

Feb. 6, 1923.

E. F. HATHAWAY.
COUNTING MECHANISM.
FILED MAR. 14, 1921.

1,444,505.

3 SHEETS—SHEET 1.

Fig. 1a

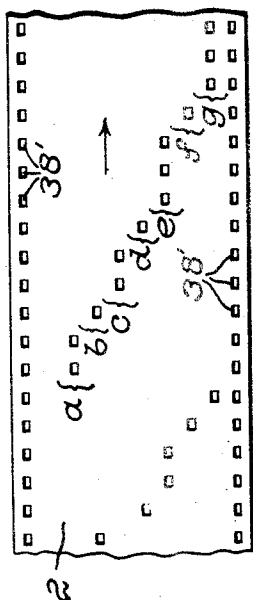


Fig. 1.

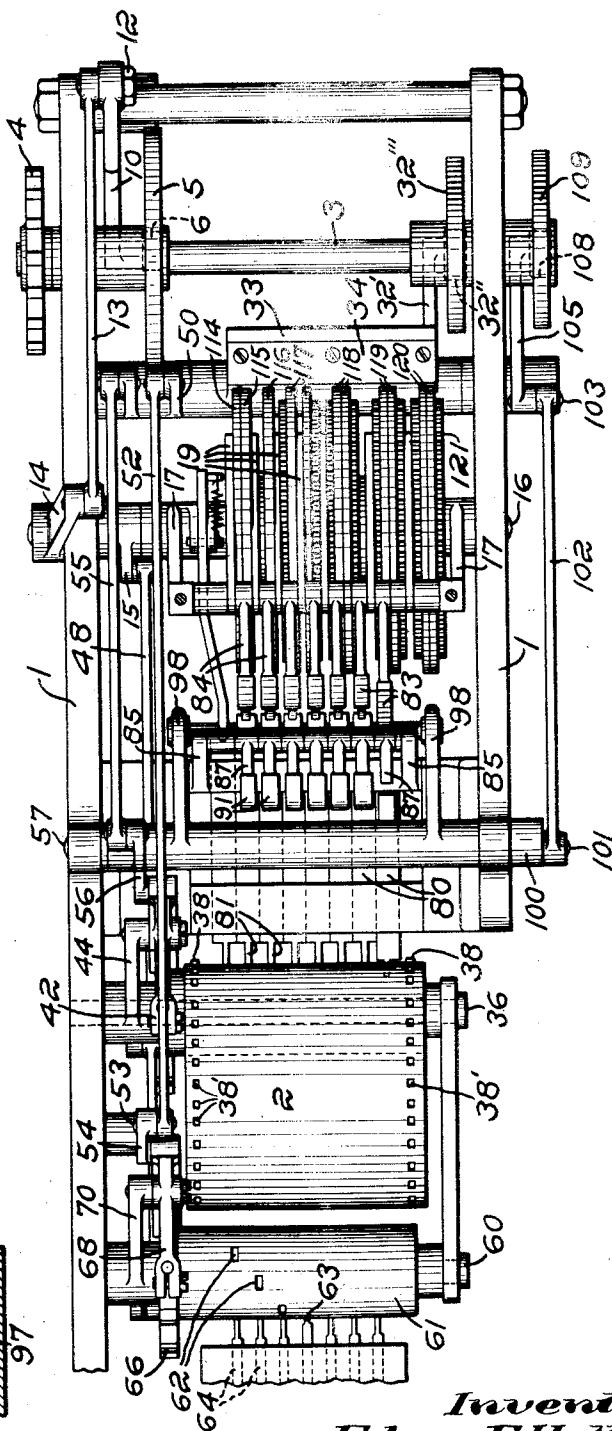
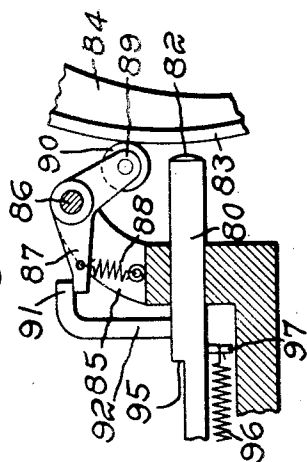


Fig. 3a



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3 SHEETS—SHEET 2.

