

March 16, 1937.

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2,073,983

REGISTERING SYSTEM

Filed May 17, 1932

2 Sheets-Sheet 1

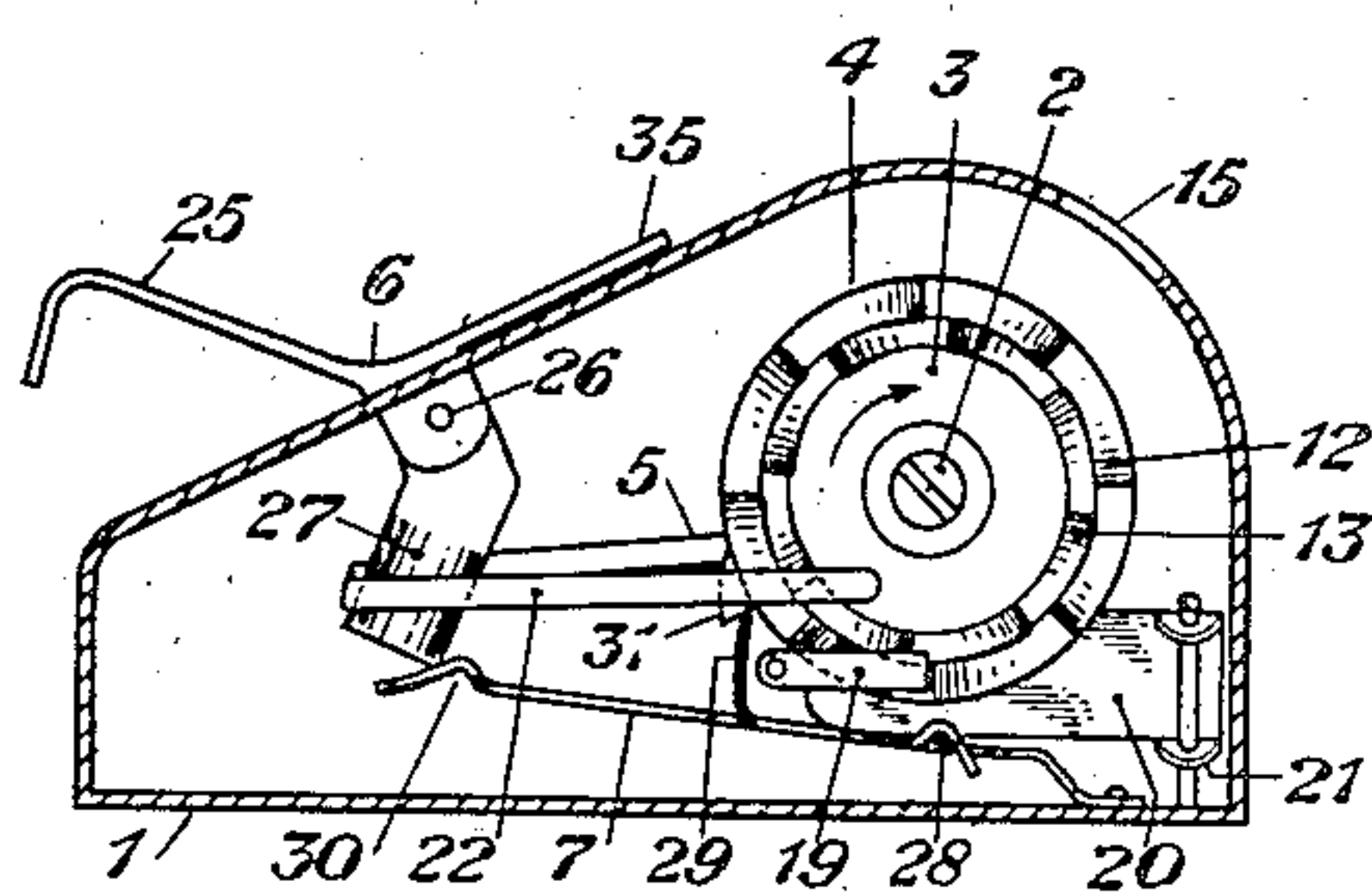


Fig. 1

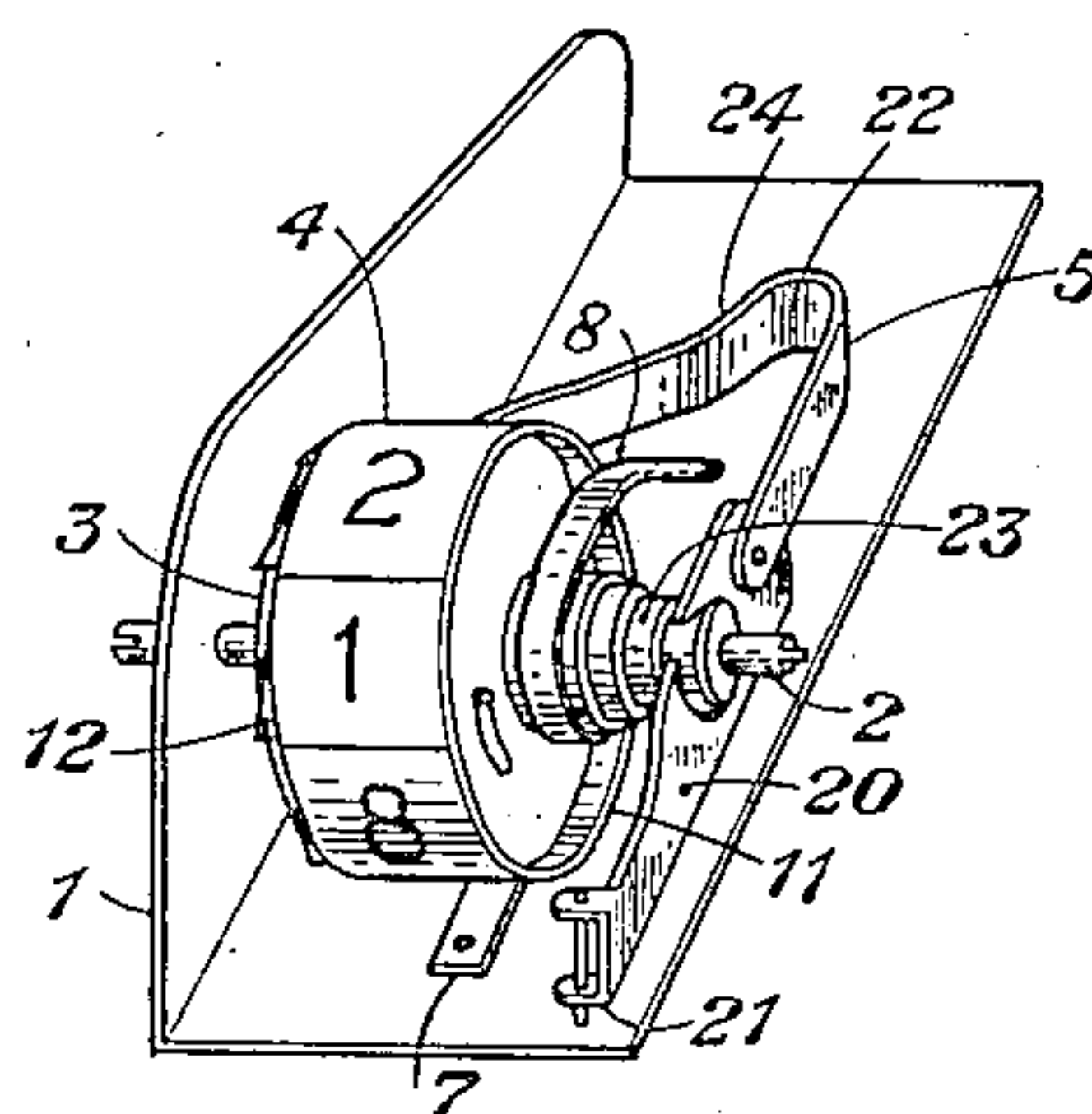


Fig. 2

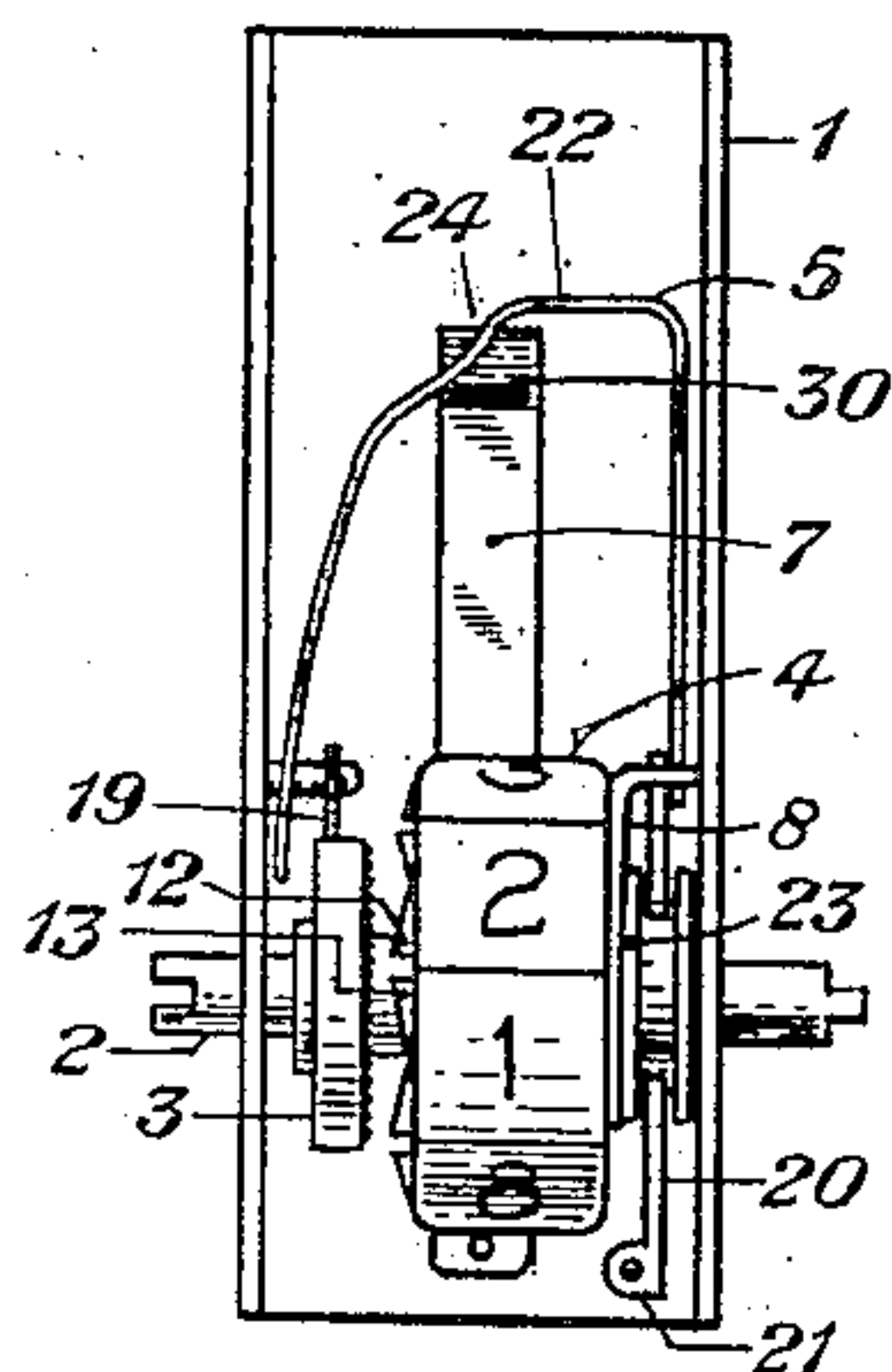


Fig. 3

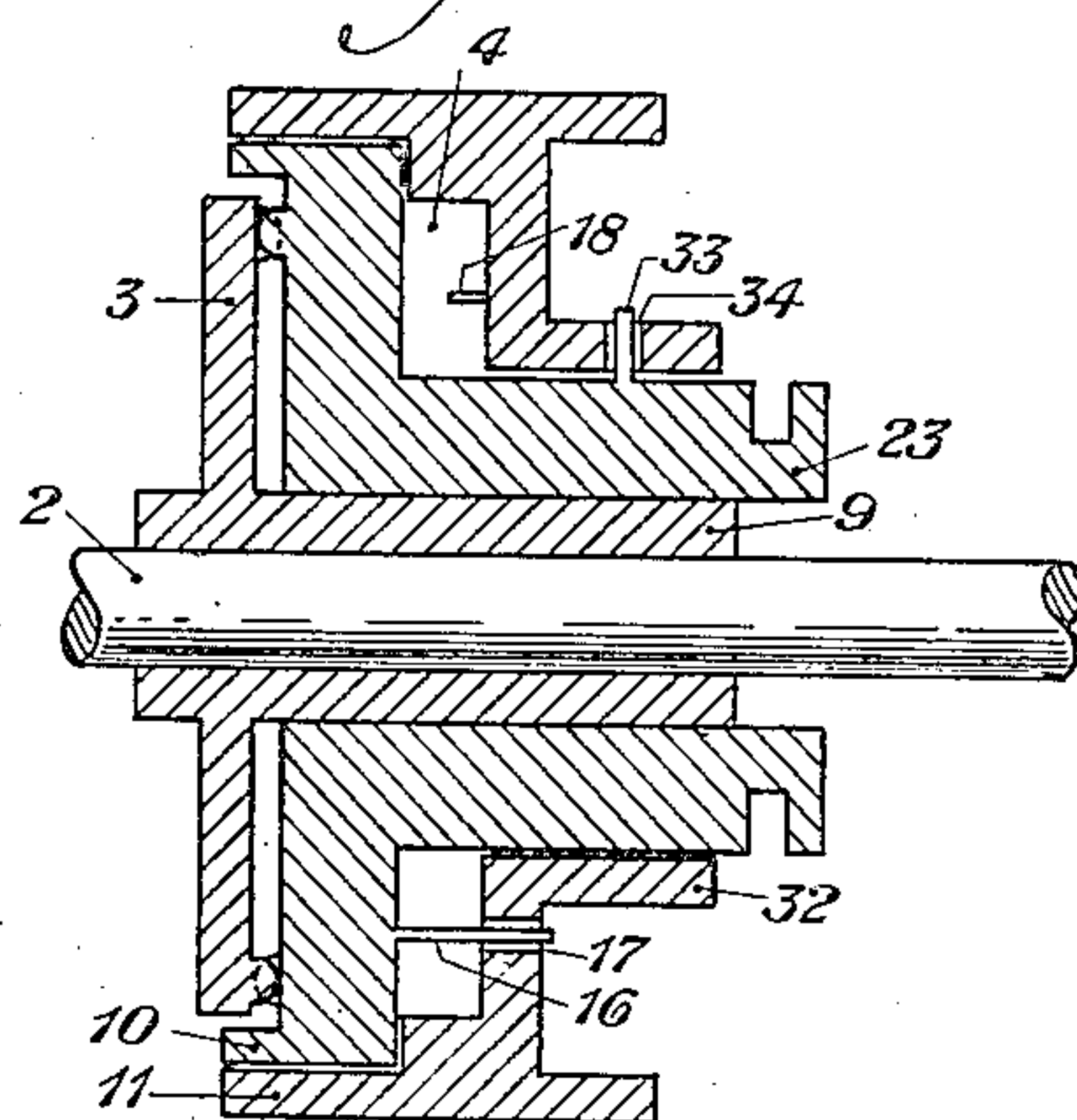


Fig. 4

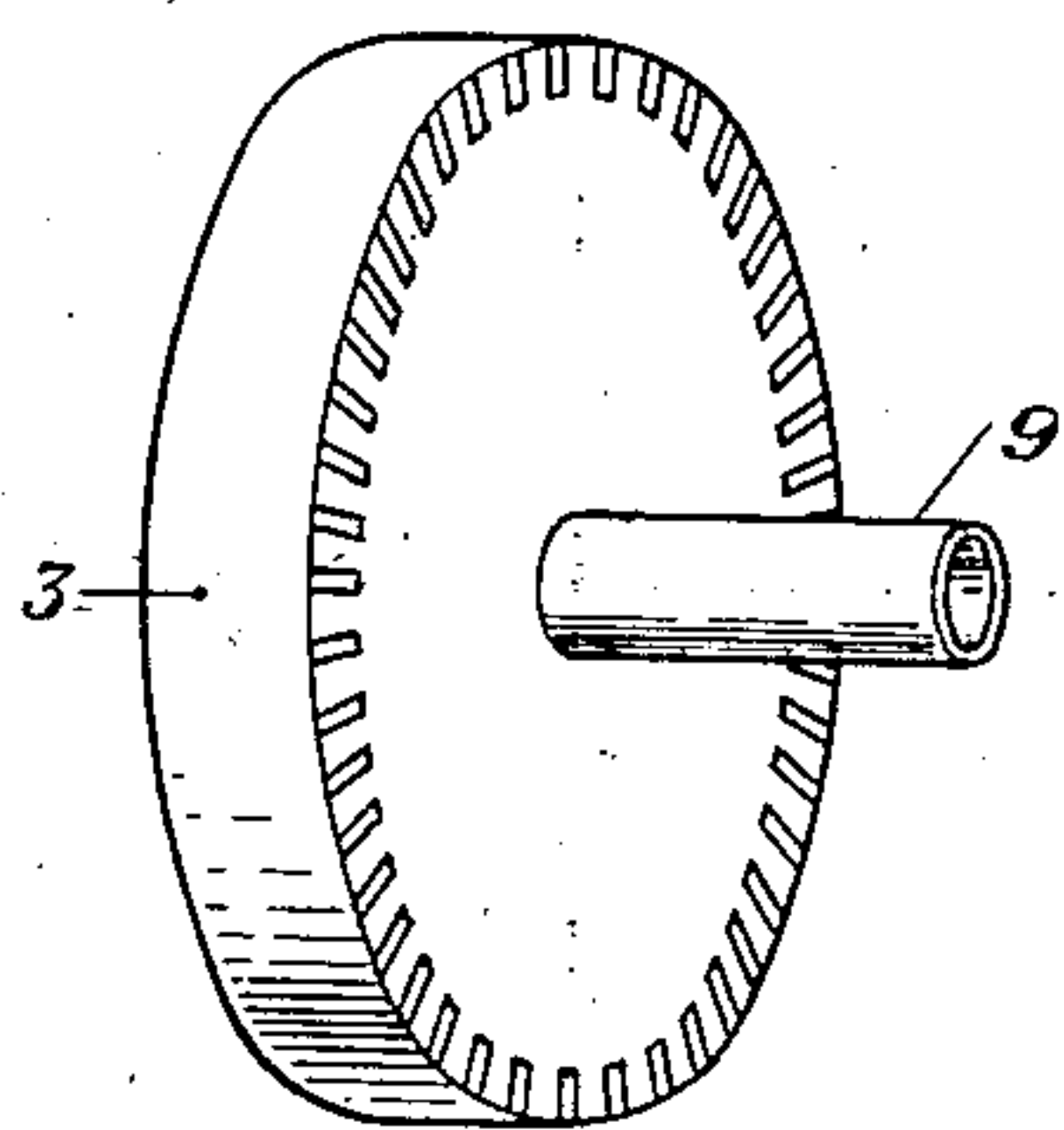


Fig. 5

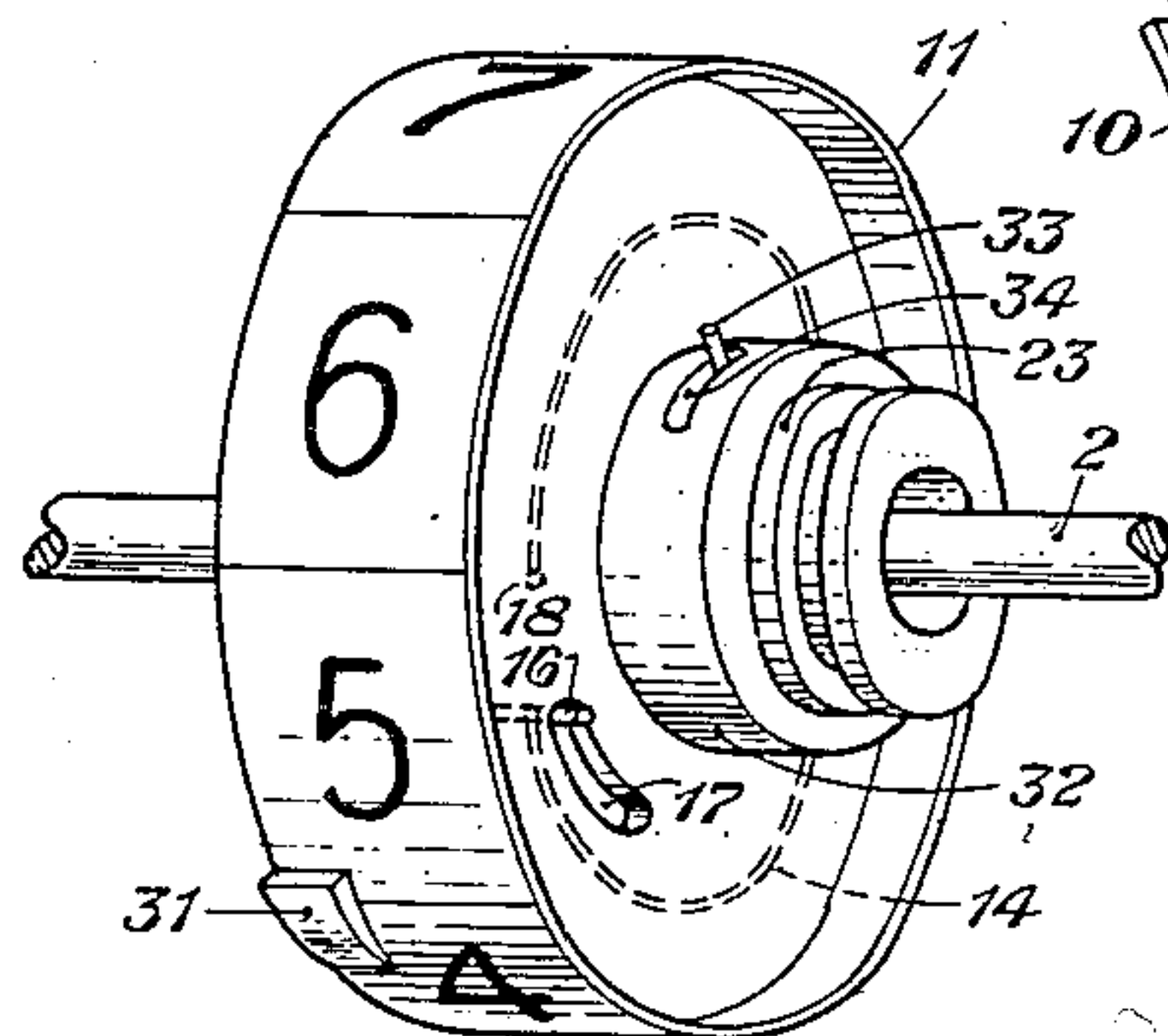


Fig. 6

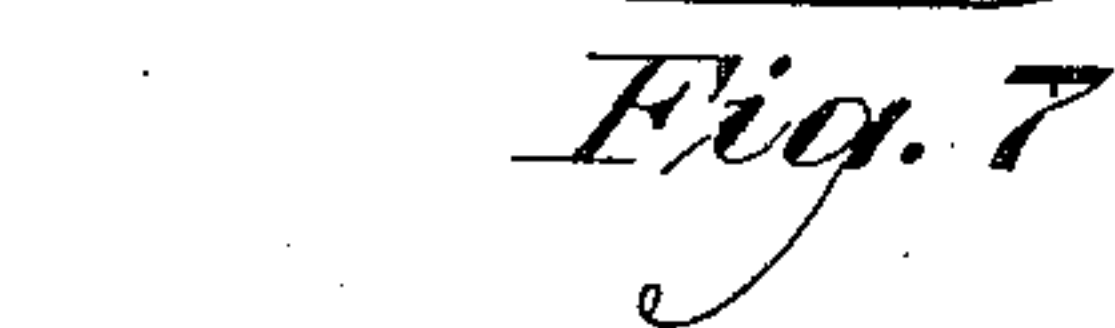


Fig. 7

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2 Sheets-Sheet 2

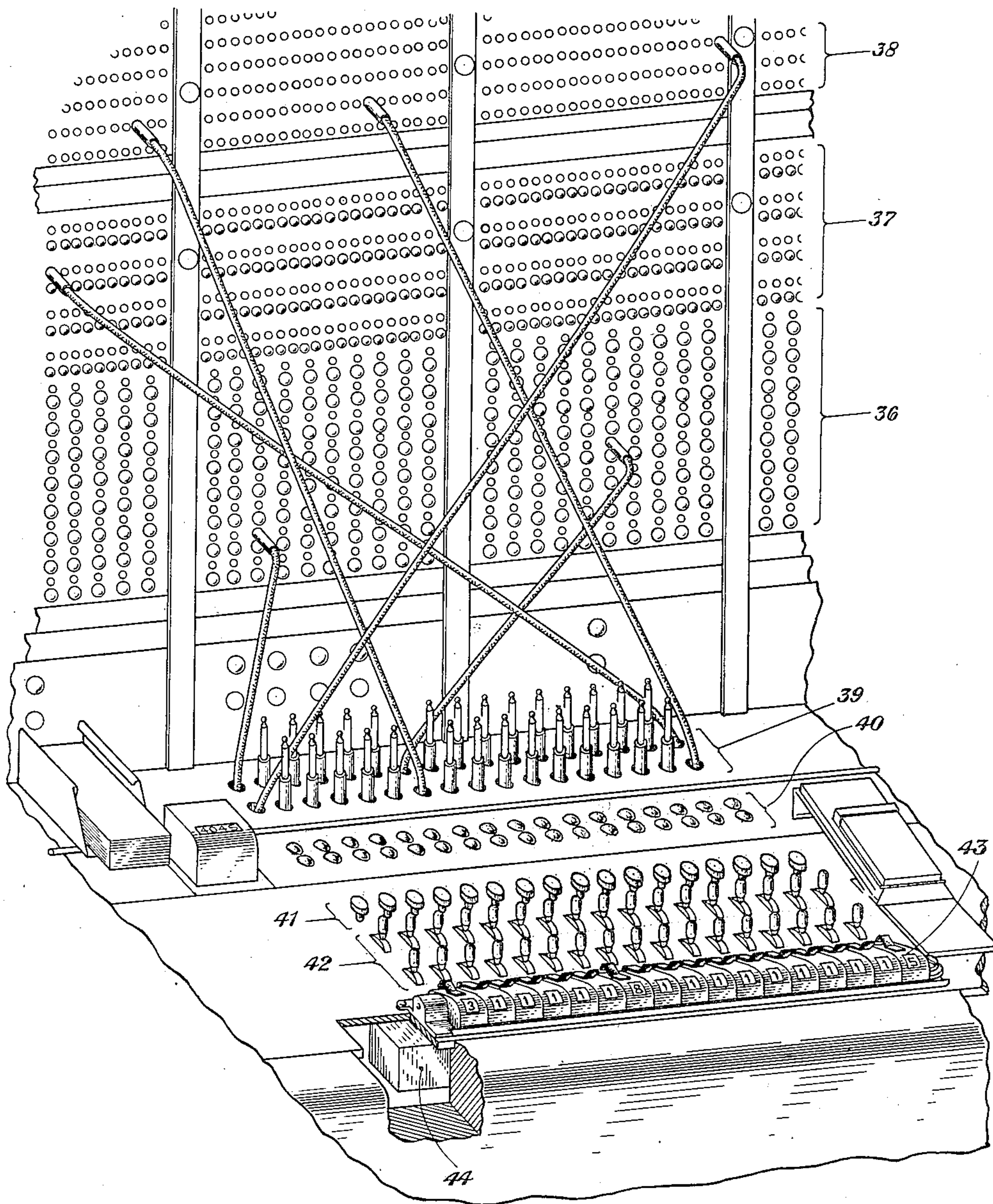


Fig. 8

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2,073,983

REGISTERING SYSTEM

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Application May 17, 1932, Serial No. 611,908

1 Claim. (Cl. 74—112)

This invention relates to measuring devices and more particularly to registers for measuring the elapsed time of telephone conversations.

