R. E. KIMBALL.

SETBACK REGISTER.

APPLICATION FILED OCT. 22, 1915.

1,352,973.

Patented Sept. 14, 1920.

2 SHEETS—SHEET 1.

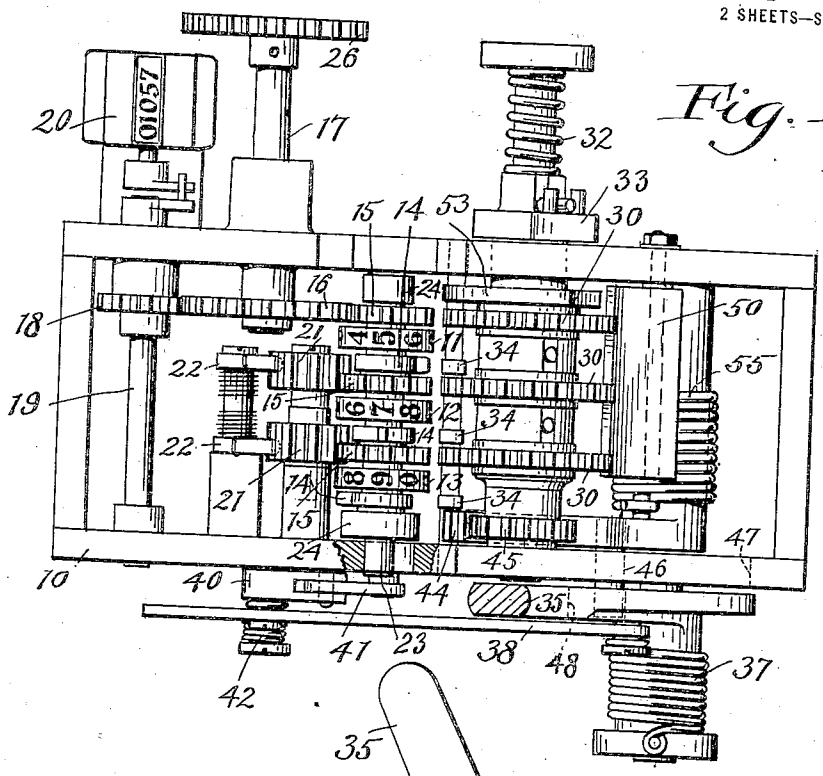

Fig. 1.

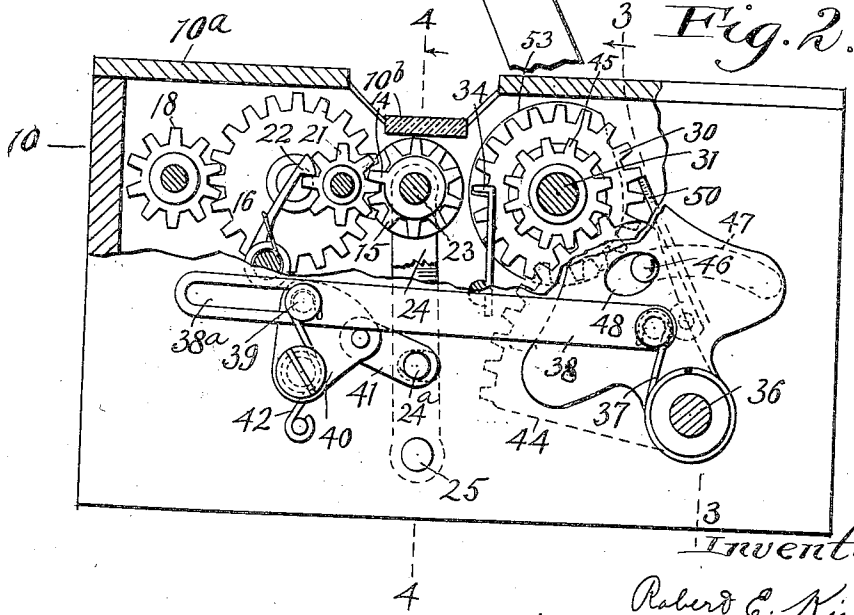

Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 3.

