S. W. WARDWELL.

COUNTER.

APPLICATION FILED FEB. 6, 1906.

987,273.

Patented Mar. 21, 1911.

2 SHEETS—SHEET 1.

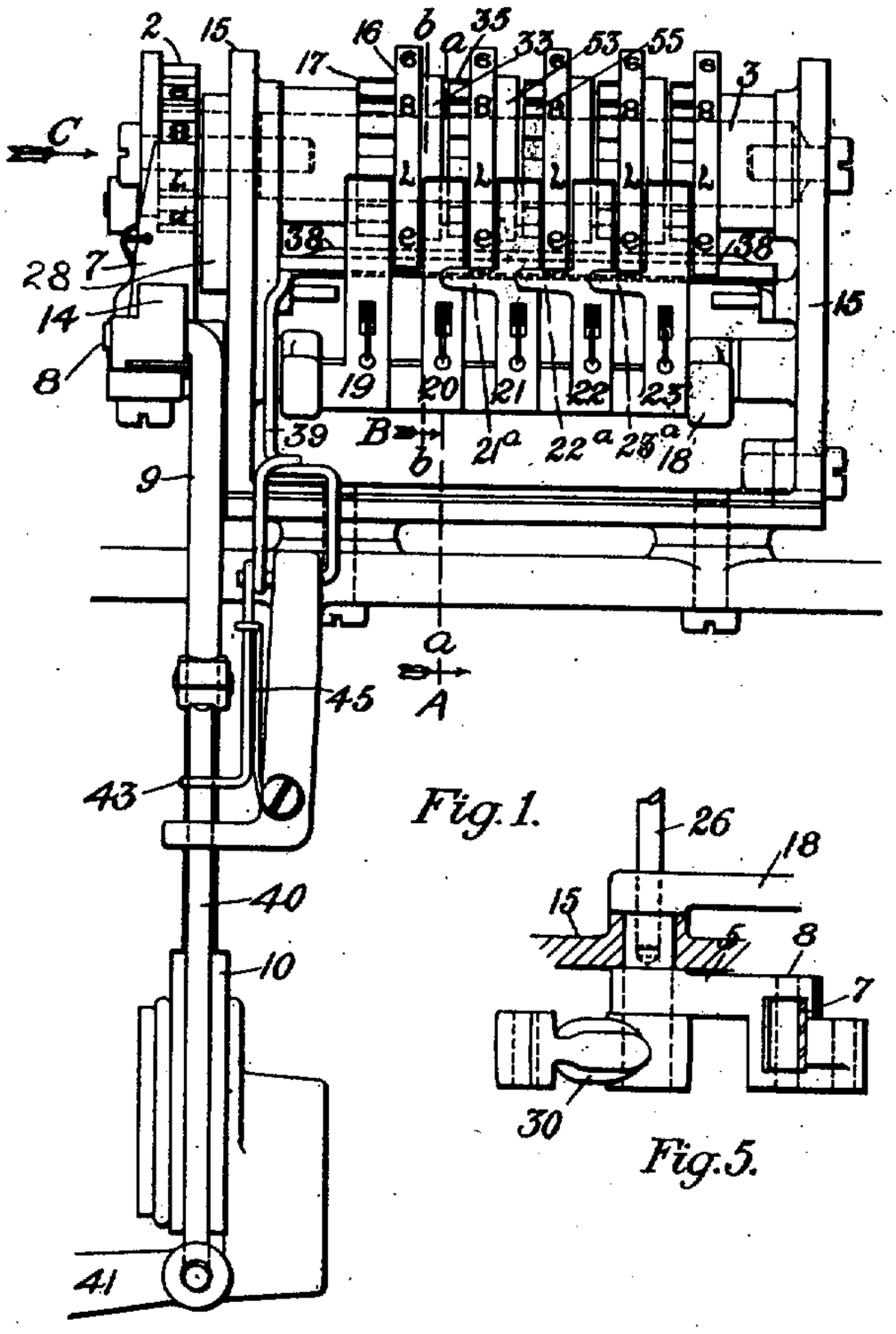

Fig. 1.

