July 13, 1943. W. G. PETERS 2,324,321

REGISTER RESETTING MECHANISM

Filed May 24, 1941 2 Sheets-Sheet 1

Fig. 1.

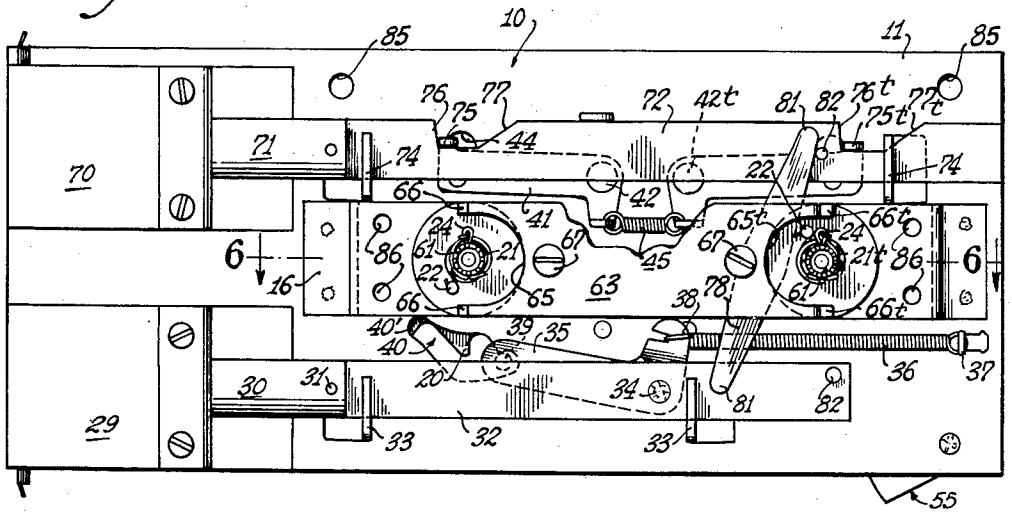


Fig. 2.

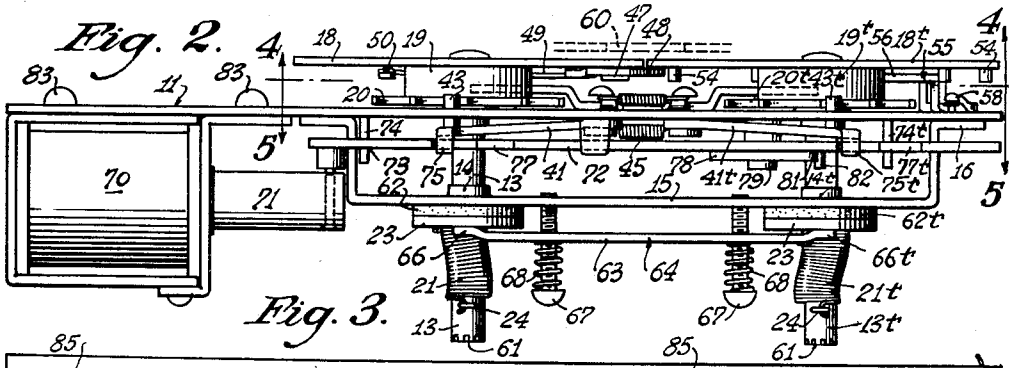
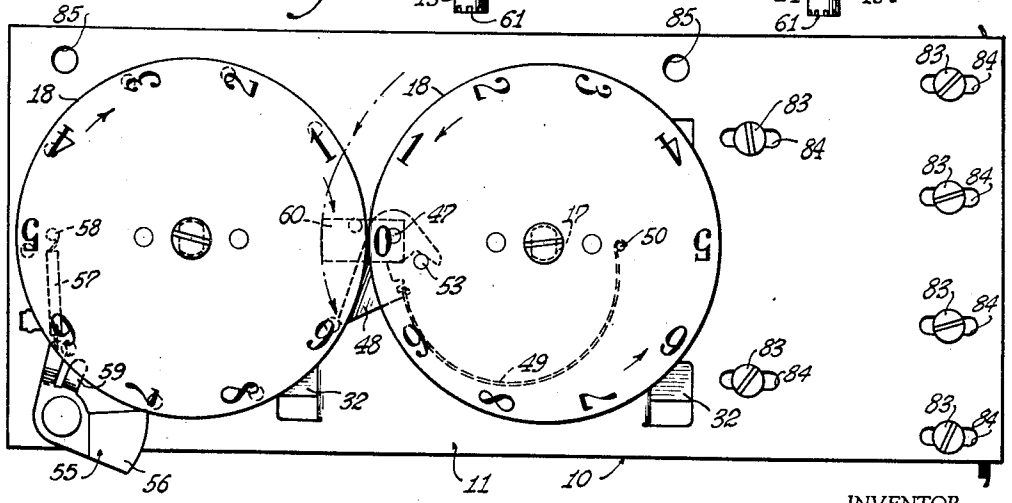