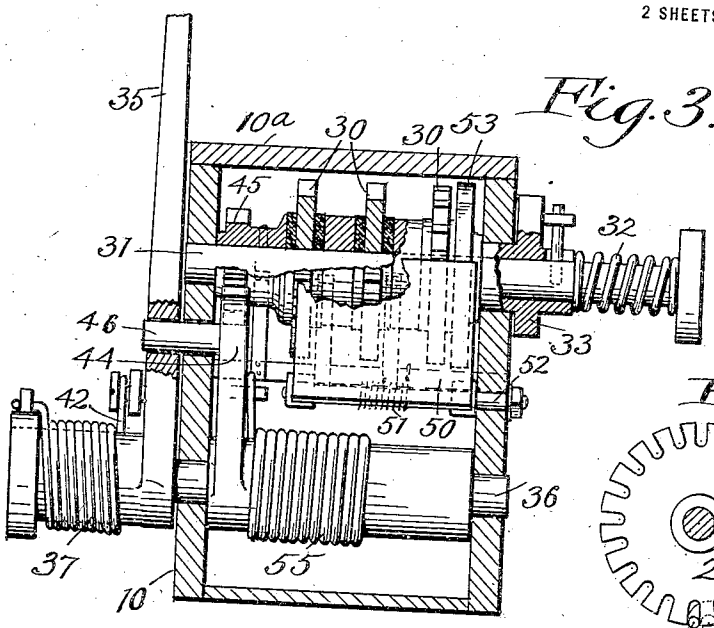


Fig. 6.

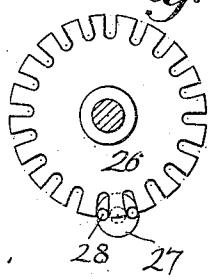


Fig. 4.

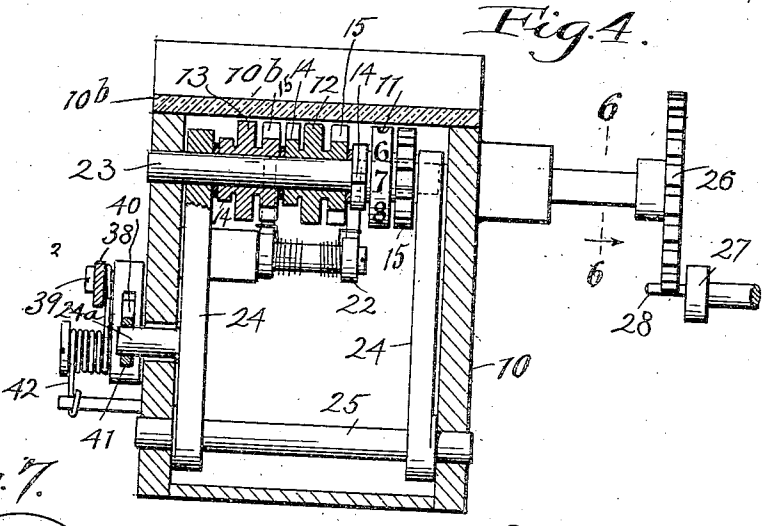
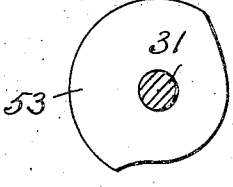


Fig. 7.



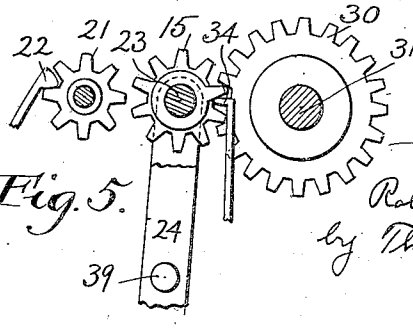


Fig. 5.

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UNITED STATES PATENT OFFICE.

ROBERT E. KIMBALL, OF CLEVELAND, OHIO.

SETBACK-REGISTER.

1,352,973. Specification of Letters Patent. Patented Sept. 14, 1920.

Application filed October 22, 1915. Serial No. 57,284.

To all whom it may concern:

Be it known that I, ROBERT E. KIMBALL, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invention a certain new and useful Improvement in Setback-Registers, of which the following is a full, clear, and exact description.

This invention relates to a set-back register adapted especially for use with ticket and railway transfer counters, although capable of use for other purposes. This device has particular utility in connection with a machine for counting tickets and transfers constituting the subject-matter of a companion application filed by me of even date herewith.

The object of the present invention is to provide a setback register which can be operated at a very high speed and which can be quickly and easily set back to zero.