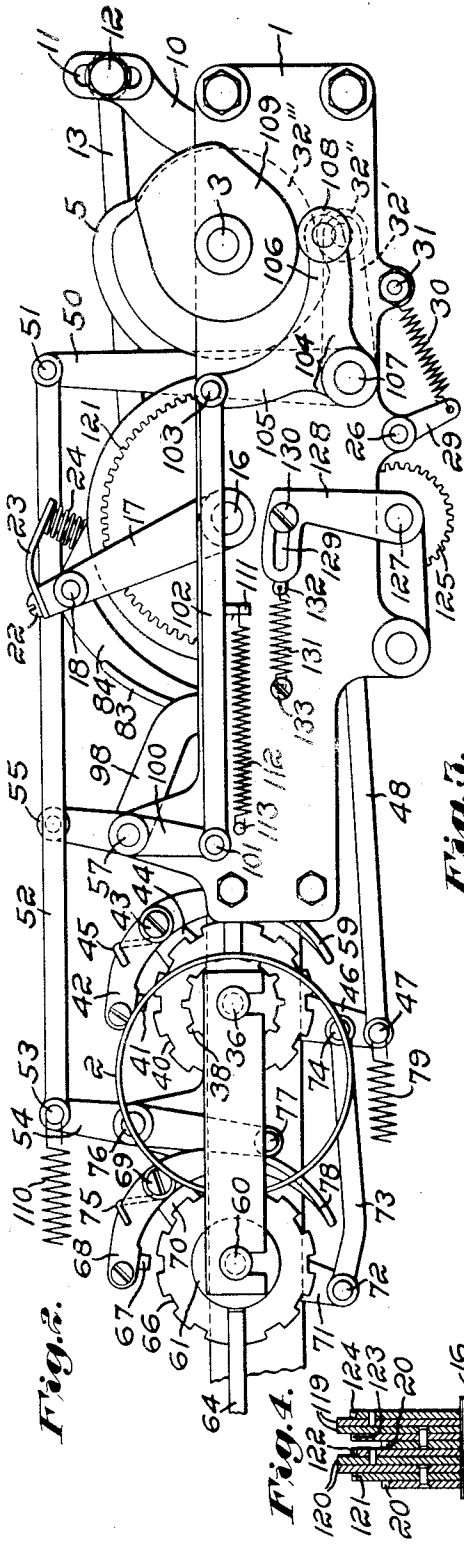
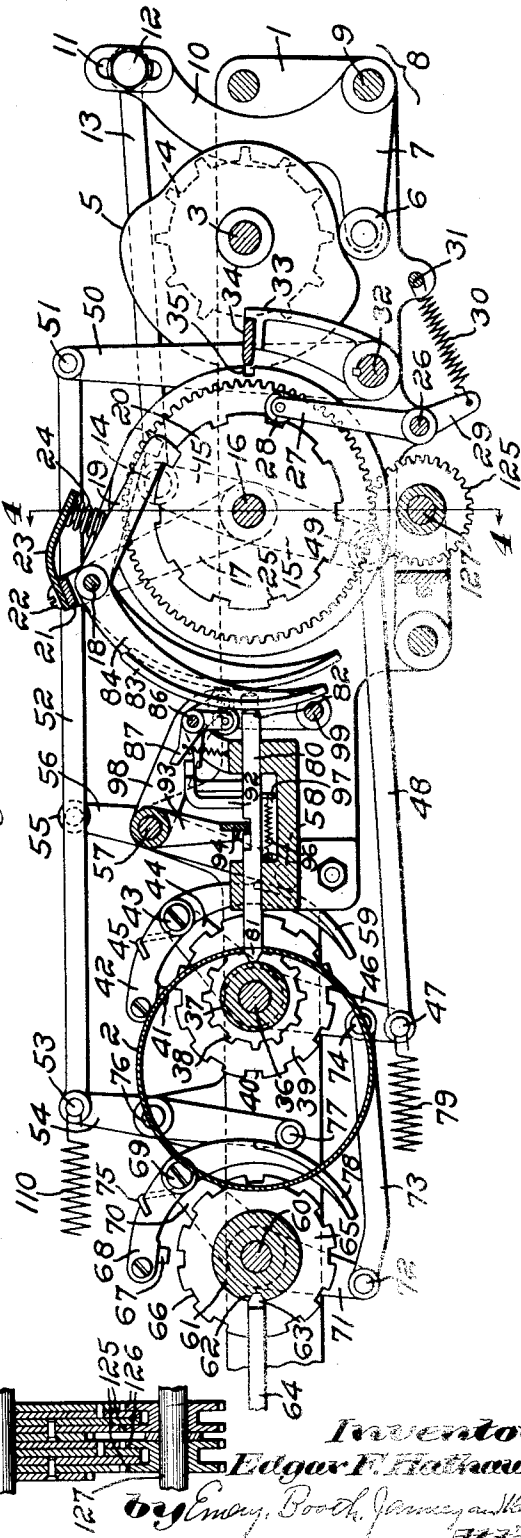


Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 9.

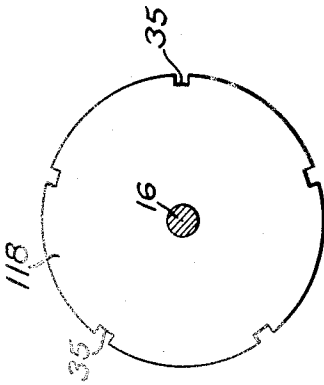


Fig. 10.

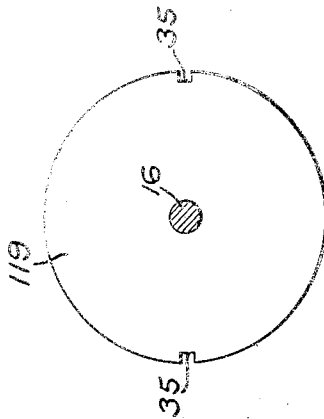


Fig. 11.

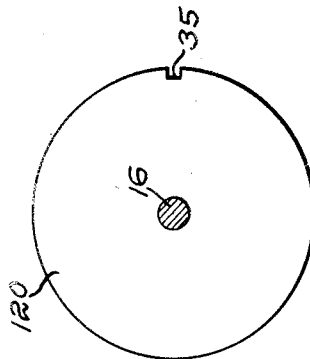


Fig. 5.

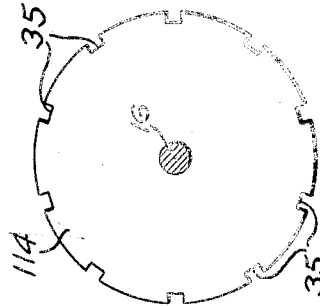


Fig. 6.

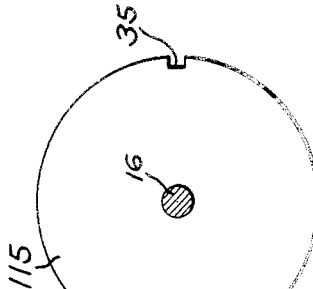


Fig. 7.

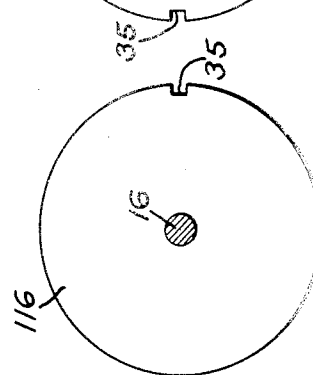
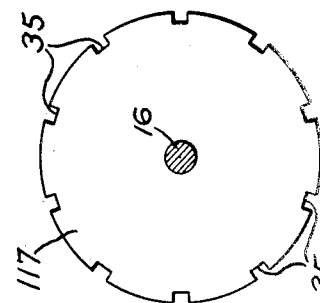


Fig. 8.



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UNITED STATES PATENT OFFICE.

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COUNTING MECHANISM.

Application filed March 14, 1921. Serial No. 452,289.