Fig. 3.



INVENTOR.
William G. Peters
BY Clarence E. Threedy
HIS ATTORNEY

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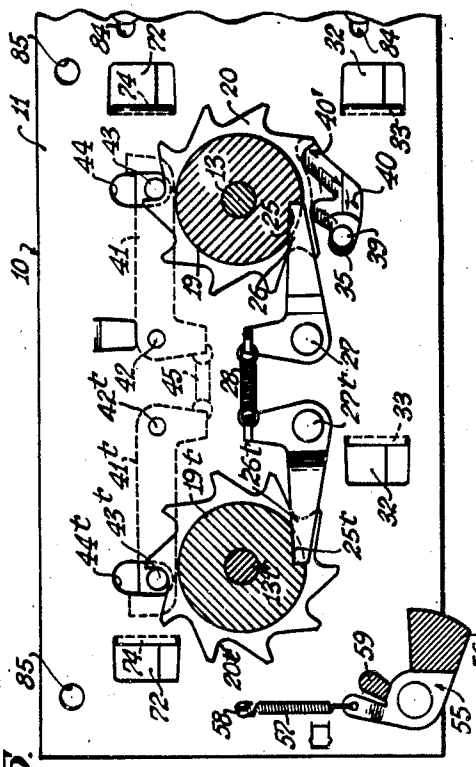


Fig. 5.

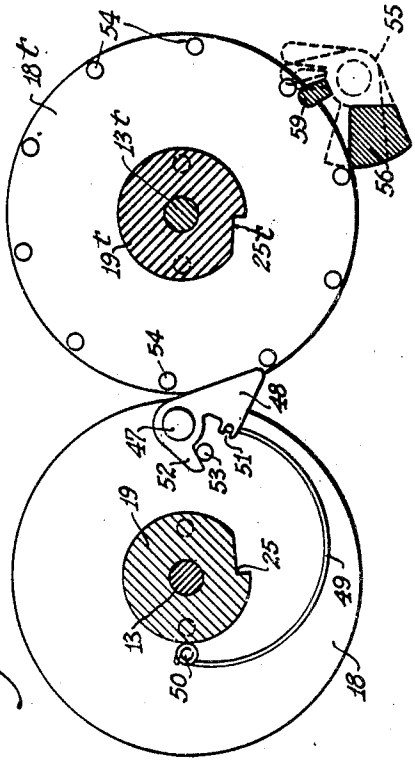


Fig. 4.