The invention may be briefly summarized as consisting in certain novel details of construction and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying sheets of drawings, wherein I have shown the preferred embodiment of my invention, Figure 1 is a top plan view of the set-back register with the set-back lever in section and with the top or cover removed so as to show the interior construction; Fig. 2 is a side view of the same with parts in section and other parts broken away; Fig. 3 is a section substantially along the line 3—3 of Fig. 2, looking in the direction indicated by the arrow; Fig. 4 is a section substantially along the line 4—4 of Fig. 2, looking in the direction indicated by the arrow; Fig. 5 is an inside detail view illustrating some of the parts for alining the counting or registering wheels during the set-back operation; Fig. 6 is a section substantially along the line 6—6 of Fig. 4, looking in the direction indicated by the arrow; Fig. 7 is a detail view of one of the parts of the set-back mechanism.

The set-back register comprises a rectangular casing or box 10 which incloses the major part of the mechanism, this box having in the top 10^a a glass or window 10^b which is located directly above the counting or registering wheels. The registering mechanism proper includes a series of counting or registering wheels with peripheral counting numerals from zero to nine, the mechanism here shown having units, tens and hundreds wheels designated 11, 12 and 13. Associated with each counting wheel is a one tooth carrying wheel 14 and also a full toothed gear 15, each of the counting wheels being between one of the single toothed gears 14 and one of the gears 15. As will appear subsequently, the single toothed gears associated with the units and tens wheels only are employed for the carrying operation, while the single toothed wheel associated with the hundreds wheel 13 is utilized with the other two single toothed wheels for alining the counting wheels during the set-back operation. Furthermore, the gears 15 associated with the tens and hundreds wheels 12 and 13 form part of the carrying mechanism, whereas the gear 15 associated with the units wheel 11 is simply a driving gear which is engaged by a larger gear 16 on the driving shaft 17 which is rotated to actuate the register by any suitable mechanism such as a ticket or transfer counting machine. It may be here stated also that the gear 16 drives a gear 18 on a shaft 19 adapted to operate a totalizer or total counter or register 20, the latter constituting no part of the present invention.

The carrying mechanism includes in addition to the single toothed gears 14 and the gears 15 two gears 21 which are mounted to turn independently on a short shaft supported by the casing, each gear 21 being about twice the width of the gears 15, and one of these gears 21 being adapted to transmit movement from the single toothed gear 14 associated with the units wheel to the gear 15 associated with the tens wheel 12, and the other gear 21 being adapted to transmit movement from the single toothed gear 14 associated with the tens wheel to the gear 15 associated with the hundreds wheel. The two gears 21 are engaged by pawls 22 which prevent free rotation of the former on the pin or shaft supporting them.

The counting wheels 11, 12 and 13, the three single toothed gears 14 and the three gears 15, are mounted upon a shaft 23 which is not directly supported in the casing but

in a U-shaped frame or yoke comprising a pair of arms 24 secured at their lower ends to a shaft 25 mounted in the lower part of the casing (see particularly Fig. 4). One end of the shaft 23 extends through a short arc-shaped slot in one side wall of the casing, as shown in Figs. 1 and 4. As shown particularly in Fig. 4, the three counting wheels 11, 12 and 13, the three single toothed wheels 14 and the three gears 15, are arranged in the form of three units, each composed of one of the counting wheels, a single toothed gear 14 and a full toothed gear 15. The three parts of each unit are either integrally formed or are fastened together in such a manner that they turn in unison. The counting wheels and carrying gears 14 and 15, also the shaft 23 upon which said wheels and gears are mounted, are normally in the position shown in Figs. 1 and 2, with the gear 15 (associated with the units wheel 11) engaging the gear 16 and with the two wide gears 21 engaging the gears 15 associated with the tens and hundreds wheels. When the parts are in this position the apparatus acts in a well known manner to count the revolutions or fractions of revolutions of the shaft 17. In the present case for each revolution of the shaft 17 the counting wheels are turned through 20 counting spaces, *i. e.*, the units wheel 11 will make two complete revolutions and the tens wheel will make two-tenths of a revolution. This is accomplished by a toothed driving wheel 26 which is mounted on the end of the shaft 17 previously referred to and by a rotary actuating member 27 having two pins 28 which engage in the teeth of the wheel 26 and at each half revolution of the member 27 turn the wheel 26 one step or through one-twentieth of a revolution. This driving or transmitting mechanism has the advantage that the member 26 and the train of mechanism connected thereto starts and stops slowly, for at the beginning and at the end of each half revolution of the member 27 the two pins 28 have a sliding and substantial tangential movement on the teeth of wheel 26, the result being that even though the member 27 is driven very rapidly there will be no hammering or banging of the gears and liability of breakage or of rapid deterioration is minimized. By this particular driving means I am enabled also to employ a simple form of carrying mechanism for the counting wheels.