In telephone systems it is at present customary to charge for long distance or toll calls on a time basis and for local calls on a message or flat rate basis. In the case of local calls of the message rate type, it is sometimes necessary to charge for what is generally known as over-time. In other words, a certain charge is made for each completed call lasting a predetermined period of time or less, for example, five minutes, and an over-time charge is made for each additional predetermined period of time during which a call lasts. In the case of a coin box call the subscriber is notified at the expiration of the first and of each additional period that if he desires to continue the call, he must deposit another coin. This over-time charge may be computed either on a message basis, i. e., a charge is made as if it were another call, or on an elapsed time basis.

It has heretofore been suggested in connection with systems for timing such calls that an individual elapsed time register be provided for each cord circuit of the telephone switchboard for measuring the elapsed time of each connection completed by the use of the corresponding cord circuit, a plurality of said registers being associated with a common continuously rotating driving shaft, and each individual register being provided with means for starting, stopping, and restoring it to normal, as desired.

One object of this invention is to provide an accurate and inexpensive register for use in connection with such systems. Another object is to provide such a register with escapement means incorporated therewith. Other objects and features of the invention will be apparent from the detailed description hereinafter set forth.

Figure 1 of the drawings is a side view of the register with the side of the case removed; Fig. 2 is a perspective view of the register with the side and top of the case removed; Fig. 3 is a top view of the register with the top of the case removed; Fig. 4 is a cross-section of all except one of the rotating parts of the register; Fig. 