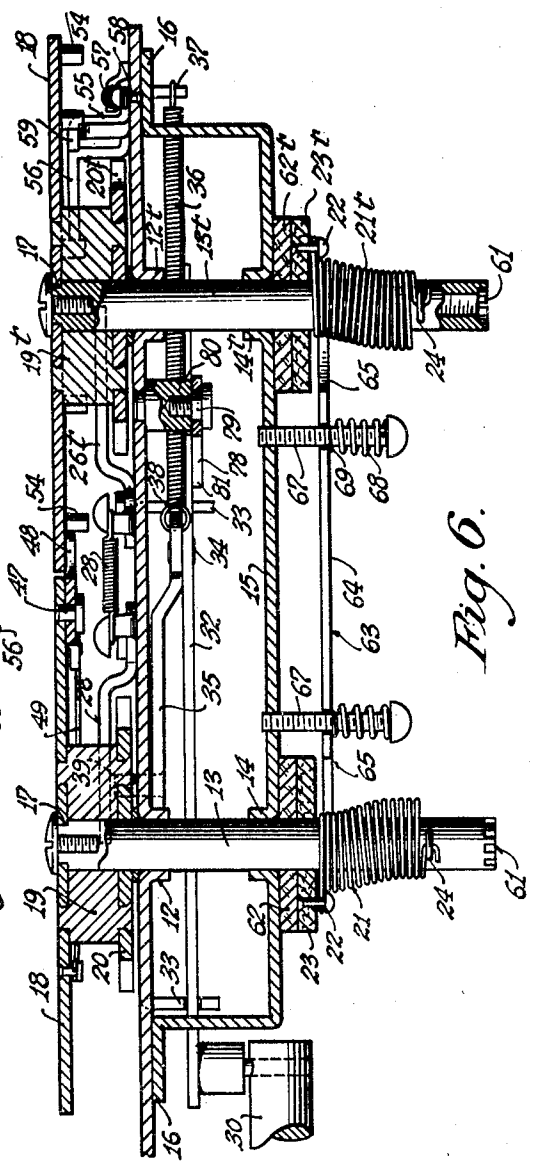


Fig. 6.

William G. Peters
INVENTOR.

BY Clarence E. Threedy
HIS ATTORNEY.

Patented July 13, 1943 2,324,321

UNITED STATES PATENT OFFICE

2,324,321

REGISTER RESETTING MECHANISM

William G. Peters, Chicago, Ill., assignor to Richard Groetchen, doing business as Groetchen Tool & Mfg. Co., Chicago, Ill.

Application May 24, 1941, Serial No. 395,066

6 Claims. (Cl. 235—144)

This invention relates to step-up mechanism and more particularly to registering devices for counting and totalizing a score or the like determined by some initial operation of a device with which this mechanism is adapted to be associated.

It is a principal object of this invention to provide a compact unit step-up mechanism which will be simple in construction, economical in manufacture, and highly efficient in use.

It is another object of this invention to provide in step-up mechanism means for accomplishing a positive advancement of a registering means for each operation effected by the device with which this mechanism is associated.

Another object of this invention is the provision in step-up mechanism of a unidirectional advancing shaft having a resetting spring associated therewith for returning the shaft to an initial position.

A further object of this invention is to provide in unidirectional stepping shafts of the type employed in registering mechanism, a self-adjusting spring tensioner for returning the shaft to an initial position upon each resetting thereof.

It is a still further object of this invention to provide in step-up mechanism having means for latching the stepped units in advanced position, a positive resetting mechanism which when caused to operate will assume and remain in resetting condition until the next advancing operation is effected.

Other objects and advantages of the present invention will appear more fully as the device is described in the specification and in conjunction with the annexed drawings, in which:

Fig. 1 is a side elevational view of the step-up mechanism;

Fig. 2 is a top plan view of the same;

Fig. 3 is a side elevational view, opposite to that seen in Fig. 1;

Fig. 4 is a sectional view of a portion of the step-up mechanism as seen from line 4—4 in Fig. 2 and showing portions thereof partly in elevation;

Fig. 5 is a sectional detail view, complementary to that seen in Fig. 4, and looking in the direction of line 5—5 of Fig. 2; and

Fig. 6 is a horizontal sectional detail view taken along line 6—6 of Fig. 1.

The present disclosure is adapted for use as a scoring mechanism and as such is adapted to be employed in game apparatus or the like. Referring to Fig. 1, 10 indicates my new step-up unit which comprises a mounting plate 11 having boss formations 12 and 12*t* stamped in the plate 11 to provide a mounting for a pair of shafts 13 and 13*t*, there being additional bearing provided, by the stamped boss formations 14 and 14*t*, in a bracket 15 which has offset flange portions 16 attached to the main plate by welding or the like.

The shafts 13 and 13*t* each have one end portion 17 thereof keyed to a disc 18 and 18′ respectively, and each disc 18—18*t* has fixed thereto a hub structure 19 and 19*t* respectively which in turn is fastened to a ratchet 20 so that the shaft 13 and the disc, hub and ratchet 18, 19 and 20, respectively, will rotate as a unit about the axis of the shaft 13 while the disc, hub and ratchet 18*t*, 19*t* and 20*t* respectively will comprise a unit rotatable on the axis of shaft 13*t*.