When it is desired to set back the counting wheels to zero the yoke or frame carrying the counting and carrying wheels is swung about the axis of the shaft 25 so as to move the three gears 15 out of engagement with the gears 16, 21, 21 which they normally engage and into engagement with three normally stationary set-back gears 30 which are in alinement or in the same planes with the three gears 15 and are so located in the casing that when the yoke or casing previously referred to is swung through an arc of a few degrees the said three gears 15 will engage the three gears 30. The gears 30 are mounted on a shaft 31 supported by the casing and are held frictionally fairly tightly on the shaft by means of a coil spring 32 which surrounds one end of the shaft projecting beyond one side of the casing, and clamps the gears and disks of leather which are on opposite sides of the gears between a pair of shoulders or abutments, one fixed to the shaft and consisting of the hub of the gear 45, hereinafter referred to, and the other consisting of a cam 53 hereinafter referred to and carried by a member 33 which rotates with the shaft 31 but may slide relative thereto under the action of the spring 32. These gears, which, while rotatable with the shaft 31 and capable of slipping thereon when held against rotation, are designed to turn the gears 15 and hence the counting wheels to bring the corresponding numerals on the counting wheels into alinement. For the purpose of accomplishing the alining of the numerals of the counting wheels, I provide adjacent the gears 30 shoulders or stops 34 in the form of stationary fingers which are supported by the casing directly opposite the single toothed gears 14 and are so positioned that when the gears 15 are rotated by the gears 30 these shoulders are in the path of movement of the teeth on the single toothed gears 14. In consequence, by the rotation of the shaft 31 the gears 15 will be rotated, causing the rotation of the single toothed gears 14 as well as the counting wheels until the teeth of the single toothed gears 14 engage the stops or shoulders 34 which stop the rotation of the single toothed gears, the counting wheels and the gears 15. When the tooth of any one single toothed gear engages the shoulder, the rotation of gear 30 with the associated gear 15 is stopped, but the other two gears 30 will continue their rotation until the teeth of the three single toothed gears engage the three shoulders, in other words, until the numerals on the counting wheels are in alinement. When this occurs the zero numerals are in alinement but are not at the top of the counting wheels, but in the particular embodiment of the mechanism here shown the "5" numerals are in line at the top of the wheels, and this necessitates the backward rotation of the counting wheels after the numerals have been alined, through substantially a half revolution so as to bring the zero numerals to the top of the counters before the yoke carrying the counting wheels is restored to normal position. The manner in which this is done will be subsequently explained.

For the purpose of shifting the counting

wheels in the manner above explained and actuating them,—in other words, for the purpose of accomplishing the set-back operation quickly,—I employ a shifting lever 35 which is loosely mounted on one end of a shaft 36 projecting outwardly from one side of the casing. This lever, which is normally held in the position shown in Fig. 2 by a coil spring 37, has connected to it a forwardly projecting link 38 which is just outside of one of the side walls of the casing. This link has at its forward end an elongated slot 38[a] engaged by a pin 39 extending laterally from an arm or lever 40 which is connected by a short link 41 to a pin 24[a] projecting from one of the arms 24 of the yoke carrying the counting wheels. A spring 42 which is weaker than the spring 37 tends to shift the yoke and counting wheels away from the position shown in Fig. 2 over toward the set-back gears 30, but the link 38 under the action of the spring 37 normally holds the yoke and the counting wheels in the position shown in Fig. 2 or with the gears 15 engaging the gears 16, 21, 21. It will be seen, therefore, that when the lever 35 is swung to the right, as viewed in Fig. 2, during the initial movement of the lever the yoke will be swung by the spring 42 to the right carrying the gears 15 into mesh with the set-back gears 30; and it may be here stated that when they are thus swung over by the spring 42 the pivotal centers of the two members 40, 41, are brought so nearly in alinement that even though a fairly weak spring 42 is employed the action of the teeth of the gears 30 will not throw the gears 15 out of mesh therewith even when the single tooth gears engage the stops, and in spite of the fact that there is naturally a tendency for the driving gears, *i. e.* in this instance the set-back gears, to push the gears which engage them in an outward direction. After the yoke and counting wheels have been swung in the manner above stated during the initial movement of the lever 35, further or continued movement of the lever causes the rotation of the gears 30 and hence of the gears and wheels on the shaft 23, and this is brought about by a gear sector 44 which is fixed to the shaft 36 about which the lever 35 turns just inside of the casing and engages a gear 45 which is fixed to the shaft 31 carrying the set-back gears 30. It will be observed by reference particularly to Figs. 2 and 3, that this sector 44 is provided with a pin 46 which extends outwardly through an elongated arc-shaped slot 47 in a side wall of the casing, (said slot shown by dotted lines in Fig. 2) and through a much shorter slot 48 in the lever 35. By reason of this construction during the initial movement of the lever 35 the sector, and hence the set-back gears 30, are not turned, but they are turned by the lever 35 immediately after the yoke carrying the counting and carrying wheels is swung so as to bring the gears 15 into engagement with the gears 30.