5 is a perspective view of the driving gear; Fig. 6 is a perspective view, from one side, of the dial view assembly; Fig. 7 is a perspective view, from the other side, of the dial view assembly; and Fig. 8 illustrates a telephone switchboard position showing the manner in which the register may be associated with the equipment of a telephone system.

As shown in Figs. 1-7, the apparatus consists in general of a case 1, a driving shaft 2, a driving gear 3, a dial wheel assembly 4, a clutch means 5, a clutch control means 6, a control or released spring 7, and a reset spring 8. Driving

shaft 2 is adapted to be rotated continuously at a constant speed, for example, by means of a synchronous motor. Driving gear 3 is fastened to one end of hub 9 which, in turn, is mounted on shaft 2, and is adapted to rotate therewith. Gear 3 is of the crown gear type—that is, the teeth protrude from the inner face thereof as shown in Figs. 3 and 5.

Dial wheel assembly 4 consists of gear 10, which is also of the crown gear type, dial wheel member 11, escapement teeth 12 and 13 and escapement tension spring 14. The dial wheel assembly is mounted within case 1 in such position that the periphery of dial wheel member 11 is visible through window 15 in case 1. Gear 10 is slidably mounted on hub 9 of driving gear 3. Dial wheel member 11 is loosely mounted on gear 10. The periphery of the dial wheel member is divided into a plurality of sections, each section representing a predetermined timing period. All the timing periods may be of equal length, for example, five minutes, or the first period may be longer than the subsequent periods, that is, the first period may be five minutes and each subsequent period one minute, for example. The number of sections is dependent upon the desired length of each timing period and upon the number of timing periods desired to be measured by one revolution of the dial wheel assembly. One end of escapement tension spring 14 is connected to bar 16 of gear 10, which bar member protrudes through a slot 17 of dial wheel member 11. The other end of spring 14 is connected to bar member 18 of dial wheel member 11. Escapement teeth 13 protrude from the face of gear 10 at points adjacent the regular gear teeth. The forward edge of each tooth slopes toward the face of the gear and the rear edge of each tooth is straight or horizontal. One such tooth is provided for each section into which the periphery of the dial wheel member is divided. Escapement teeth 12 at points adjacent but slightly to the rear of the points at which teeth 13 protrude from the face of gear 10. The forward edge of each of teeth 12 is straight or horizontal and the rear edge slopes toward the edge of the dial wheel member. One end of escapement spring 19 is fastened to the side of the case. The other end of spring 19 is bent inwardly, said bent part being adapted normally to fit in between teeth 12 and 13 when the dial wheel assembly is moved into engagement with driving gear 3.