Each of the rotatable units associated with the shafts 13 and 13*t* is adapted to assume a normal or zero position through the medium of a coil spring 21 and 21*t* respectively having one end thereof anchored as at 22 to a friction disc 23 and 23*t* respectively, later to be described, and the opposite end attached to a cotter pin 24 carried by the shaft 13 so that the shaft 13 will be urged toward an initial position. The hub structure 19—19*t* of each of the rotatable units has formed therein a notch 25—25*t* respectively, and as seen in Fig. 5 there is a pair of stop pawls 26 and 26*t* respectively each of which pawls has pivot mounting as at 27 and 27*t* respectively on the main plate 11, the pivot mountings being spaced laterally with respect to each other. Each of the pawls 26 and 26*t* has an offset arm to which is attached a coil spring 28 to normally urge the pawl members 26—26*t* in a direction toward the hub structure so that the latter and the respective shaft thereof will be prevented from rotating by action of the return spring 21—21*t* when the pawl 26—26*t* is engaged in the notch 25—25*t* respectively.

For the purpose of convenience, the several rotatable units should be identified one from the other, and for this purpose the first of the rotatable units may be called a register for "units," and the other a register for "tens"; when referring specifically to the parts in the "tens" register which are common to both registers the exponent *t* is used with the reference numeral for such part. The means for advancing the "units" register consists of a step-up solenoid 29 having a movable core or armature 30 which is connected as at 31 to a sliding bar 32, which sliding bar is guided for sliding movement on a pair of projecting lugs 33 struck up from the main plate 11.

The bar 32 has pivotally mounted thereon, as at 34, an advancing pawl 35 adapted to assume normal position (as shown in Fig. 1) by spring means 36 having one end anchored on the main plate 11 as at 37 and its opposite end connected as at 38 to an offset on the pawl 35 to urge the latter toward the right and in a clockwise direction. The pawl 35 carries at one end thereof a laterally projecting pin 39 which is adapted to project through a guide slot 40 formed in the main plate 11.

The solenoid 29 may be associated with any suitable circuit breaker which, when disposed in circuit-completing condition, will serve to energize the solenoid 29 whereby the latter will attract its armature 30 and the bar 32 connected thereto to the left as seen in Fig. 1, against the action of the spring 36. Upon such movement of the slide bar 32, the pawl 35 will effect an advancement of the ratchet 20 on the "units" register. This is best illustrated in Fig. 5, wherein it will be noted that the laterally extending pin 39 on the pawl 35 will be urged up into the first tooth formation on the ratchet 20 and will cause a rotation of the ratchet and shaft 13 a circumferential step equal to the distance between two teeth as limited by the guide formation 40 through which the pin 39 extends. It will be noted that regardless of the speed or snap action with which the solenoid 29 may effect the movement of the pawl 35, the ratchet 20 will advance only one step and any inertia created by the snapping or quick stepping action will be dissipated when the pin 39 reaches the advanced position indicated at 40', by reason of the fact that the pawl 35 will be locked against rotative movement and cause the inclined portion of the next succeeding tooth to bear against the locked projecting pin. It is therefore seen that there will be but one single step without any override, upon each energization of the solenoid 29.

Each of the registering units has associated therewith a latching pawl, the pawl 41 for the "units" register and pawl 41*t* for the "tens" register, each of which latching pawls has a separate pivotal mounting as at 42 and 42*t* respectively on the main plate 11, on the side thereof opposite to that on which the ratchets 20 and 20*t* are disposed. Each pawl 41—41*t* has a laterally extending pin 43—43*t* respectively adapted to extend through an arcuate slot formation 44—44*t* respectively in the main plate 11, so that the pin 43 will latchingly engage in one of the tooth formations on its respective ratchet 20 while the pin 43*t* will engage one tooth on the ratchet 20*t*. Each of the latching pawls 41—41*t* has its respective pin member 43—43*t* urged into latching engagement with its respective ratchet 20—20*t* by spring means 45. It is to be noted that the pivotal mountings 42—42*t* of the respective latching pawls are spaced horizontally with respect to each other such that the spring means 45 may be arranged between the two latching pawls 41—41*t* with its respective end portions fixed to laterally extending hook formations on the respective latching pawls.