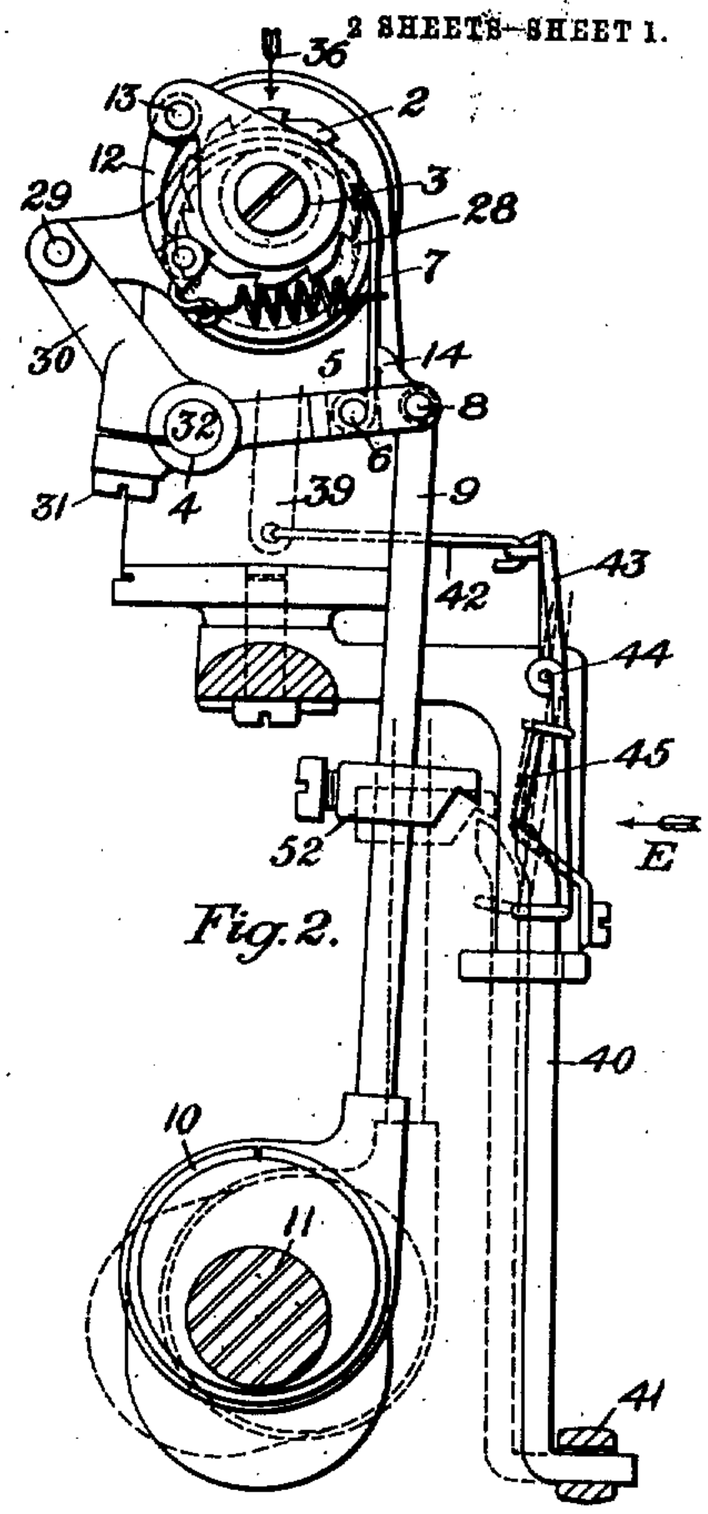

Fig. 2.

Fig. 5.