Clutch means 5 consists of a shifting fork 20, which is pivoted at 21 to the bottom of the case, and a peculiarly shaped spring 22. The shifting fork is in such position within the case that its prongs fit in a groove in hub 23 of gear 10. Spring 22 is shaped more or less like a horse

shoe. One end of said spring is fastened to shifting fork 20 and the other end rests against the opposite side of the case. The position of this spring, with respect to the other parts of the register, is shown in Figs. 1, 2 and 3. Near its curved part this spring is bent inwardly to form flange 24.

Clutch control means 6 is T-shaped with one end of the top member being bent upward, as shown at 25 in Fig. 1. The vertical member extends downwardly through a slot in case 1 and is pivoted to the sides of the case at 26. The lower part 27 of the vertical member is cylindrically shaped and is positioned within the curved part 15 of clutch spring 22, as shown in Fig. 1.

Control or release spring 7 is positioned beneath the dial wheel assembly and the clutch control means, one end thereof being fastened to the bottom of the case. At one point on said spring a part thereof is bent upward to form flange 28. At another point thereon a part thereof is bent upward to form flange 29. The free end of said spring is bent upward to form a third flange 30. Flange 30 serves as a holding means for clutch control means 6, flange 29 serves as a stop for the dial wheel assembly when it is being reset and flange 28 when pressed down by tripping member 31, which is fastened to the periphery of the dial wheel member, causes the release of the clutch control means 6.

The reset means consists of coil spring 8 wound around hub 32 of dial wheel member 11. The inner end of said spring is fastened to a bar 33 of hub 23 of gear 10, which bar protrudes through a slot 34 in hub 32. The outer end of said spring is fastened to the side of the case as shown in Fig. 3.

As stated above, shaft 2 and gear 3 rotate continuously at a constant speed. When the register is in its inoperative condition, end 25 of clutch control means 6 is pressed down and cylindrically shaped arm 27 thereof is positioned in front of flange 30 and rests lightly against spring 22. As a result, dial wheel assembly 4 remains in its disengaged position with respect to rotating gear 3, as shown in Fig. 3. When end 35 of clutch control means 6 is pressed down, arm 27 thereof moves to a position at the rear of flange 30 as shown in Fig. 1, and is held in such position by flange 30. Arm 27 when in this position exerts pressure on the curved part, particularly on flange 24 of clutch spring 22. Pressure exerted on this part of spring 22 causes its ends to move toward each other. This movement of the end which is fastened to shifting fork 20 causes the entire dial wheel assembly to slide along hub 9 to a position such that escapement spring 19 fits in between one of escapement teeth 12 and one of escapement teeth 13 and such that the regular teeth of gear 10 mesh with the regular teeth of gear 3. Since the forward edges of escapement teeth 12 are straight or horizontal, escapement spring 19 prevents the rotation of dial wheel member 11. However, since the forward edges of escapement teeth 13 slope toward the face of gear 10 and since dial wheel member 11 is loosely mounted on gear 10, escapement spring 19 does not interfere with the rotation of gear 10, and hence, gear 10 begins to rotate with gear 3 at a constant predetermined speed. Since one end of escapement tension spring 14 is connected to gear 10 and the other end to dial wheel member 11, the rotation of gear 10 distorts spring 14. The rotation of gear 10 causes escapement spring 19 to be lifted

by the sloping edge of the next succeeding one of teeth 13 gradually out of engagement with the straight or horizontal edge of tooth 12. This disengagement occurs when the straight edge of the next succeeding one of teeth 13 is substantially in alignment with the straight edge of tooth 12. As soon as this disengagement occurs, tension spring 14 becomes effective to cause dial wheel member 11 to rotate very rapidly in the same direction as gear 10 and quickly overtake said gear. As dial wheel member 11 rotates, escapement spring 19 slides down the sloping edge of tooth 12, so to speak, until it reaches a position such that the straight edge of the next succeeding one of teeth 12 encounters said spring. The engagement of said next succeeding one of teeth 12 with escapement spring 19 again prevents the rotation of dial wheel member 11. The further rotation of gear 10 again causes escapement spring 19 to be lifted by the sloping edge of the next succeeding one of teeth 13 gradually out of engagement with the straight edge of tooth 12, and the cycle of operations described above is repeated until dial wheel member 11 has rotated substantially one revolution. The position of escapement spring 19 and the positions of teeth 12 and 13 are such that only one numbered section on the periphery of the dial wheel member 11 is visible through window 15 at any one time. The speed at which gear 10 rotates is such that each successive number on the periphery of the dial wheel member remains visible through window 15 a predetermined period of time, for example, five minutes. At the end of each period of time the number then visible quickly disappears and almost simultaneously with such disappearance the next higher number appears. When dial wheel member 11 rotates substantially one revolution, tripping member 31 comes in contact with and presses down flange 28 of control spring 7. This causes flange 30 of spring 7 to be pressed down to a position below arm 27 of clutch control means 6. Clutch spring 22, being distorted, quickly moves arm 27 to its normal unoperated position in front of flange 30, which, of course, causes arm 25 to move downward and arm 35 to move upward. Simultaneously with the release of clutch control means 6, the ends of spring 22 spread out or move apart. This movement of the end to which shifting fork 20 is fastened moves said shifting fork to the right, which in turn slides the entire dial wheel assembly to the right along hub 9. This disengages gear 10 from gear 3 and teeth 12 and 13 from escapement spring 19. Reset coil spring 8, which was wound up by the rotation of gear 10 and dial wheel member 11, now becomes effective to cause the entire dial wheel assembly to rotate in the opposite direction until tripping cam 31 comes in contact with flange 29 and stops the reverse rotation of the dial wheel assembly, at which time the dial wheel assembly is in its normal zero position. The apparatus is now in its inoperative condition. It can be seen from the above description that at the end of a predetermined number of timing periods the apparatus automatically releases the clutch control means and the clutch means and automatically restores itself to its normal inoperative condition. However, it may be restored to its normal inoperative condition at any time by pressing down end 25 of clutch control means 6. If end 25 of clutch means 6 is pressed down during any timing period, arm 27 is pressed

against flange 30 with sufficient force to cause flange 30 to move down and permit arm 27 to pass over said flange and move to its normal position in front of said flange. As a result, the clutch means is released, gear 10 is disengaged from gear 3, and the dial wheel assembly is restored to its normal zero position as before.