The disc 18 forming a part of the "units" register has pivotally arranged as at 47 on its inner face, a radially extending finger 48. This finger 48 has associated therewith a bail spring 49 having one end thereof anchored as at 50 on the disc 18 and its opposite end hooked onto a yoke formation 51 in the finger 48, to urge the latter counterclockwise about its pivot mounting 47, as seen in Fig. 4. This counterclockwise movement of the finger 48 is limited by the abutment of the portion 52 on the finger 48 with the stud formation 53 carried by the disc 18, the arrangement being such that the finger 48 may be pivoted to a position within the peripheral edge of the disc 18 against the action of the spring 49 and will normally assume the position shown in Fig. 4, by action of the spring 49. After a predetermined number of steps on the ratchet 20 of the "units" register in the manner heretofore described, the disc 18 associated therewith will rotate into a position where the finger 48 will come into engagement with a laterally extending stud 54 carried by the disc 18*t* on the "tens" register.

In the present instance it will require nine successive steps of the "units" ratchet 20, through the medium of the solenoid 29, to position the finger 48 in readiness to engage the projecting stud 54 as aforesaid, and upon the tenth circumferential step of the "units" ratchet, the "tens" register will be caused to step one circumferential step equal to the distance between two teeth on its ratchet 20*t*, by reason of the finger 48 urging the "tens" disc 18*t* in a counterclockwise direction as seen in Fig. 4. The foregoing step of the "tens" register will advance the latter one step, and its latching pawl 41*t* will hold the ratchet 20*t* associated therewith in advanced position in exactly the same manner as explained in connection with the "units" register.

It will be noted in Fig. 4 that the swing of the finger 48 about the axis of the shaft 13 has a considerable amount of leverage upon the rotative action of the "tens" registering disc 18*t*, and that by virtue of the short and snap-like action of the armature 30 and bar 32 associated with the solenoid 29 it is possible that a considerable amount of momentum be created in the "tens" disc 18*t*. To this end there is provided an escapement device which prevents any override of the "tens" disc 18*t*. This disc associated with the "tens" register is provided with a plurality of laterally extending stud formations 54 spaced equally with respect to each other and radially with respect to the shaft 13*t*, the number of studs 54 corresponding to the number of teeth in the ratchet 20*t* with which they are associated.

The escapement device is indicated at 55 and consists of a pivotally mounted segment 56. This escapement device is normally disposed in the position shown, by spring means 57 anchored as at 58 to the main plate 11. There is a camming projection 59 formed on the escapement 55, and this camming projection is normally disposed in the path of movement of one of the lug elements 54 on the "tens" disc 18*t*, so that when the latter is stepped one step in the manner heretofore described, the escapement 55 will be urged into the dotted line position (Fig. 4) with the segmental portion thereof disposed in abutting relationship with respect to the next successive lug 54 to prevent more than one step of the "tens" disc for each operation caused by the finger 48. As soon as the latching pawl 41*t* engages the ratchet 20*t* to prevent retrograde movement thereof, the bearing action of the next successive lug 54 against the periphery of the segment 56 will be released and the escapement 55 will be returned to normal position by its spring 57.

It will be noted that from Figs. 2 and 3 that the discs 18—18*t* are adapted to carry indicia and that these two discs are arranged very nearly tangentially with respect to each other. It is

further to be noted that the two discs may be arranged with respect to a sight opening illustrated as at 60, so that the respective indicia of the two discs 18—18t may be legible through the sight opening 60. It is therefore seen that the step-up mechanism may be employed to visibly register a total commensurate with the number of steps made upon the device.

It is further pointed out that each of the shafts 13—13t is splined as at 61 and that these splined shafts are adapted to carry some mechanism to be acted upon, such for instance as a commutator which may be advanced in steps with the shaft 13 and shaft 13t to close a switch corresponding in number to the number of steps made by the step-up unit, each of which switches in turn may be adapted to close circuit to some electrically operated score-recording panel or the like. The splining 61 on the shaft 13t forming a part of the "tens" register, may be employed with a high score register such that upon attaining a maximum score a particular switch may be closed, or such that a particular lever may be tripped. It is to this end that the splining is of importance, because the particular arm or lever or commutator wiper may at the option of the user be placed in a predetermined position, such that upon the attainment of a predetermined score, say, for instance 50,000 (when the number "5" on the "tens" register aligns with the sight opening 60), some particular means will be actuated to ring a bell or otherwise announce that such high score has been attained. If the device with which this step-up mechanism is employed is such that a high score may be attained with greater ease, then it may be desirable to set the lever or switch on the splined end of the shaft at a different position, such that it would require a higher score to be attained before the particular operation desired would be effected.