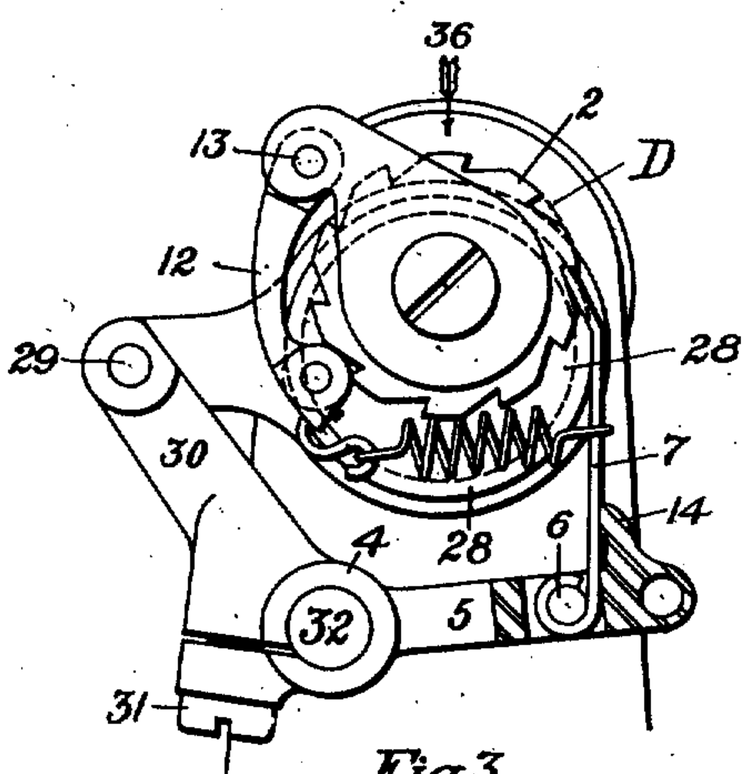

Fig. 3.

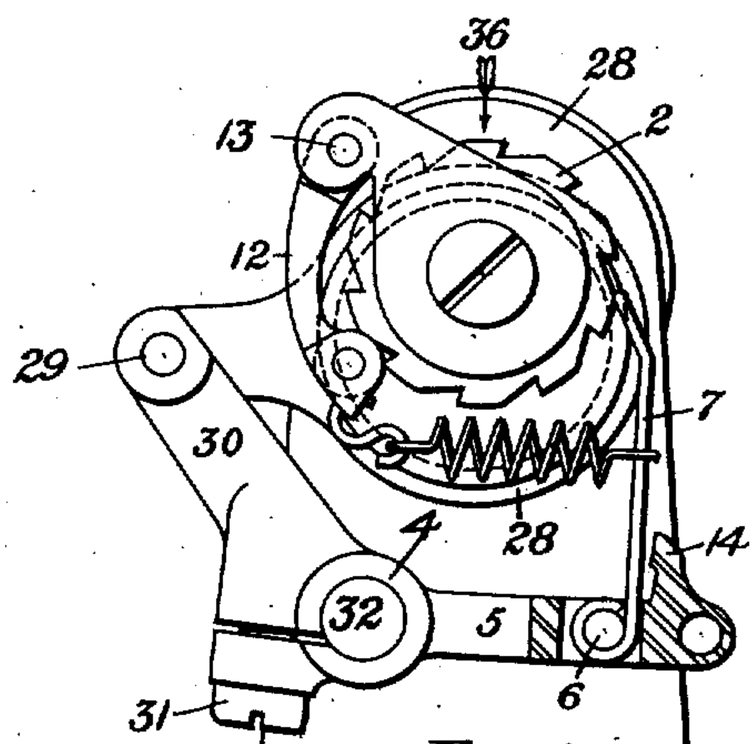

Fig. 4.

WITNESSES

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2 SHEETS—SHEET 2.