To all whom it may concern:

Be it known that I, EDGAR F. HATHAWAY, a citizen of the United States, and a resident of Dorchester, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Counting Mechanism, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to counting mechanism of general application. In order that the principle of the invention may be readily understood, I have disclosed a single embodiment thereof in the accompanying drawings, wherein—

Fig. 1 is a plan view of counting mechanism embodying my invention;

Fig. 1^a is a development of a portion of a pattern surface preferably employed in the practice of my invention and indicating how a predetermined number may be counted;

Fig. 2 is a side elevation of the structure shown in Fig. 1;

Fig. 3 is a view in vertical, longitudinal, central section of the mechanism shown in Fig. 1.

Fig. 3^a is a detail upon an enlarged scale of a portion of the structure shown in Fig. 3; and

Fig. 4 is a view in vertical section upon the line 4—4 of Fig. 3 and looking toward the left in said figure.

Figs. 5 to 11 inclusive are side elevations of counter disks of different denominations.

While my invention is of general application and is capable of use in many different relations, I shall describe the same with reference to thread or yarn changing mechanism which may be of any suitable type but is preferably of the general type disclosed in my co-pending applications Serial Nos. 449,887, 455,503 and 449,888.

Referring more particularly to the drawings, the framing of the mechanism is indicated generally at 1 and for the purposes of the description it may be regarded as a part of the framing of the mechanism shown in said co-pending applications wherein is disclosed means for forming a chenille fabric that is cut into chenille strips. In such an organization, to which my invention is in nowise limited, I desirably provide means

for supplying any one of a series of differentiated weft threads to a weft laying device. While such wefts may be differentiated by reason of any selected characteristics, they are desirably contrasted in color. In such an organization each weft thread or yarn is supplied to the weft carrier by an element which may be a tube or finger, and the functioning element is positioned in such relation to the weft carrier that its yarn or thread is supplied thereto. The functioning position of such element is controlled by a pattern organization and for purposes of this description the master pattern may be assumed to be the pattern surface 2 represented in the several figures of the drawing. It is clearly to be understood, however, that the application of my invention is broad and such specific description as is herein given does not constitute a limitation in this respect.

In Figs. 1, 2 and 3, I have indicated at 3 a shaft mounted in the framing and having fast thereon a sprocket gear 4 that is adapted to be driven from some suitable part of the mechanism. Fast upon the shaft 3 is a cam 5. In the referred to application of my invention, the cam 5 makes one complete rotation to one complete reciprocation of the lay of the mechanism by which the wefts are beaten up. Engaging with the periphery of the cam 5 is a roll 6 upon the arm 7 of a lever 8 pivoted at 9 upon the framing 1 and having an arm 10 provided with a slot 11 in its free end. Pivotally mounted in the said slot at 12 is the end of a link 13 which at its other end is pivotally connected at 14 to a lever arm 15 loosely mounted upon a shaft 16 but fast with two lever arms 17 also pivotally mounted on said shaft 16 at opposite ends thereof and near their outer ends each having a pin or pivotal support 18 for a series of pawls 19, which correspond in number with the number of counters or members hereinafter more fully referred to, and which in the present instance are the unit counter, and the five, the ten, the fifty, the one hundred, the five hundred and the one thousand counters. All of said counters, which will be described more fully hereinafter, are loosely mounted upon said shaft 16 for step-by-step rotation and are shown in plan in Fig. 1.

It will be understood from the foregoing description that the levers 17 are constantly reciprocated from the cam 5 and that they tend constantly to impart a step-by-step movement through the series of pawls 19 to the various counters. As hereinafter set forth the functioning of the pawls 19 is controlled by certain pattern mechanism, so that according to the dictates of the pattern, the selected counter member may be caused to function and to count in accordance with the dictates of the pattern and in accordance with its own formation.

As shown most clearly in Figs. 2 and 3, I provide means tending normally to move the several pawls 19 into engagement with their ratchets, one of which latter is indicated at 20 in Fig. 3, and the number thereof equaling the number of counters. For this purpose, the outer ends of the levers 17 are represented as having a cross piece 21 thereon to which is secured by screws 22 a plate 23 extending across the mechanism and supporting a series of coiled springs 24 positioned above the respective pawls 19, the lower ends of said springs pressing upon the said pawls and corresponding in number thereto. As will be pointed out hereinafter, only a single pawl 19 is permitted to function at a given time, and then only in accordance with the dictates of the pattern mechanism.

The ratchet 20 shown in Fig. 3, is provided with a series of pawl receiving notches 25 and to prevent over movement of the ratchet, I provide a lever pivoted at 26, one arm 27 of said lever having a roll 28 adapted to engage the notches 25 and the other arm 29 of said lever having connected thereto a coil spring 30, the opposite end of which is connected to a cross rod or stud 31 upon the framing 1. The entire series of ratchets 20 is similarly constructed.

In the side members of the framing 1, there is supported for rocking movement a shaft 32 adapted to be rocked by a lever arm 32' fast thereon and provided with a roll 32'' bearing upon the periphery of the cam 32''' fast upon the shaft 3, and shown most clearly in Figs. 1 and 2. Said shaft is constantly rocked at regular intervals, and in the disclosed embodiment of the invention once for each revolution of the shaft 3, and has fast thereon a feeler arm 33 extending entirely across the series of counter elements, as indicated most clearly in Fig. 1. Secured to the upper end of said arm 33 is a feeler 34 preferably in the form of a plate or bar and adapted constantly to be rocked toward and from the series of counter elements and to enter into the series of notches, one of which is indicated at 35 in Fig. 3, when the entire series of notches is brought into transverse alignment.

As pointed out more fully hereinafter, the number of said notches 35 upon the several

counter elements depends upon the counting capacity of that element. For example, in the tens counter, there may be provided but a single such notch 35 whereas the units counter may be provided with ten such notches. In the counter elements that are adapted to count higher numbers, as, for example, the thousand, I may and preferably do provide for a duplex organization wherein at the end of a count, two notches of that duplex organization are themselves brought into transverse alignment, as well as with notches in the other counters of the series.