When it is desired to reset the ratchets and discs to an initial position, any desirable circuit-closing means may be operated to energize the reset solenoid 70 to attract its armature 71. This armature 71 is associated with a slide bar 72 which is slidably arranged in the guide slots 73 formed in lateral projections 74 struck up from the main plate 11. Each of the latching pawls 41—41t is provided with a laterally extending lip 75—75t respectively adapted to be disposed in a recess 76—76t respectively and each formed in a respective edge of the slide bar 72 adjacent the particularly extending lip with which it is associated. Each of the recesses 76—76t is provided with a cam formation 77—77t respectively which is adapted to engage the lip 75—75t with which each is associated when the slide bar 72 is attracted to the left with the armature 71 of the reset solenoid 70, such that the latching pawls 41—41t will be pivoted against the action of the spring 45 into a position where the laterally extending pins 43—43t disengage connection with their respective ratchet 20—20t, whereupon the shafts 13—13t of each of the registering units are free to rotate by action of the coil springs 21—21t in retrograde action until the notch formations 25—25t in the hubs 19—19t are engaged by their respective stop pawls 26—26t. It will be noted that regardless of the number of revolutions made by the shafts 13—13t, when they are released for retrograde movement they make less than a full revolution in return; that is to say, if either the "units" counter or the "tens" counter has stepped beyond the tenth position, for instance, twelve steps, immediately upon release of the latching pawls 41—41t the unit will return to initial position, which would amount to a circumferential distance between two teeth on the respective ratchet 20—20t.

In this score registering device there is provided a novel return means for the various discs. Each return means is identical in structure and operation, hence only that of the "units" counter will be explained in so far as is necessary to understand the same. This return means consists of the coil spring 21 which normally tends to return the shaft 13 toward its initial position. As heretofore explained, the coil spring 21 has one end attached to a cotter pin 24 carried by the shaft 13 and its opposite end anchored as at 22 to the fiber disc 23. This disc 23 floats freely on the shaft 13 and bears against a similar disc 62 (there being a like disc 62t on the "tens" shaft 13t) which disc 62 preferably may be of cork or leather and likewise floats upon the shaft 13. The floating anchor for the coil spring 21 and the coil spring 21t is engaged by a tensioner 63 which consists of a metal plate 64 having concave formations 65—65t at its ends to provide a pair of bearing fingers 66—66t each of which is adapted to engage the disc 23—23t in the region of the peripheral edge thereof. In the present arrangement the tensioner 63 is adapted to affect the floating anchor of each of the registering shafts 13—13t and is arranged on a pair of stud screws 67 each of which is provided with a compression spring 68. The screw 67 is adapted to pass through an opening 69 in the member 64 and to threadably engage the bracket 15, the compression spring 68 being disposed between the head of the screw 67 and the plate 64.

The bearing pressure of the tensioner 63 against the floating anchors 23—23t is determined by the adjustment of the screws 67 and may be increased by an increase in pressure on the spring 68, or decreased by an unthreading of the screw 67. The arrangement is such that the floating anchor will normally be held by the tensioner in fixed relation so as not to rotate with the shaft 13 until the tension on the spring 21 overcomes the frictional engagement of the finger 66 on the disc 23. In the present instance this rotation of the floating anchor will not occur until preferably a little more than one full revolution of the shaft 13. After the shaft 13 has rotated slightly beyond a full revolution, the coil spring 21 will be fully tensioned and thereafter the floating anchor 23 will overcome the tension force of the fingers 66, so that the disc 23 will rotate with the shaft 13. The disc 62 provides a relatively resilient seat for the floating anchor 23 and makes for a more efficient frictional hold on the member 23 when the spring 21 is run down. The fibre disc 23 would slip too easily on the metal bracket 15, therefore the disc 62 is employed.

By this arrangement there is provided an automatically adjustable return spring. In conjunction with the "units" register it will be noted that after the tenth step, the return spring 21 will be fully tensioned and thereafter the anchoring disc 23 will rotate with the shaft 13 so that if the ratchet is stepped up beyond the tenth point, say to the number "5" (which would be the fifteenth step), and the reset slide bar 72 were moved to the left, Fig. 1, to cam the latching pawl 41 out of engagement with the ratchet 20, the "units" register would rotate in retrograde movement by the action of the spring 21

until the notch 25 on the hub 19 came into abutment with the stop pawl 26, which would be a return of only five steps instead of the full fifteen steps that it was originally advanced.