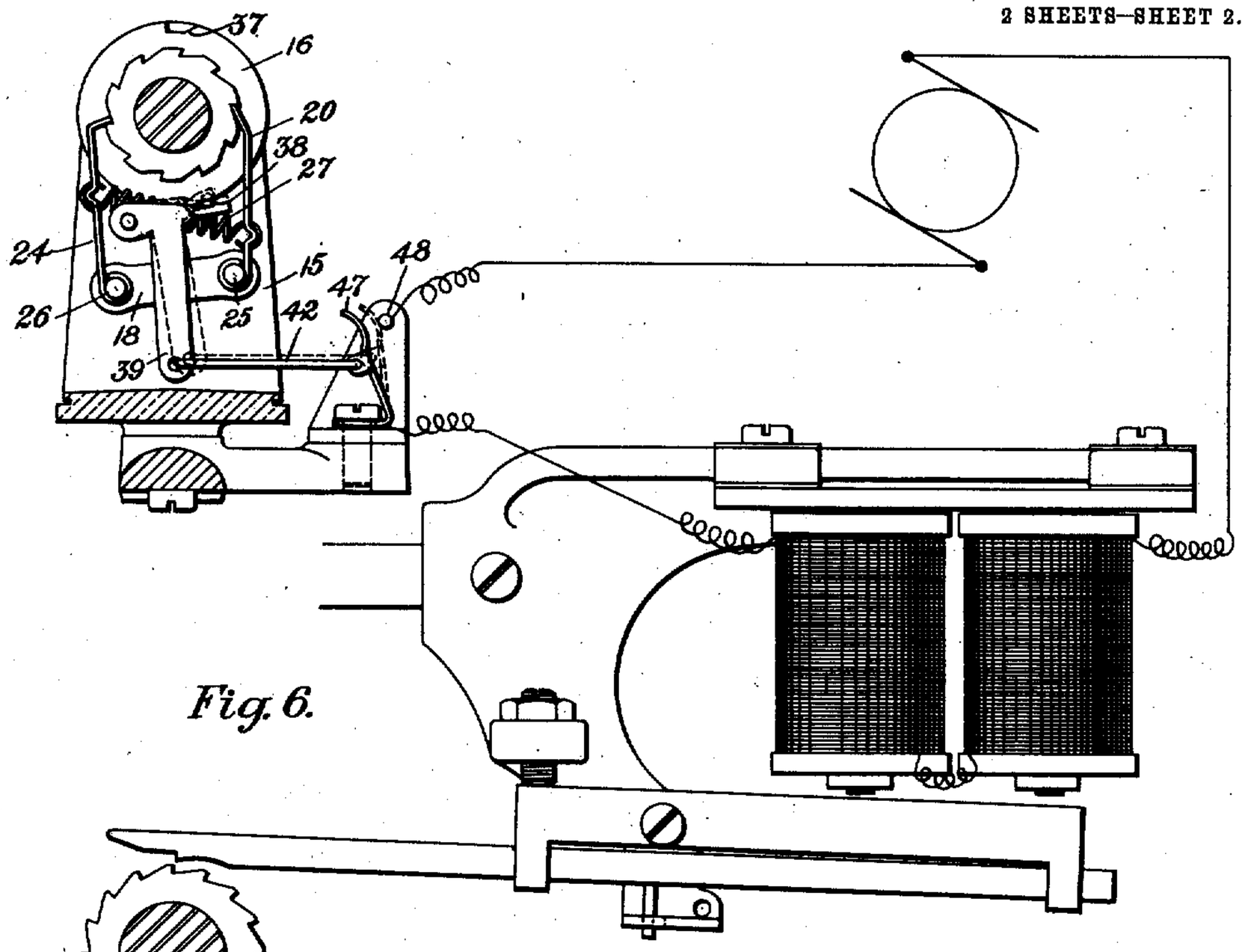

Fig. 6.

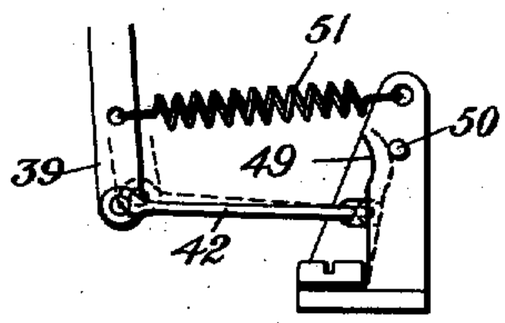

Fig. 7.

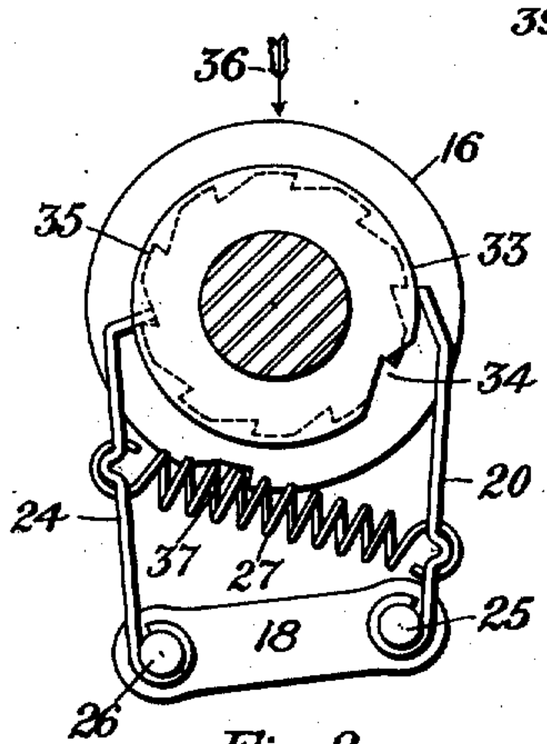

Fig. 8.

