarithmically with elapsed time.

5. An apparatus as recited in claim 1, wherein said timer includes a shaft rotatable to provide said output movement, and wherein said drive means comprises a second shaft, means supporting said second shaft for rotation, linkage means coupling said timer shaft to said second shaft, and wherein said adjusting means comprises a clutch means supporting one

of said dials for rotation with said second shaft.

6. An apparatus as recited in claim 5, wherein said timer shaft rotates linearly with elapsed time, and wherein said linkage means includes a disc rotatable with said timer shaft, said disc defining therein a spiral slot, a pinion gear rotatable with said second shaft, a rack, means supporting said rack for movement with said pinion gear, and said rack having a pin rideable in said spiral slot.

7. An apparatus as recited in claim 1, wherein said timer includes a shaft rotatable to provide said output movement, and wherein said drive means comprises a lever arm, means supporting said lever arm for pivotal movement, a disc rotatable with said timer shaft, said disc defining therein a spiral slot, and wherein said lever arm has at one end thereof a pin rideable in said spiral slot, said lever arm supporting at another end thereof said index.

8. A telephone long-distance call charge indicator including:

- a. a housing,
- b. a timer supported by said housing and providing an output rotation of a shaft thereof which varies with time,
- c. a disc means supported by said timer shaft within said housing which defines at least one notch therein,
- d. a first logarithmic scale inscribed on said housing whose markings correspond to time units,
- e. a dial having inscribed thereon a second logarithmic scale whose markings correspond to charge units,
- f. a dial shaft supported by said housing for rotation,
- g. clutch means supporting said dial on said dial shaft so that said first and second scales are in register, said clutch allowing the relative displacement of said dial with respect to said dial shaft,
- h. a linkage means coupling said dial shaft to said timer shaft,
- i. a latching means supported by said housing for selective engagement with said notch for selective initiation of rotation of said timer shaft, and
- j. means supported by said housing for selective termination of rotation of said timer shaft.

9. An indicator as recited in claim 8, wherein said timer shaft rotates linearly with time, and wherein said disc means defines a spiral slot, said linkage means further including a pinion gear rotatable with said dial shaft, a rack, means supporting said rack from said housing for movement with said pinion gear, and wherein said rack includes a pin rideable in said spiral slot.

10. An indicator as recited in claim 9, wherein said disc further defines a circular slot adjacent to and continuous with said spiral slot, the relative positions of said notch and said circular slot in said disc being chosen so as to provide a time delay between the initiation of rotation of said timer shaft and the initiation of rotation of said dial shaft.

* * * * *

55

60

65

70

75