As previously stated, when the numerals on the counting wheels are brought into alinement by the rotation of the set-back gears 30 the "5" numerals of the three wheels are in alinement at the top of the wheels and it becomes necessary to rotate the counting wheels backward so as to bring the zero numerals to the top of the counting wheels. This is done by rotating the set-back gears 30 backward on the return movement of a lever 35, but in order that the backward rotation of the counting wheels may be stopped with the zero numerals in alinement at the tops of the wheels, it is necessary to stop the backward rotation of the gears 30 when the counting wheels are in just the right position and before the end of the return movement of the lever 35. This is accomplished by providing in connection with the three set-back gears 30 a stop pawl or plate 50 which is wide enough to engage all three gears 30 and is pressed yieldingly toward the same by a weak spring 51 (see Fig. 3), the said plate or pawl 50 being pivotally mounted on a pin 52 extending inwardly from one of the side walls of the casing.

Acting in conjunction with this pawl 50 and for the purpose of controlling its action, I provide on the shaft 31 a disk or cam 53 which rotates with the shaft 31 opposite one end of the pawl 50. This disk or cam, the detail of which is shown in Fig. 7, during a portion of its revolution does not engage the pawl which is then permitted by the action of the spring to engage the teeth of the gears 30, and it has a peripheral portion which during another portion of the revolution of the shaft 31 engages the pawl 50 and lifts the same away from or out of engagement with the teeth of the gears 30. The parts are so proportioned that when the lever 35 is moved forwardly and during the early part of the forward rotation of the gears 30 counter-clockwise in Fig. 2 the pawl 50 rides freely over the teeth of the gears 30, but during the latter part of the movement the raised part of the cam or disk 53 engages and lifts the pawl 50 away from the teeth. Thence, during the early part of the return movement of the lever 35 because the pawl engages the raised peripheral surface of cam 53, it is held out of engagement with the teeth of the gears 30, permitting the backward rotation of the gears 30 to give a backward or reverse rotation to the counting wheels. The pawl 50 rides on the raised peripheral surface of the cam or disk 53 until the zero numerals of the counting wheels are in alinement at the top of the

wheels, or where they should be located when the counters are set back to zero when the lowered periphery of the cam engages the pawl, whereupon the pawl 50 drops inwardly and immediately locks the gears 30 against further rotation. As soon as this occurs the gears 30 simply slip on the shaft 31 but the shaft continues to rotate until the sector 44 has reached its normal or initial position,—in other words, when the pin 46 reaches the end of the slot 47, whereupon the further or continued movement of the lever 35 under the action of the spring 37 and through the instrumentality of the link 38 shifts the yoke supporting the counting wheels and carrying gears back to normal position. The register has now been set back to zero.

Preferably the sector 44 is restored to normal position by a rather stiff coil spring 55 which surrounds the hub of the sector, which in turn surrounds the shaft 36, as shown particularly in Fig. 3, so that when the lever 35 is moved from normal position to the end of its forward stroke both springs 37 and 55 are compressed or put under tension and both springs, therefore, act in conjunction to return the parts to normal position after the lever 35 is released until the sector reaches the end of its backward movement, and when this occurs the remainder of the return movement is accomplished by the spring 37. This spring 37 acting as it does through the link 38 on the pin 39, easily overcomes the opposing action of the spring 42.