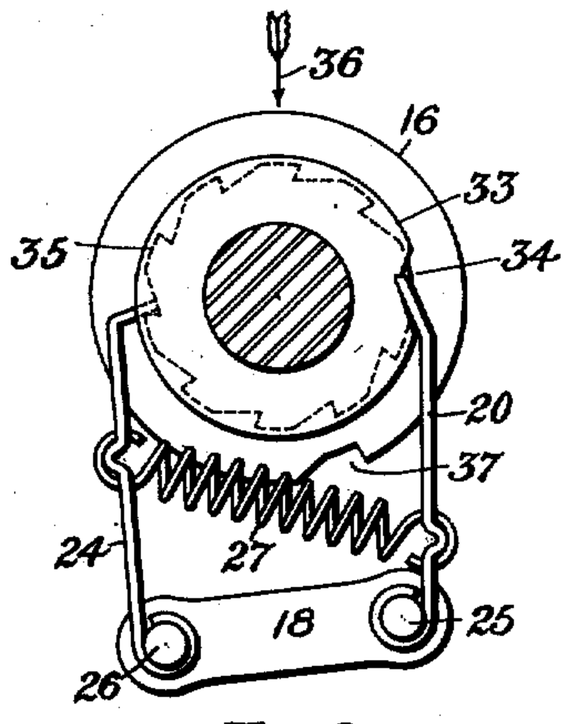

Fig. 9.

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SIMON W. WARDWELL, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO UNIVERSAL WINDING COMPANY, OF PORTLAND, MAINE, A CORPORATION OF MAINE.

COUNTER.

987,273. Specification of Letters Patent. Patented Mar. 21, 1911.

Application filed February 6, 1906. Serial No. 299,741.

To all whom it may concern:

Be it known that I, SIMON W. WARDWELL, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Counters, of which the following is a specification.

My invention is an improvement in counters or indicators for automatically showing the number of movements or operations performed by a device, machine or moving part.

The purpose of my invention is to produce a counter susceptible of high speed operation, and provide means whereby it may act on stopping devices to arrest the operation or movement of that to which it is applied or attached.

Figure 1 is a side elevation of my new device; Fig. 2, an end elevation; Fig. 3 and Fig. 4, enlarged diagrammatic representations of the relations of the ratchet wheel 2 to its actuating pawl 7 and the follower 14; Fig. 5, a detail of the lever 5 and arm 30; Fig. 6, a sectional view on the line *a*—*a*, Fig. 1, looking in the direction indicated by the arrow A, and showing a modification of the stopping connections; Fig. 7, a detail view showing a modification of the electrical stopping device; Figs. 8 and 9, enlarged detail views of the register wheels 16, etc., showing the relation thereto of the pawls 20 etc., and being part sectional on the line *b*—*b*, of Fig. 1, looking in the direction indicated by the arrow B.

The "units" register element is shown in Fig. 2, which is an end elevation looking in the direction of the arrow C, Fig. 1.

2 is a ten tooth ratchet wheel which rotates free on the shaft 3. It also combines the function of register wheel, having its ratchet teeth marked successively 0—9—8—7 &c., as shown in Fig. 1.

Adjacent the wheel or disk 2 is fulcrumed at 4 the lever 5, having hinged at 6 an actuating pawl 7. At its extremity is connected the rod 9, preferably hinged by its right-angled extremity 8, which is reciprocated by an eccentric or cam or other functionally equivalent device 10, carried on or operated by a moving member 11 as, for example, a rotating shaft or spindle of the machine to which the counter is attached.

Each rotation of the eccentric 10 oscillates the lever 5, causing the actuating pawl 7 to rotatively advance the ratchet wheel 2 one tooth. A check pawl 12, hinged at 13, engages the ratchet wheel and prevents self-movement due to jar or vibration, or retractive movement, due to friction of the actuating pawl 7, as it withdraws from the tooth just advanced, over and into engagement with the succeeding tooth next to be advanced.

The ratchet wheel 2 is prevented from over-running, when operated at high speed, by the follower or backing 14 adjacent the actuating pawl 7, and preferably a part of the lever 5. This is best shown by two enlarged diagrammatic views, Fig. 3 and Fig. 4. Fig. 3 shows the relation of the follower 14 to the actuating pawl 7 just as the ratchet wheel 2 has been advanced by the pawl 7 and before the latter's retraction. Observe that the extremity of said pawl, at this point, lies within the extreme outside peripheral line D of the ratchet wheel 2, and is prevented from withdrawing from within said line by the follower 14 that now bears against said pawl 7. Fig. 4 shows the relation of the ratchet wheel 2, the follower 14 and the pawl 7 after the latter has commenced to withdraw from the tooth just advanced. The follower 14 has withdrawn from the pawl 7 (and it thereafter continues to withdraw from it) sufficiently to permit the pawl 7 to ride over and engage the tooth next succeeding.