As stated above, Fig. 8 illustrates the manner in which the registers may be used in connection with the equipment of a telephone system for measuring the elapsed time of message rate calls. In said figure, 36 indicates the primary line jacks, 37 the multiple answering jacks, 38 the out-going trunk jacks or the subscribers' multiple jacks, depending upon the particular type of switchboard, 39 the plugs of the cord circuits, 40 the cord supervisory lamps, 41 the message register keys, and 42 the ringing and listening keys. The registers indicated at 43 are mounted side by side on the top of the key shelf, each register being in alignment with the plugs of the cord circuit with which it is to be used. It will be noted by reference to Figs. 2 and 3 that the driving shaft 2 of each register has a male and female end. When the registers are mounted side by side on the key shelf, the male end of shaft 2 of each register is fitted in the female end of the shaft of the adjacent register. As a result, the several shafts of the registers form a common driving shaft which is divided into a plurality of sections with male and female ends, one section for each register. By reason of this arrangement, any number of registers may be used for each position of the switchboard and any register may be replaced or taken out at any time. The male or female end, as the case may be, on one of the terminal registers is fitted in the female or male end, as the case may be, of the driving shaft of a continuously operated constant speed motor 44, for example, which shaft is connected to the motor through suitable gearing apparatus. Motor 44 may be, for example, of the type disclosed in Patents Nos. 1,283,432, 1,283,433 and 1,283,435 issued to Henry E. Warren on October 29, 1918. Hence, shaft 2 and gear 3 of each register rotate continuously at a constant speed.

Let it be assumed, for convenience, that the register assembly described above is used for measuring over-time on local calls. When the operator receives a signal from a calling subscriber, she selects an idle one of cord circuits 39, inserts the answering plug into the proper one of line jacks 36 and ascertains the number of the subscriber desired. She then inserts the calling plug in the proper one of the subscribers' multiple jacks 38, or, in case trunk jacks are provided, in one of the trunk jacks 38 which extends to an operator having access to the called subscriber's multiple jack. When the called subscriber answers, the originating operator presses down end 35 of clutch control means 6 of the register corresponding to the cord circuit used. The operation of the clutch control means operates the clutch means, which in turn causes the engagement of gear 10 and gear 3 and the rotation of gear 10 with gear 3. During the first predetermined timing period gear 10 continues to rotate at a constant speed but, as explained above, dial wheel member 11 remains stationary. As a result, section numbered 1 remains visible through window 15. At the end of the first timing period the escapement means operates in the manner described above and section num-

bered 1 suddenly disappears and section numbered 2 immediately becomes visible through window 15. In the case of a message rate call, the operator enters the details of the call on an over-time ticket preparatory to entering the number of over-time periods. At the expiration of the second timing period and of each succeeding period the section then visible suddenly disappears and the succeeding section immediately becomes visible. If the call should last for a sufficient length of time for the dial wheel assembly to rotate substantially one revolution, the clutch control means and the clutch means will be automatically released and the dial wheel assembly restored to its normal zero position in the manner described above. In such a case the operator will immediately re-operate end 35 of clutch control means 6 and the register will again start timing the call. At the termination of the call the operator presses down end 25 of clutch control means 6 and, in the case of a message rate call, depresses the proper one of message register keys 41 once, takes down the connection and enters on the ticket the number of over-time periods. The operation of the clutch control means releases the clutch means and restores the dial wheel assembly to its normal zero position.

Although this invention has been described in connection with a telephone system for measuring over-time on local calls, it is to be understood that it may be used in connection with a telephone system for measuring other types of calls and that the apparatus and features thereof may be used in connection with other systems than a telephone system to time any operation, without departing from the spirit and scope of the appended claim.

What is claimed is:

In combination, a driving means, a first rotatable element adapted to be rotated by said driving means, a second rotatable element mounted on said first rotatable element, tension means tending to cause said second rotatable element to rotate with said first rotatable element, a plurality of escapement teeth fastened to and protruding from the face of said first rotatable element near the periphery thereof, the rear edge of said teeth being straight and the forward edge thereof sloping toward the face of said first rotatable element, a plurality of escapement teeth fastened to and protruding from the side edge of said second rotatable element, each of said last mentioned teeth being positioned slightly to the rear of a corresponding one of said first mentioned teeth, and an escapement spring adapted normally to engage successively the teeth associated with said second rotatable element and prevent the rotation of said second rotatable element as said first rotatable element rotates through predetermined arcs, the first mentioned teeth being adapted, at the end of each rotation of said first rotatable element through said predetermined arcs, to raise said escapement spring out of its successive engagement with the escapement teeth associated with said second rotatable element to permit the rotation of said second rotatable element, and said tension means being operative, when said escapement spring is disengaged, to cause said second rotatable element to rotate in the direction of and overtake said first rotatable element.

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