Suitably mounted in the framing is a shaft 36 preferably in substantially the same horizontal plane as the shafts 3 and 16, and fast thereon is a drum or barrel 37 having thereon at its opposite ends teeth 38 adapted to engage the rows of perforations 38' in the opposite ends of the pattern surface or roll 2 so as to move the latter in a step-by-step manner as hereinafter set forth, it being noted that the surface or roll 2 may, when formed as a cylinder, be of any suitable diameter and is supported loosely or tightly as the case may be by the drum 37. Also fast upon the shaft 36 is a ratchet 39 having spaces 40 adapted to be engaged at designated times by a tooth or pawl 41 upon a lever 42 pivoted at 43 upon the arm 44 of a lever which is itself loosely mounted upon the shaft 36. A suitable spring 45 is provided tending normally to hold the tooth 41 in functioning relation to the ratchet 39. Rigid with the lever arm 44 is a lever arm 46 which at its outer end 47 is pivotally connected to a link 48 itself pivotally connected at 49 to one end of the lever 15 and which as heretofore stated is constantly operated through the agency of the cam 5. Thus a constant movement of oscillation is imparted to the pawl lever 42 and a constant step-by-step movement would thereby be imparted to the pattern surface 2 were not means provided and which will now be described, to hold the pawl lever 42 out of functioning relation with the ratchet 39, excepting at the times said ratchet 39 is to receive movement in accordance with the count.

Fast upon the rock shaft 32 and hence rigid with the feeler bar 34, and which latter is permitted to make a complete movement to the left viewing Fig. 3, only when the notches 35 are all brought into transverse alignment, is a lever arm 50 to the outer end whereof is pivotally connected at 51 a link 52 which at its opposite end is pivotally connected at 53 to a lever 54. Between its ends and as indicated at 55 there is pivotally connected to the link 52 a lever 56 which is loosely mounted for rocking movement upon a stud or short shaft 57. The lower end of said lever 56 is represented in dotted lines in Fig. 3 as having a head or enlargement 58 which is adapted to bear

against a flange 59 upon the lower end of the pawl lever 42, the construction being such that until the link 52 is permitted to move to the full extent of its movement to the left viewing Fig. 3 (and which can occur only when the notches 35 come into transverse alignment), the projection 58 on the lever 56 will, because of its engagement with the flange 59 of the pawl lever 42, hold the tooth or pawl 41 out of engagement with the ratchet 39 throughout the oscillating movement of the lever 44, and hence no movement is imparted to the said ratchet 39 and therefore the pattern surface 2 remains stationary. When, however, the notches 35 are brought into transverse alignment, then the link 52 makes its full movement toward the left viewing Fig. 3 upon the ensuing feeling movement of the feeler 34, thus withdrawing the projection 58 from the flange 59 of the pawl lever 42 and the spring 45 thereupon moves the tooth or pawl 41 into functioning relation with the ratchet 39 and moves the latter one step, thus moving the pattern surface 2 one step with the result that by intermediate devices to be hereinafter referred to the notches 35 no longer remain in transverse alignment.

Suitably mounted in the framing 1, and as here shown in substantially the same horizontal plane as the shafts 3, 16, 36, is a shaft 60 having fast thereon a drum 61 which may and preferably does correspond with a drum shown in my co-pending application Serial No. 449,888, said drum desirably being composed of a series of disks placed in face to face contact and each provided with one or more sockets 62 according to the desired pattern, said sockets being adapted to receive the tapered ends 63 of a series of rods or spindles 64 by which the mechanism may be controlled. In the broad aspect of my invention, such mechanism may be of any suitable character, and my invention is so to be regarded, although in my said co-pending application I have represented the rods 64 as controlling the positioning of certain web supplying fingers or elements.

Fast upon the shaft 60 is a ratchet 65 having notches or spaces 66 with which at the proper times is adapted to engage a tooth 67 upon a pawl lever 68 itself pivotally mounted at 69 upon a lever arm 70 loose upon the shaft 60 but fast with a lever arm 71 which is pivotally connected at 72 to a link 73 itself pivotally connected at its opposite end at 74 to the lever arm 46 between its ends.

As heretofore stated, the lever 46 is constantly oscillated through the described connections from the cam 5. Thus the lever arm 70 with its pawl lever 68 is constantly oscillated and would impart a constant step-by-step movement of rotation to the ratchet

65 were it not that I have provided means whereby only at certain times is the tooth or pawl 67 permitted to enter a notch in the ratchet 65 and to function by imparting a stepped movement to said ratchet 65 and consequently to the drum 61. I provide a suitable spring 75 tending constantly to move the tooth or pawl 67 into engagement with the ratchet 65.

The lever 54 is pivoted intermediate its ends upon the frame at 76 and at its lower end has a roll or head 77 which is adapted to bear against a flange 78 upon the lower end of the pawl lever 68, the construction being similar to that provided for the pawl lever 42 and so that a movement of oscillation may be imparted to the lever 70 with a bodily movement of the pawl lever 68 and throughout such movement the pawl 67 may and will be held out of functioning relation to the ratchet 65 excepting in the event that the lever 54 is rocked so as to withdraw the roll or projection 77 from the flange 78. In such event the pawl 67 is permitted to function and a movement of one step is imparted to the drum 61, the rods or plungers 64 being at the same time withdrawn from functioning relation with the said drum, in a manner not herein necessary to describe and fully pointed out in my said co-pending application Serial No. 449,888.

Preferably I provide a coiled or other spring 79 connected to the frame and to the lever 46 tending to rock said lever in a clockwise direction and through the connections thereto to hold the roll 6 in contact with the cam 5.

The pattern surface 2 as represented most clearly in Fig. 1^a is provided with a series of perforations, which I have generally indicated respectively at *a, b, c, d, e, f* and *g*, and cooperating respectively with the disks for counting units, fives, tens, fifties, one hundreds, five hundreds and thousands. It will be understood that counters of any desired denomination may be provided, those herein represented being indicative merely of counters that may be employed. For each of said counters I provide as most clearly represented in Fig. 3 a plunger or spindle which are herein shown as having tapered ends 81 to enter openings in the pattern surface 2 or to ride on said surface. Said plungers or spindles at their opposite ends 82 are respectively adapted to engage flanges 83 upon a corresponding number of lever arms 84 respectively fast with the pawl levers 19 mounted upon the stud or pin 18. As heretofore set forth, the several ratchets 20 of the series of counters are adapted to be rotated in a step-by-step manner by the corresponding pawls 19. While the coil springs 24 tend normally to hold the pawls 19 in

functioning relation with the ratchets 20, it is to be understood that the respective plungers or spindles 80 under the dictates of the pattern 2 will, when riding upon the surface of the pattern 2, hold the corresponding pawls 19 out of functioning relation with the ratchet 20. When, however, and as indicated in Fig. 3, a spindle or plunger 80 is received in an opening in the pattern surface 2, it moves to the left viewing Fig. 2, and permits the corresponding pawl 19 to enter a notch in the corresponding ratchet 20 and to turn the same one step. This operation is repeated according to the dictates of the pattern surface 2.