It will be seen, therefore, that when the operator desires to set back the register to zero all that it is necessary for him to do is to give a quick stroke to the lever 35 and then release it. As the parts move easily and as the length of the stroke is short, no appreciable amount of time is required for the set-back operation. As a matter of fact, in practice the forward and return movement of the lever, in other words, the complete set-back operation, requires not more than a second of time, although it could be set back even more quickly than that if necessary.

To explain the operation briefly and in a more connected manner than above, it may be said that when the operator moves the lever forwardly its full distance and then releases it (about 60 degrees in extent), the yoke carrying the counting wheels and carrying gears is first swung over until the gears engage the set-back gears, whereupon the carrying gears are rotated until the counting numerals on the three counting wheels are brought in alinement by the three teeth on the three single toothed gears engaging the stops 34 after which and during the remainder of the movement in the forward direction the gears 30 are held against rotation, and the disk or cam 53 lifts the pawl 50 away from the teeth of the gears 30, the edge of the pawl riding on the arc-shaped periphery of the cam 53 for a predetermined part or fraction of a revolution. When the lever reaches the end of its forward movement by the pin 46 engaging the end of the slot 47 the operator can either release the lever or manually move it backward. Ordinarily he will release it so as to permit the springs to restore the parts to normal position and to complete the remainder of the set-back operation. During the early part of the return movement of the lever the gears 30 are rotated backward clockwise in Fig. 2, bringing the zero counting numerals to the top of the counting wheels, whereupon the pawl 50 drops into the gears 30 stopping their further rotation and causing the gears 30 to slip on shaft 31 during the remainder of the rotation of said shaft or until the sector reaches the end of its return movement, whereupon the spring 37 completes the return movement of the lever and finally shifts the yoke and counting wheels back to the normal position with all parts ready for another count.

As before stated, this set-back register has particular utility in connection with the ticket or transfer counting machine which constitutes the subject matter of my copending or companion application filed of even date herewith. When used in conjunction with such a machine the operator is enabled to count transfers or tickets brought in by the different conductors and to set back the register after each individual count with practically no delay and very little effort. Not only is the register quickly set back to zero, but it is very reliable in action and will stand the wear and tear of constant use for a very long period of time, the construction being such that no part is mechanically weak and liable to get out of order. The long life and durability is due not only to the construction of the set-back register as a whole, but also to the particular means here shown for transmitting movement to the driving shaft 17 during the counting operations.

Many changes may be made in the arrangement of parts and details of construction without affecting the principle of the operation and without materially affecting the very high efficiency of the device as a whole, and I aim in my claims to cover all changes and modifications which do not involve a departure from the spirit and scope of the invention as expressed in the broadest of the appended claims.

Having thus described my invention, what I claim is:—

1. In a set-back register, registering mechanism comprising counting wheels with counting numerals, and carrying

means including single toothed gears adjacent the carrying wheels, and set-back mechanism comprising stop devices arranged opposite the single toothed gears, and means for turning the wheels so as to bring corresponding numerals into alinement by the engagement of the teeth of the different single toothed gears with said stop devices, and for then simultaneously rotating all the wheels through a predetermined portion of a revolution sufficient to bring the alined zero numerals from one given position to another given position.

2. In a set-back register, registering mechanism including counting wheels with counting numerals and carrying means comprising single toothed gears adjacent to and rotatable with the counting wheels, set-back mechanism including means for rotating said counting wheels in one direction, fixed stop devices located opposite the single toothed gears and adapted to be engaged by the teeth thereof for separately limiting and stopping the movement of said wheels so as to bring corresponding numerals into alinement with certain alined numerals in a given position, and means for causing simultaneous rotation of all the counting wheels through a definite portion of a revolution to bring said certain alined numerals into another given position.

3. In a set-back register, registering mechanism including counting wheels with counting numerals and carrying mechanism, comprising single toothed gears adjacent to and rotatable with the counting wheels, and set-back mechanism including stop devices located in predetermined positions with respect to the single toothed gears, and means for independently turning said counting wheels so as to aline corresponding numerals, for shifting the counting wheels into operative relationship with said turning means, and for shifting the single toothed gears into a position such that the stop devices will be engaged by said single toothed gears and stop the rotation of said wheels with the corresponding numerals in alinement and with the zero numerals in a predetermined position for simultaneously turning said wheels to bring the zero numerals to another predetermined position and for returning said counting wheels to normal position.