Within the frame 15 of the counter are mounted the "tens" element, the "hundreds" element and whatever other elements compose the counter. These elements are functionally and operatively similar to the "units" element, differing from it only in specific composition.

Referring to Figs. 8 and 9, which are sectional views of Fig. 1 on the line *b*—*b*, looking in the direction indicated by the arrow B, 16 is a register wheel, numbered from 0 to 9, and doweled or otherwise secured to it is a ten tooth ratchet wheel 35, shown by dotted lines, each tooth corresponding to a numeral on the register wheel. Mounted in bearings in the frame 15 is a rocking frame or frame shaped lever 18, Figs. 1 and 6, which carries the actuating pawls 19, 20, 21, 22, 23, and, oppositely disposed, an equal number of check pawls 24, etc., see Figs. 8 and 9. The actuating pawls are mounted on the moving or outer side of the rocking

frame 18 on the pin or rod 25. The check pawls are mounted at the fulcrum side of the rocking frame, preferably on the pin or rod 26. A spring 27 connects each actuating pawl with its check pawl, causing both to bear against their ratchet wheel and successively engage its teeth. The rocking frame 18 is operated from the "units" element through the eccentric 28 (see Figs. 2, 3 and 4) which is connected with or secured to the ratchet wheel 2. The eccentric 28 is connected by the pin 29 with the arm 30 which is preferably clamped by the screw 31 to the trunnion 32 of the frame 18 which extends through the frame 15, coaxially with and serving as a support for the pin 26, the latter being forced or driven into it, see Fig. 5. The trunnion 32 also serves as a bearing for the arm 5. Each complete rotation of the "units" element rocks the frame 18 once, advancing the ratchet wheel 17 of the "tens" element one tooth. The "hundreds" element, the "thousands" element and all others except the "units" and "tens" elements, are otherwise operated. Secured to and forming a part of the "tens" element is a disk 33 having one indentation 34, as shown in Figs. 8 and 9. The periphery of the disk 33 is of greater diameter than the adjacent ratchet wheel 17. Therefore, the actuating pawl 20 which bears on the disk 33 cannot, when moved by the rocking frame 18, engage its ratchet wheel 17. The disk 33 is secured to the "tens" elements so that, as the latter is successively advanced, tooth by tooth, through the action of the eccentric 28 on the rocking frame 18, the indentation 34 is brought at each rotation of the disk beneath the actuating pawl 20, permitting it to engage the ratchet wheel 35 of the "hundreds" element. By this engagement the ratchet wheel 35 is advanced one tooth, but with this advance the disk 33 is turned, removing its indentation 34 from under the pawl 20, so that the latter cannot again engage its ratchet 35 until the disk 33 has completed another full rotation.

The above described controlling means suffice when only two elements work together, as the "tens" and "hundreds". When a third or other elements are combined with the two, other means are required to control the actuating pawls of the "other" elements. The disk 33 moves with every rock of the frame 18, and, therefore, as stated in lines 21 *et seq.*, moves the indentation 34 under the end of the pawl 20 so it can advance the ratchet 35 just one tooth, and then withdraws it so there cannot be another such engagement until after a complete rotation of the disk 33. But the disk 53 on the "hundreds" element is shifted only once in every ten rocks of the frame 18; or, in other words, its indentation remains under the extremity of the pawl 21 during ten rocks of the frame 18. Therefore, unless the pawl 21 is otherwise restrained, it will enter said indentation nine units too soon, and shift the "thousands" element on the ninety-first advance of the "tens" element instead of on the one hundredth. To prevent this, the pawls are provided with arms 21^a, 22^a and 23^a, so that the pawl 21 cannot engage the ratchet 55 unless the pawl 20 is in engagement with the ratchet 35, and likewise the pawl 22 is controlled by 21, and 23 by 22. In other words, the pawl 20 controls the action of the pawls 21, 22 and 23, none of which can engage their respective ratchets except when the pawl 20 engages the ratchet 35. Therefore, while the pawl 20 rides on the periphery of the disk 33, the pawl 21 is prevented from entering the indentation of the disk 53 by the arm 21^a bearing on the pawl 20:—and likewise with the pawls 22 and 23.