The pattern surface 2 may be made of any suitable material such as metal or even paper. If, however, the pattern surface be made of paper or some like material, there is a tendency on the part of the spindles or plungers 80 in their constant axial movements to wear holes in the surface 2. I therefore find it desirable to take strain off the said spindles or plungers 80 which in the disclosed embodiment of my invention are employed to rock the pawls 19. While for this purpose any suitable means may be provided, I have employed the following mechanism.

Upon an upstanding part 85 of the framing, and as shown most clearly in Fig. 3^a, there is provided a stud or pin 86 upon which are loosely mounted a series of bell crank levers corresponding in number to the number of pawls 19 and each having one arm 87 to which is connected a spring 88 tending to rock said lever in a contraclockwise direction and an arm 89 having thereon a roll 90 adapted to take against the corresponding flange 83 on the corresponding lever arm 84. Thus each lever arm 84 when rocked to the left viewing Fig. 3, rocks the corresponding bell crank lever 87, 89 upon the stud or pin 86 so as to bring the corresponding arm 87 into contact with the under side of the bent end 91 of a corresponding pin 92 fast on and upstanding from the corresponding spindle or plunger 80. This upward pressure against the pin 92 relieves largely the pressure in an axial direction upon the corresponding spindle or plunger 80 and permits me to employ pattern surfaces 2 of relatively light material such as paper without danger of wearing holes in such pattern surfaces. Any other suitable means may be provided to accomplish this result.

I provide means whereby periodically and preferably once at each revolution of the cam shaft 3, all the plungers or spindles 80 are momentarily withdrawn from the pattern surface 2 so as to permit the latter to be turned if such movement is called for, and also to withdraw the several pawls 19 from or to move them outwardly with respect to

the ratchets 20. While for this purpose any suitable means may be provided, I have herein provided the following organization of parts.

Upon the stud or pin 57 I loosely mount a pair of similar bell crank levers, one arm 93 of each of which is provided at its lower end with a cross bar or actuator 94 connecting said levers and adapted to move to and fro in a series of slots or elongated recesses 95 in the upper surface of the several spindles or rods 80, thereby when said bell crank levers are rocked, to move said spindles or rods 80 in an axial direction and thus momentarily to withdraw their ends 81 from the pattern surface 2 and to cause them momentarily to swing the pawls 19 out of functioning relation with and away from the ratchets 20. The said spindles or rods 80 are, however, normally held in engagement with the surface 2 by means of a corresponding number of coiled springs 96 connected at one end to pins 97 depending therefrom and at their other ends to the framing 1.

As most clearly shown in Figs. 1 and 2, the opposite arms 98 of said bell crank levers at their lower ends are connected by a cross pin 99 which when said levers 93, 98 are rocked so as to move in a contraclockwise direction, engage all the lever arms 84 and rock them in a contraclockwise direction, thus withdrawing the pawls 19 from or moving them away from the several ratchets 20. Fast with the pair of levers 93, 98 is a lever arm 100 to which is pivotally connected at its end 101 a link 102 to the opposite end 103 whereof is pivotally connected a bell crank lever 104 having arms 105, 106, said lever being pivoted at 107 and provided at the end of the arm 106 with a roll 108 adapted to bear upon the periphery of a cam 109 fast upon the shaft 3, and therefore rotating once to each complete reciprocation of the lay in the described application of the invention. The link 52 has connected to its left hand end viewing Fig. 3, a coil spring 110, the opposite end whereof is connected to the framing and tending normally to hold the feeler 34 against the series of counters and to cause it to enter the notches 35 therein when in alignment.

The feeler 34 is so controlled by the cam 32'' that it is normally out of contact with the periphery of the counter disks or elements, but is periodically—that is, at each revolution of the shaft 3—rocked toward said counter elements so as to enter the slots 35 if in alignment.

Unless the said slots 35 be in alignment, the periodic movement of said feeler is through a small arc and consequently the movement of the link 52 and the parts connected thereto is also slight. The full

movement of said link is, as heretofore stated, performed only when the feeler 32 enters the aligned slots 35.

The cross pin 99 is periodically moved 5 by the lever arms 98, which in turn are moved from the cam 109, so as to swing all the pawls 19 away from the ratchets 20. Thus all strain, or substantially all strain, is taken off the plungers or spindles 80, 10 being understood that said plungers or spindles are employed to prevent all the pawls 19 from engaging the respective ratchets 20, excepting that pawl that is called into action by reason of an opening 15 in the pattern surface 2, as indicated in Fig. 3. Thus, if desired, the spindles or plungers 80 may be made somewhat shorter than indicated, and so that at times there will be clearance between their ends and the 20 flanges 83 upon the lower arms 84.

In order to maintain the roll 108 in contact with the cam 109, I provide the link 102 with a pin 111 to which is connected one end of a coil spring 112, the other end 25 whereof is connected to a pin 113 upon the framing.

The pattern surface 2 may be of any suitable form or shape, and may be simply a sheet. Preferably, however, it is endless, 30 and is herein shown as of cylindrical form.

In Figs. 4 to 11 inclusive, I have represented counters of different orders that may be employed. These, however, are 35 illustrated for purposes of description merely, and I desire it to be understood that counters of higher and lower order of any suitable denomination or value may be employed. Herein I have in Figs. 5 to 11 respectively represented a units counter, a 40 fives counter, a tens counter, a fifties counter, a one hundreds counter, a five hundreds counter and a thousands counter. The units counter is indicated at 114, it being provided with ten notches 35, the fives counter 45 is indicated at 115 and is provided with two oppositely placed notches 35; the tens counter is indicated at 116 and is provided with a single notch 35, the fifties counter is provided with two disks placed in facing 50 relation, one of them being indicated at 117 in Fig. 11. Each of said disks of the fifties counter is provided with ten notches 35. The one hundreds counter is provided with two disks in facing relation, one of them 55 being indicated at 118 in Fig. 9, and each of them is provided with five notches 35. The five hundreds counter is provided with two disks in facing relation, one of them being indicated at 119 in Fig. 10, each of 60 said disks having two diametrically positioned notches 35. The thousands counter is provided with two disks in facing relation, one of them being shown at 120 in Fig. 11, and each of said disks is provided 65 with a single notch 35.