4. In a set-back register, registering mechanism including a shaft, counting wheels having numerals thereon and full toothed and single toothed gears for turning the same mounted on the shaft, and set-back mechanism comprising stop devices, a rotary shaft having set-back gears thereon said gears being capable of independent movement on the shaft, means for shifting said first named shaft so as to bring the full toothed gears thereon into operative relation with said set-back gears and so as to position the single toothed gears that the teeth thereof will engage the stop devices, and means for rotating said set-back gears first in one direction to aline the numerals with the zero numerals in a given position and then in the other direction to simultaneously turn all the counting wheels through a predetermined fraction of a revolution to bring the zero numerals to another given position.

5. In a set-back register, registering mechanism including a shaft, counting wheels having numerals thereon and full toothed and single toothed gears for turning the same mounted on the shaft, and set-back mechanism comprising stop devices located opposite the single toothed gears, a rotary shaft having set-back gears thereon said gears being capable of independent movement on the shaft, means for shifting said first named shaft so as to bring the full toothed gears thereon into operative relation with said set-back gears and the single toothed gears to a position such that when they are rotated the teeth thereof will engage the stop devices, and means for rotating said set-back gears so as to turn the counting wheels until each is brought to a predetermined position with corresponding numerals of all wheels in alinement with the zero numerals in a given position and for subsequently rotating said set-back gears so as to turn all counting wheels simultaneously through a predetermined degree of rotation to bring the zero numerals to another given position.

6. In a set-back register, registering mechanism including a shaft, counting wheels having numerals thereon and full toothed and single toothed gears for turning the same mounted on the shaft, and set-back mechanism comprising stop devices located opposite the single toothed gears, a rotary shaft having set-back gears thereon said gears being capable of independent movement on the shaft, means for shifting said first named shaft so as to bring the full toothed gears thereon into operative relation with said set-back gears and the single toothed gears to a position such that the teeth thereof will engage the stop devices, means for rotating said set-back gears so as to turn the counting wheels until each is brought to a predetermined position with corresponding numerals of all wheels in alinement and with the zero numerals in a given position and subsequently rotating said set-back gears so as to turn all counting wheels simultaneously through a predetermined degree of rotation, and means for stopping the rotation of said set-back gears when said counting wheels have been simul-

taneously moved a predetermined amount and the zero numerals are in a second given position.

7. In a set-back register, a movable shaft having a series of counting wheels and associated operating gears including full toothed and single toothed gears, a movable support for said shaft, a second shaft, set-back gears arranged thereon, a set-back lever movable a predetermined distance in one direction and then a predetermined distance in the reverse direction, a connection between said lever and said support to move the full toothed gears associated with the counting wheels into engagement with the set-back gears, means associated with said lever and operated thereby during the stroke of the lever in one direction for rotating the set-back gears and the counting wheels until the numerals of the latter have been alined and for simultaneously rotating the counting wheels during the reverse movement of the lever, stop devices arranged opposite the single toothed gears and adapted to be engaged by the teeth thereof when the full toothed gears are rotated by the set-back gears, and a locking device controlled by the movement of the said lever for stopping the rotation of said set-back gears after they have been rotated simultaneously a predetermined amount.

8. In a set-back register, a shaft provided with counting wheels and operating and single toothed carrying gears associated with the counting wheels, driving or actuating gears normally engaging said operating gears, a movable support for said shaft, a second shaft, a plurality of set-back gears thereon, stop devices adjacent the set-back gears and in line with the single toothed gears, means for shifting said support to bring the operating gears on the first named shaft into engagement with the set-back gears and to bring the single toothed gears to a position such that when rotated, the teeth thereof will engage the stop devices, for rotating the set-back gears in one direction to aline the numerals on the counting wheels, for rotating the set-back gears in the reverse direction to simultaneously move the counting wheels through a given portion of a revolution with the numerals alined and for swinging the support so as to restore the operating gears on the first named shaft into engagement with the actuating or driving gears, said means including a lever adapted to be moved through a given distance in one direction and then through the same distance in the reverse direction, a lost motion link connection between said lever and said support, and a segment having a lost motion connection with said lever and having a gear connection with said shaft carrying the set-back gears, and a stop device for stopping the rotation of the set-back gears after they have simultaneously rotated the counting wheels a given amount with the numerals alined.

In testimony whereof, I hereunto affix my signature.

ROBERT E. KIMBALL.