The action of three elements is, then, as follows: Each rock of the frame 18 advances the ratchet 17 one tooth. At the ninth advance, the indentation 34 of the disk 33 is brought to position to be engaged by the pawl 20 at the next rock of the frame. At the tenth rock, the pawl 20 falls into said indentation 34, engages the ratchet 35 and advances it one tooth. At the same time the disk 33 is advanced, withdrawing the indentation 34 from under the pawl 20, causing the latter to ride on the periphery of the disk 33. At the ninth advance of the ratchet 35 or the ninetieth advance of the ratchet 17, the indentation of the disk 53 is brought to position to be engaged by the pawl 21, but the pawl 20, upheld by the periphery of the disk 33, withholds said pawl 21 from such engagement, until the ninety-ninth advance of the ratchet 17, which brings the indentation 34 again beneath the pawl 20, permitting it to engage the ratchet 35, which also permits engagement of the pawl 21 with the ratchet 55, so that at the one hundredth stroke, the three ratchets, 17, 35 and 55 move together. The rotation of the "thousands" and other elements of higher denomination is controlled in the same way. Reviewing, each rotation of the shaft 11 rocks the lever 5, and through the pawl 7, actuates the ratchet wheel 2, causing its numbered teeth to successively pass the reading line represented by the arrow 36, and at the same time rotating the eccentric 28. The relation of the eccentric 28 to the ratchet wheel 2 is such that as the (0) of the ratchet wheel 2 passes the reading line, Fig. 9, the "tens" register is shifted, causing the counter to read (10) (20) &c., dependent on whether the units register has completed one, two or more rotations. As the relation of the eccentric 28 to the numeration of the units register is such as to cause the "tens" element to register at the appropriate moment, so the rela-

tion of the indentation 34 to the "tens" register is such that the "hundreds" element is caused to register when the (0) of the "tens" element reaches the reading line, and so also with the "thousands" and other elements.

By a simple device, the counter is arranged to stop the machine to which it is attached after a predetermined number of operations or movements have been performed, as, for example, after a predetermined number of rotations of the shaft 11.

Each of the register wheels or disks, except the units, has an indentation 37, Fig. 6, and adjacent the disks is a rockable bar 38, so disposed that when the indentations of all the disks are in line, the said bar can enter them. The relation of these indentations to the numeration of the register disks is such that, as the register elements all show zero (0) at the reading line, the bar 38 enters the alined indentations. When this occurs, the arm 39, secured to or connected with the rocking bar 38, acts upon stop devices of the machine. These devices may be purely mechanical or may depend upon electrical agency for their actuation. Both forms are herewith indicated.

Fig. 2 shows a form of mechanical "knock-off" or stop device. Secured to the rod 9 of the eccentric 10 is a block 52, one end of which has a sharp, engaging edge. Adjacent the travel path of this block is a dagger 40 which is connected with a movable member 41 of a stop device of known and usual construction. Connected with the rocking lock bar 38 by the link 42 is the lever 43, hung on the pin 44, which lever also engages the dagger 40. A spring 45 presses the lever 43 in the direction of the arrow E, and through the link 46 presses the rocking bar 38 against the periphery of the registering wheels, so that, when the indentations thereof aline, the rocking bar 38 enters them, and in its movement, through the lever 43, shifts the dagger 40 into the path of the block 52. The resulting engagement causes movement of the member 41 and action of the stopping devices.