It is therefore seen that by this floating anchor for the resetting spring, there is provided a step-up ratchet disc and shaft which is unidirectional for any number of successive steps and that in returning the step-up to initial position, it is not necessary that the ratchet return a number of steps corresponding to the number of advanced steps but that it will assume the first initial position in less than a full revolution of the shaft 13.

The resetting unit of this device is of such a nature as to provide a positive resetting of the several registering units, and this is brought about by reason of the fact that the slide bar 72 floats freely on its guideways 73. There being no return spring associated with the resetting solenoid 70, it is obvious that when the armature 71 is attracted to the left, Fig. 1, the slide bar 72 will likewise move to the left to cam the two latching pawls 41 out of latching engagement with respect to the ratchets on the registering units. There being no resetting spring for the armature 71 and slide bar 72, they will remain in resetting position after once being caused to assume that position. There is provided a means for returning the resetting bar 72 and armature 71 to a normal, ineffective position; and this means comprises a rocking lever 78 pivotally arranged as at 79 on a stud formation 80 carried by the mounting plate 11. This rocking lever 78 is arranged so that its free end portions 81 will extend to a point adjacent the two slide bars 32 and 72, there being a laterally projecting pin 82 on each of the slide bars 32 and 72, which pin 82 is adapted to engage the free end 81 of the rocking lever 78.

As seen in Fig. 1, the rocking lever 78 is in normal position, and it will be noted that when the reset solenoid and slide bar 72 are attracted to the extreme left, the pin 82 on the slide bar 72 will rock the lever 78 anticlockwise into dotted line position. The several parts will remain in this condition until the step-up solenoid is energized, whereupon the solenoid 30 and slide bar 32 will be attracted to the left and the pin 82 on the slide bar 32 will engage the lower free end of the rocking lever to rock the latter clockwise and at the same time to cause the upper free end 81 of the lever 78 to bear against the pin 82 on the slide bar 72, thereby to urge the latter and the solenoid armature 71 to the right, Fig. 1, in which position the lip 75—75*t* of each of the latching pawls 41—41*t* will again seat in their respective recesses 76—76*t* on the slide bar 72, so that the latching pins 43—43*t* may again assume latching relationship with regard to their respective ratchet means 20—20*t*.

The solenoids employed to operate either the advancing or resetting mechanism are each mounted on the plate 11 by means of screws 83, there being elongated slots 84 in the plate 11, through which each of the screws passes, and these slots 84 have their long axis disposed parallel with respect to the slidable movement of the slide bars 32 and 72. By this arrangement the several solenoid units may be adjusted with respect to the mounting plate into a position where their operation will affect the slide bars with the greatest efficiency.

Having thus described the structural features of my new step-up mechanism, it is pointed out that this entire unit is of a relatively compact nature and is capable of a multitude of uses. The entire mechanism is mounted as a unit within whatever apparatus it is to be employed with, by mounting the plate 11 on any well-known type of stud mounting at the openings 85 formed in the plate 11. As heretofore explained the several shafts 13—13*t* are adapted to have their splined ends 61 connected to any mechanism desired to be actuated thereby, and to this end there may be provided a suitable mounting extending from the bracket 15 wherein there may be provided mounting openings as at 86 to support the structure to be associated with this step-up mechanism.

While I have illustrated and described the preferred form of construction for carrying my invention into effect, this is capable of variation and modification without departing from the spirit of the invention. I, therefore, do not wish to be limited to the precise details of construction set forth, but desire to avail myself of such variations and modifications as come within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In a step-up mechanism comprising a base plate, a rotatable unit mounted on the plate and including a disc having equally spaced detents in the region of its circumferential edge, stop means adapted to limit rotative movement of said unit in one direction, means for advancing said unit in steps in an opposite direction, latch means engageable with said unit to latch the same in advanced position, the combination of an adjustable return means for said unit and including a coil spring and a floating anchor for the same, means for tensioning said anchor in a relatively stationary position with respect to said unit, said spring arranged with its free end attached to said unit and adapted to be tensioned by the stepping action of the unit, said floating anchor being arranged to move when the tensile strength of said spring is greater than the action of the tensioning means, and escapement means pivotally arranged on said plate in the region of said equally spaced pins on said disc, spring means arranged to dispose the escapement in an initial position with a portion thereof in the path of movement of said detent means, and a segmental section of said escapement adapted to assume a blocking position in the path of movement of said detents when one of the latter engages the aforementioned portion of the escapement.