Each of the said counters is provided with a ratchet 20 as indicated in side elevation in Fig. 3. In Fig. 4, I have indicated in vertical section two counter elements, namely, the thousands and the five hundreds 70 counters. The two disks of the thousands counter are indicated at 120, 120 in said figure, and at the right and left sides respectively of said disks are represented gears 121, 122 which are respectively secured to 75 the said disks 120, 120. The ratchet 20 is secured to one of the gears 121 and to its disk 120.

Gears 121 and 122 have respectively 80 ninety-nine teeth and one hundred teeth. The five hundreds counter shown in Fig. 4 is of generally similar construction to the thousands. It is provided with a ratchet 20 and two gears 123, 124 having respectively 85 ninety-nine teeth and one hundred teeth, and between them are positioned the two disks 119 respectively secured to the said gears. In order to convey motion from the ratchet 20 and its attached gear 121 to the gear 122, 90 I provide a series of double pinions 125, 126, each formed as an integral member and loosely mounted upon a shaft 127 represented in Figs. 2, 3 and 4. The pinions 125, 126 95 have the same number of teeth, and it will be understood that because the gears 122 and 124 each have one more tooth than the gears 121 and 123, it will require in the case of the thousands counter one thousand impulses of the corresponding pawl 19 to bring the two 100 notches 35 into transverse alignment, and in the case of the five hundreds counter, it will require five hundred impulses of the corresponding pawl 19 to bring two of the notches 35 into transverse alignment.

I may provide any suitable means to move 105 the sets of pinions 125, 126 out of meshing relation with the pinions 121, 122, etc., so as to permit the manual resetting or reverse rotation of the various counters. For this purpose, I have in Fig. 2, represented the 110 shaft 127 as mounted in two parallel arms 128 at its opposite ends, said arms being at their upper ends provided with eccentric or cam shaped slots 129 receiving pins or screws 130 mounted in the framing 1. A coil spring 115 131 connected to an ear 132 upon each lever 128 and to the screw 133 upon the framing tends to hold the levers in the position indicated in Fig. 2, and thus to hold the sets of pinions 125, 126 in meshing relation with 120 the pinions 121, 122, etc. By moving the levers 128 in a clockwise direction against the tension of the spring 131, the pinions 125, 126 are withdrawn from meshing relation with the said gears 121, 122, etc. 125

I have illustrated and described the use of a units counter among others. It is not necessary to employ a units counter, as will be evident from the following. I have described the units counter as having ten 130

notches 35. Each of the ratchets 20 for the several counters is shown in Fig. 3 as having ten notches. Thus it is evident that, when the notches 35 are brought into transverse alignment, the proper counter is moved one step, that is, its ratchet 20 is moved the distance of one notch 35. This, however, is the same as moving the units counter the distance between two adjacent notches 35 therein. Thus, the units counter may itself be omitted and the pattern 2 may be moved the distance between two adjacent openings in the units path *a* in Fig. 1^a.

In the said Figure 1^a, I have indicated a series of openings *a* to *g* inclusive, which would count 3877.

It is evident from the foregoing description that during a single rotation of the shaft 3, the feeler 34 is oscillated once to feel for the notches 35. If they are found to be in alignment, the feeler 34 enters said notches, and as a consequence, the link 52 is moved fully to the left viewing Fig. 3, and thereby the head 58 of the lever 56 is withdrawn from the pawl lever 42 and the head 77 of the lever 54 is withdrawn from the pawl lever 68. Thereupon both of said pawls are thrown by their springs into engagement with their ratchets 39 and 65. Thereupon the pattern surface 2 is moved one step, and according to the arrangement of the perforations therein, the spindles or plungers 80 are positioned so as to determine which counter shall be turned one step through its ratchet 20 and its pawl 19. Thus the pattern 2 through the plungers 80 controls the actuation of the counters, and the counters in turn control the movement of the pattern 2. The drum 61, by which the parts to be ultimately controlled are positioned or moved, and which I term a subsidiary pattern, is itself governed in its movement by the counters, and therefore by the pattern 2.

It will also be evident that at each rotation of the shaft 3, all the spindles or plungers 80 are momentarily withdrawn from the pattern 2, thus freeing said pattern from the plungers and permitting it to be turned one step, if such movement is dictated by any one of the counters.

Furthermore, at each rotation of the shaft 3, all the pawls 19 are moved out of engagement or away from the ratchets 20, so that if the notches 35 are found by the feeler 34 to be in transverse alignment, then the proper pawl 19 may be permitted through the corresponding spindle or plunger 80 to be moved by its spring 24 into engagement with a notch in the corresponding ratchet 20. Furthermore at each rotation of the shaft 3, all of the pawls 19 are moved in a contra-clockwise direction, so that if any one of said pawls has been brought into functioning relation to its ratchet 20, it will impart a movement of one step thereto, the

other pawls moving idly because withheld from functioning relation by the position of the plungers or spindles 80.

Having thus described one illustrative embodiment of my invention, I desire it to be understood that although specific terms are employed, they are used in a generic and descriptive sense and not for purposes of limitation, the scope of the invention being set forth in the following claims.

Claims—

1. Counting mechanism comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member adapted to control said counting members and coordinating said members to represent a single predetermined number, axially movable rods or plungers adapted to engage the pattern member and controlled in position by said formations, and cooperating means whereby the positioning of the rods or plungers determines the movement of the counter members whereby said coordination is effected.

2. Counting means comprising in combination, a plurality of counter members, a pattern member adapted to control said counting members and coordinating said members to represent a single predetermined number, a plurality of axially movable rods or plungers adapted to contact with said pattern member, and governed in position by said formations, and cooperating means whereby the positioning of said rods or plungers determines the movement of said counter members whereby said coordination is effected.