Fig. 6 shows the operation of an electric stop device of known and usual form. Movement of the rocking bar 38 effects the action of a contact device such as the two terminals 47 and 48. The terminal 47 is preferably a spring piece tending to close against the fixed terminal 48, but withheld from such a contact by the rocking bar 38, through the link connection 42. In Fig. 7, a modification of the device is illustrated, in which the movable contact piece 49 has, of itself, no spring tendency to close against the fixed contact piece 50, but is caused to make contact by the link 42 which is connected to the arm 39 of the rocking bar 38. The rocking bar 38 is controlled by a spring 51 which causes the bar to enter the recesses 37 in the disks 16 when the latter are all in alinement, and through the link 42 forces the contact piece 48 into the position shown by dotted lines. As above indicated, the bar 38 operates when all the register wheels except the "units" stand at zero. Therefore, if it be desired that the machine to which the counter is attached or applied perform a given number of movements or operations, as, for example, rotations of the shaft 11, the counter is set to the desired number, say, for example, 9847. The registering wheels are so marked that they read backward, each wheel reading successively 0—9—8—7—6—5—4—3—2—1. Therefore, the counter will read backward; 9847—9846— 9845 &c. to zero, when as above indicated, the rocking bar 38 operates, causing action of the stop devices aforementioned. With the structure above described, however, the units element is independent of the rocking bar, in which case the machine will be stopped automatically at 9840, leaving seven operations to be accomplished manually or otherwise. It is obvious, however, that to segregate the "units" element is not functionally essential. The element described as the "tens" element might be used as a "units" element, by rocking the frame 18 directly from the shaft 11, without the intermediation of the eccentric 28 and its accompanying connections. But this modification is less favorable to high speed operation, which is essential in many cases. In this case the counter will cause the machine to stop at any one instead of any ten operations.

Therefore, without limiting myself to the precise form, arrangement or mode of application of my device, I claim:

1. In a counter, the combination with a plurality of register elements, a series of actuating pawls to move said elements, check pawls to hold the elements after they have been moved, and a frame member to carry and operate all of the pawls of the series, of a separate, independent register element and a pawl to operate the same, said pawl arranged to be operated independently of the series of pawls.

2. In a counter, the combination with a plurality of register elements, of a lever carrying one actuating pawl for one of the register elements, a second lever carrying a plurality of actuating pawls for the other register elements, and means for transmitting movement from the register element operated by the first said lever to the second lever.

3. In a counter, the combination with a plurality of register wheels, pawls to move the register wheels and a frame carrying said pawls, of a single register wheel, an eccentric connected therewith, means to oper-

atively connect the eccentric with the frame aforesaid, and means to actuate the single element.

4. In a counter, the combination with a plurality of register elements, means to operate said elements and a frame to carry said means, of a single register element, a pawl to operate the same, and means operated by said single element to operate the frame aforesaid.

5. In a counter, the combination with a series of register elements, of a single register element and a pawl to operate same, an eccentric operated by said single element, and means connected to said eccentric to operate the series of elements.

6. In a counter, the combination with a plurality of register elements, individual devices for shifting each element, and one means for carrying and operating all of said devices, of a separate register element with an operating pawl therefor, and means connecting the separate register element with the carrying and operating means of the plurality of elements.

7. In a counter, the combination with a series of register wheels and actuating devices therefor, of an independent units register wheel, a pawl for operating said units wheel, and an eccentric for transmitting movement from said units wheel to the actuating devices of the other registering wheels.

8. In a counter, the combination with a plurality of register wheels and actuating devices therefor, of an independent units register wheel, a pawl for operating said units wheel, and means for transmitting movement from said units wheel to the actuating devices of the other register wheels.

9. In a counter, the combination with a plurality of register wheels, an operating pawl for each of said wheels, a common support for all of said pawls, a units register wheel independent of those aforesaid, means for operating said units wheel, and means for transmitting movement from said units wheel to the support for the operating pawls of the other wheels.

10. The combination with the registering elements of a counter, and means to operate said registering elements, of an element 38 whose movement is regulated by the relative positions of the registering elements, a member 52, adapted to be continuously reciprocated by said registering elements operating means, and a stop member 40 arranged to be shifted by the movement of the element 38 to be engaged by the member 52.

11. The combination with a plurality of ratchets, actuating pawls to move, and check pawls to control the ratchets, and a frame to carry and operate the pawls, and having a trunnion 32, of a ratchet 2, an actuating pawl to move, and check pawl to control the same, a lever 5 to operate said actuating pawl freely rockable on the trunnion 32, an arm 30 secured to said trunnion, and an eccentric 28 connected with and rotating with the ratchet 2 to rock the frame aforesaid through the arm 30.

12. The combination with the ratchet 2, of the actuating pawl 7 to move the ratchet, and check pawl 12 to control the ratchet, and means to operate the check pawl, of a lever 5 to carry and operate the actuating pawl having a follower 14 formed thereon to follow the actuating pawl, and at the end of its movement hold it within the peripheral line of the ratchet to prevent the latter from overrunning.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SIMON W. WARDWELL.

Witnesses:
CHAS. A. EDDY,
THOS. M. CHILDS.