2. In a step-up mechanism comprising a base, a rotatable unit mounted on said base, means for advancing said unit in one direction, means for returning the same in an opposite direction, means for latching said unit in advanced position, the combination with said mechanism of a resetting device, said device including a slidable bar arranged for reciprocable movement on said base, cam means on said bar, a lip projecting from said latching means and engaging said bar adjacent the cam means and adapted to be acted upon by the latter when the bar is moved into resetting position to move said latching means out of latching engagement with respect to said unit, and means for effecting movement of said bar into resetting position aforesaid.

3. In a step-up mechanism comprising a base, a rotatable unit mounted on said base, means

for advancing said unit in one direction, means for returning the same in an opposite direction, means for latching said unit in advanced position, the combination with said mechanism of a resetting device, said device including a slidable bar arranged for reciprocable movement on said base, cam means on said bar, a lip projecting from said latching means and engaging said bar adjacent the cam means and adapted to be acted upon by the latter when the bar is moved into resetting position to move said latching means out of latching engagement with respect to said unit, means for effecting movement of said bar into resetting position aforesaid, and lever means pivotally mounted on the base between said bar and the advancing means and having one end engageable by said bar when the latter is moved into resetting position, said lever having its opposite end disposed in a position to be affected by said advancing means whereby to return said bar to latching position when said advancing means is operated.

4. In a step-up mechanism a base, a plurality of rotatable units lineally mounted on the base, advancing means for said units, means for latching the units in advanced position, the provision of a resetting device including the combination of a resetting bar arranged on said base for reciprocable movement in a direction parallel to the lineal arrangement of said rotatable units, a plurality of cam means on said resetting bar, means projecting from said latching means of each of said units and engaging said bar in the path of movement of a corresponding-one of said cam means, a resetting solenoid connected to said resetting bar and adapted to move the latter from a normal position into a position with the cam engaging said projection on each of the latching means whereby to release said units for retrograde movement.

5. In a step-up mechanism a base, a rotatable unit mounted on the base, advancing means for said unit, said advancing means comprising a slide bar arranged on said base for reciprocating movement, magnetic means connected to said bar and adapted to urge the same in one direction, pawl means on the bar and adapted to engage said unit to advance the same, spring means adapted to urge said slide bar for retrograde movement in an opposite direction, means for latching the unit in advanced position, the provision of a resetting device including the combination of a resetting bar arranged on said base for reciprocable movement in a direction parallel to said slide bar, cam means on said resetting bar, means projecting from said latching means and engaging said resetting bar in the path of movement of said cam means, a resetting solenoid connected to said resetting bar and adapted to move the latter from a normal position into a position with the cam engaging said projection on the latching means whereby to release said unit for retrograde movement, and lever means mounted on the base between said slide bar and resetting means and having one end engageable by said resetting bar when it moves as aforesaid, said lever having its opposite end in the path of movement of said slide bar and adapted to be engaged by the latter during its advancing movement and thereby effect a return of the resetting bar into normal position.

6. In a unidirectional stepping mechanism including a rotatable shaft and means for rotating the same in one direction, a releasable latch means for holding the shaft in advanced position, a spring means having one end connected to said shaft for rotating said shaft in an opposite direction to a point representing a normal position, and a means engaging said shaft for stopping the rotative movement of the latter in said opposite direction at the point representing normal position, the provision of a floating anchor for said spring means, said floating anchor comprising, in combination, a disc arranged on said rotatable shaft and having connection with the other end of said spring means, and means for frictionally engaging said disc to hold the latter in a relatively stationary position with respect to said shaft, said spring means being tensioned by the rotation of the shaft in said one direction and adapted to effect rotation of said disc when the tensile strength of said spring means is greater than the frictional engagement of said last named means whereby to permit rotative movement of the shaft a plurality of revolutions in one direction.

WILLIAM G. PETERS.