3. Counting mechanism comprising in combination, a plurality of rotatable counter members, a pattern member constituting a part of the mechanism, and as such adapted to receive a step-by-step movement, a series of axially movable rods or plungers corresponding in number to said counter members, adapted to contact with said pattern member, and governed in position by the formation thereof, and cooperating means between the rods or plungers and the respective counter members for controlling the movement of the latter.

4. Counting mechanism comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said means governed by said counter members including a feeler, and means periodically to move said feeler to and fro with respect to said counter members.

5. Counting means comprising in combination, a plurality of counter members, a pattern member, means controlled by said pattern member to govern the counter mem-

bers, and means governed by said counter members to govern said pattern member, said means governed by said counter members including a feeler, and means periodically to oscillate the same toward and from the counter members to cooperate with the latter as determined by the pattern member.

6. Counting means comprising in combination, a plurality of counter members mounted for independent, step-by-step rotation, and independently driven, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said means governed by said counter members including a feeler adapted to enter slots in said counter members, and means periodically to move said feeler toward said counters to enter said slots upon proper indication by the pattern member.

7. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said means governed by said counter members including a shaft, a cam thereon, a feeler to engage the counter members, and connections between said feeler and said cam to move said feeler.

8. Counting mechanism comprising in combination, a plurality of counter members having slots in their peripheries, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said means governed by said counter members including a shaft, a cam thereon, and a feeler adapted to be moved to and fro by said cam and to enter the slots in said counter members.

9. Counting mechanism comprising in combination, a plurality of individual counting means which need a certain predetermined plurality of impulses to count to its maximum predetermined number before establishing or returning to its initial position, a cooperating pattern having pre-arranged and related counter actuating formations to control each of said counting elements, and interrelated means whereby each counter upon reaching its maximum predetermined number thereupon controls or actuates the pattern, said interrelated means including a feeler, means periodically to move the same positively against said counters, and upon the arrival of a counter at its maximum predetermined number to move to its full extent and thereupon to effect the movement of the cooperating pattern.

10. Counting means comprising in combination, a plurality of independently mounted and independently driven counter

members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said latter means including a series of ratchets for the counter members, a series of pawls for said ratchets, and axially movable members governed by said pattern to determine the functioning of said pawls.

11. Counting means comprising in combination, a plurality of counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said latter means including a series of ratchets for the counter members, a series of pawls for said ratchets, and axially movable members governed by said pattern to determine the functioning of said pawls.

12. Counting means comprising in combination, a plurality of counter members rotatably mounted upon the same shaft for step-by-step movement, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said latter means including a series of ratchets for the counter members, a series of pawls for said ratchets, and axially movable members governed by said pattern to determine the functioning of said pawls.

13. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said latter means including a series of ratchets for said counter members, a series of pawls for said ratchets, and means acting periodically to move said pawls away from said ratchets.

14. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said controlled and governed means including a series of ratchets for said counter members, a series of pawls for said ratchets, a shaft, a cam thereon, and means periodically operated by said cam to move said pawls away from said ratchets.

15. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed

by said counter members to govern said pattern member, said controlled and governed means including a series of ratchets for said counter members, a series of pawls for said ratchets, a shaft, a cam thereon, and means periodically operated by said cam to move said pawls away from said ratchets, and also including means governed by said pattern member to determine the functioning of said pawls.

16. Counting means comprising in combination, a plurality of counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said controlled means and governing means including a series of ratchets for said counters, a series of pawls for said ratchets and axially movable plungers whose position is determined by said pattern member and which themselves determine the period of functioning of said pawls.

17. Counting means comprising in combination, a plurality of counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said controlled means and governing means including a series of ratchets for said counters, a series of pawls for said ratchets, means to oscillate said pawls, means acting periodically to move all of said pawls away from said ratchets and plungers whose positions are determined by said pattern member and which themselves determine the periods of functioning of said pawls.

18. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said controlled means and governing means including a series of ratchets for said counters, a series of pawls for said ratchets, and axially movable plungers whose position is determined by said pattern member and which themselves determine the period of functioning of said pawls.

19. Counting means comprising in combination a plurality of independently mounted and independently driven counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said controlled means and governing means including a series of ratchets for said counters, a series of pawls for said ratchets, means to oscillate said pawls, means acting periodically to move all of said pawls

away from said ratchets, and plungers whose positions are determined by said pattern member and which themselves determine the periods of functioning of said pawls.

20. Counting mechanism comprising in combination, a plurality of counter members independently mounted upon the same shaft and independently rotated step-by-step, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said controlled means and governing means including a series of ratchets for said counters, a series of pawls for said ratchets and axially movable plungers whose position is determined by said pattern member and which themselves determine the period of functioning of said pawls.

21. Counting mechanism comprising in combination, a plurality of counter members independently mounted upon the same shaft and independently rotated step-by-step, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said controlled means and governing means including a series of ratchets for said counters, a series of pawls for said ratchets, means to oscillate said pawls, means acting periodically to move all of said pawls away from said ratchets and plungers whose positions are determined by said pattern member and which themselves determine the periods of functioning of said pawls.

22. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member constituting a part of the mechanism and having prearranged and pre-inter-related formations, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said controlled means and said governed means including a shaft, a cam thereon, a series of ratchets for said counters, a series of pawls for said ratchets, means operated by said cam periodically and regularly to move said pawls away from said ratchets.

23. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said controlled means and said governed means including a shaft, a cam thereon, a series of ratchets for said counters, a series of pawls for said ratchets, means operated by said cam periodically and regularly to move said pawls away from said

ratchets, and axially movable plungers whose positions are determined by the pattern member and which themselves determine the times of functioning of said pawls.

24. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member adapted to control said counting members and coordinating said members to represent a single predetermined number, and means controlled by said pattern member to govern the counter members whereby said coordination is effected, said controlled means including a plurality of elements adapted to engage the surface of said pattern member, and means periodically to impart relative separating movement to said elements and said pattern member.

25. Counting means comprising in combination, a plurality of counter members, a pattern member adapted to control said counting members and coordinating said members to represent a single predetermined number and means controlled by said pattern member to govern the counter members whereby said coordination is effected, said controlled means including a plurality of elements adapted to engage the surface of said pattern member, and means periodically to impart relative separating movement to said elements and said pattern member.

26. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member adapted to control said counting members and coordinating said members to represent a single predetermined number, and means controlled by said pattern member to govern the counter members whereby said coordination is effected, said controlled means including a plurality of rods or plungers adapted to engage said pattern member, and means periodically to move all of said rods or plungers away from the pattern member, thereby to permit movement of the pattern member.

27. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said controlled means and governing means including a plurality of ratchets for said counters, a plurality of pawls for said ratchets, a shaft, a cam thereon, connections from said cam periodically to move all of said pawls away from said ratchets and plungers to engage the surface of said pattern member and themselves adapted to engage the ratchets to determine the functioning thereof.

28. Counting means comprising in combination, a plurality of independently

mounted and independently driven counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said counter members having notches adapted to be brought into transverse alignment, a feeler to enter said aligned notches, a shaft, a cam thereon to rock said feeler, a second cam upon said shaft, ratchets for said counters, pawls for said ratchets, connections from said second cam periodically to move all of said pawls away from said ratchets, and plungers engaging said pattern member and themselves determining the periods of functioning of said pawls.

29. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member, means controlled by said pattern member to govern the counter members, a subsidiary pattern, means to impart step-by-step movement thereto, and means governed by said pattern member to determine the time of movement of said subsidiary pattern.

30. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a main pattern member constituting a part of the mechanism and having pre-arranged and pre-inter-related formations, means controlled by said pattern member to govern the counter members, a subsidiary pattern member, means to impart step-by-step movement thereto, and means governed by said pattern member to determine the times of step-by-step actuation of said subsidiary pattern member.

31. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a main pattern member, means controlled by said pattern member to govern the counter members, a subsidiary pattern drum, ratchet and pawl means to impart step-by-step movement thereto, and means under the control of said pattern and counter members to determine the times of step-by-step movement of said drum.

32. Counting means comprising in combination, a plurality of counter members, a main pattern member, means controlled by said pattern member to govern said counter members, a subsidiary pattern drum, ratchet and pawl means to impart step-by-step movement of rotation thereto, and means governed by said pattern member and by said counter members to determine the times of step-by-step rotation of said drum.

33. Counting means comprising in combination, a plurality of counter members, a pattern member, means controlled by said pattern member to govern the counter mem-

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bers, and means governed by said counter members to govern said pattern member, said controlled means and governed means comprising a shaft having three cams thereon, a feeler for said counters operated by one of said cams, pawls and ratchets for said counters operated by another of said cams, a plurality of elements engaging the surface of said pattern member, and means operated by the third of said cams periodically to move said elements away from said pattern member.

34. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member, means controlled by said pattern member to govern the counter members, and means governed by said counter members to govern said pattern member, said controlled means and governed means comprising a shaft having three cams thereon, a feeler for said counters operated by one of said cams, pawls and ratchets for said counters operated by another of said cams, a plurality of elements engaging the surface of said pattern member, and means operated by the third of said cams periodically to move said elements away from said pattern member.

35. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member constituting a part of the mechanism and having prearranged and pre-inter-related formations, a series of rods or plungers adapted to contact with said pattern member and to govern the counter members, and means periodically to withdraw the rods or plungers from the pattern member.

36. Counting means comprising in combination, a plurality of independently mounted and independently driven counter members, a perforated pattern member adapted to be moved step-by-step, a series of rods or plungers adapted to engage the surface of said pattern member and to control the movement of the counter members, and means periodically to move said rods or members away from the pattern member to permit a stepped movement of the pattern member.

37. Counting means comprising in combination, a plurality of counting members, a pattern member adapted to control said counting members and coordinating said members to represent a single predetermined number, a series of elements adapted to engage the surface of the pattern member and to determine the movement of the counter members, and means periodically to move said elements away from the surface of said pattern member to permit movement of said pattern member.

38. Counting means comprising in combination,

a plurality of independently mounted and independently driven counter members, a perforated pattern member adapted to receive a step-by-step movement constituting a part of the mechanism and having prearranged and pre-inter-related formations, a series of rods or plungers adapted to enter the perforations of said pattern member and themselves adapted to control the movement of said counter members, and means periodically to withdraw said rods or elements from the perforations of the pattern member to permit a step movement of said pattern member.

39. Counting mechanism comprising in combination, a plurality of independently mounted and independently driven counter members, a pattern member adapted to be moved step-by-step, a series of elements adapted to engage the surface of said pattern member, a series of ratchets for said counter members, a series of pawls for said ratchets, the functioning of said pawls being determined by said plungers, a shaft, a cam thereon, and connections from said cam periodically to move said pawls, the functioning whereof is controlled by said plungers.

40. Counting mechanism comprising in combination, a plurality of counter members, a pattern member adapted to be moved step-by-step, a series of elements adapted to engage the surface of said pattern member, a series of ratchets for said counter members, a series of pawls for said ratchets, the functioning of said pawls being determined by said plungers, a shaft, a cam thereon, and connections from said cam periodically to move said pawls, the functioning whereof is controlled by said plungers.

41. Counting mechanism comprising in combination, a plurality of counter members, a pattern member, a series of elements contacting with the surface of said pattern member and themselves controlling the movements of said counter members, and means to remove from said elements strain against the surface of said pattern member.

42. Counting mechanism comprising in combination, a plurality of counting members, a perforated pattern member having a step-by-step movement, a series of rods or plungers adapted to enter perforations in said pattern member and themselves to control the movements of said counter members, and means to remove strain of axial thrust from said plungers.

43. Counting mechanism comprising in combination, a plurality of counter members, a shaft whereon they are all mounted for independent rotation, a second shaft in substantially transverse alignment with the first shaft and having thereon a plurality of cams to control the functioning parts, a third shaft in substantially transverse alignment with the first and second shafts, a pat-

tern member carried by said third shaft and adapted to govern the movement of said counter members, and a fourth shaft in substantially transverse alignment with the first, second and third shafts and having a subsidiary pattern, the movements whereof are governed by said first mentioned pattern and said counter members.

nation a plurality of counter members, a shaft whereon they are mounted, a second shaft having three cams thereon, three levers engaging said cams and moved thereby, and functioning parts cooperating with said counters and controlled by said levers.

In testimony whereof, I have signed my name to this specification.

EDGAR F. HATHAWAY.

44. Counting means comprising in combi-