Sept. 18, 1923. 1,468,490

H. L. MERRICK

ELECTROMAGNETICALLY OPERATED COUNTER

Filed June 13, 1917 4 Sheets-Sheet 1

Fig. 1

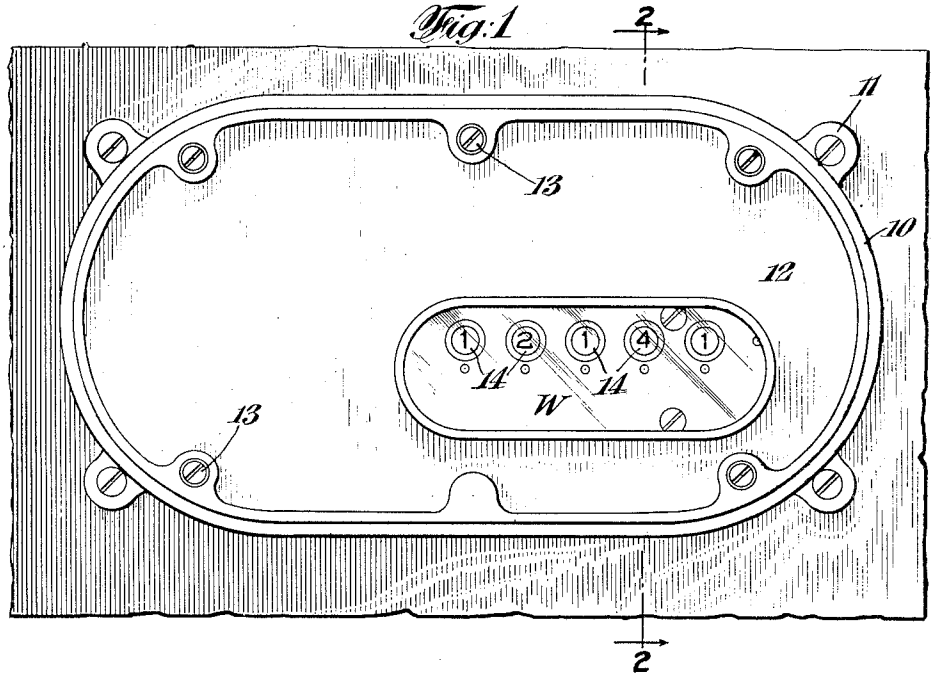


Fig. 2

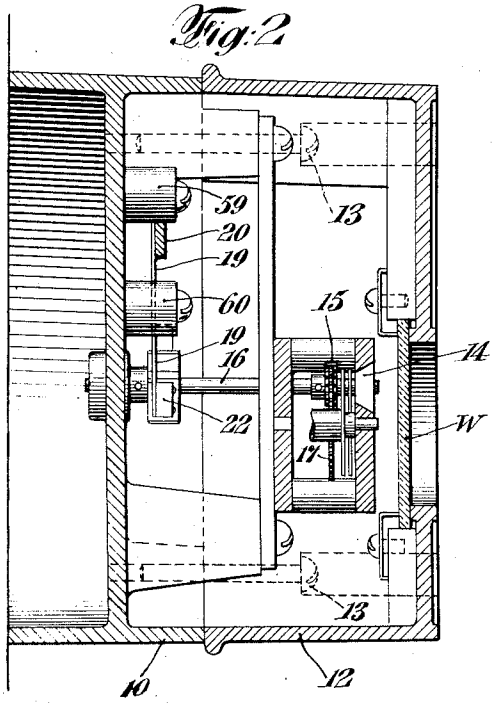
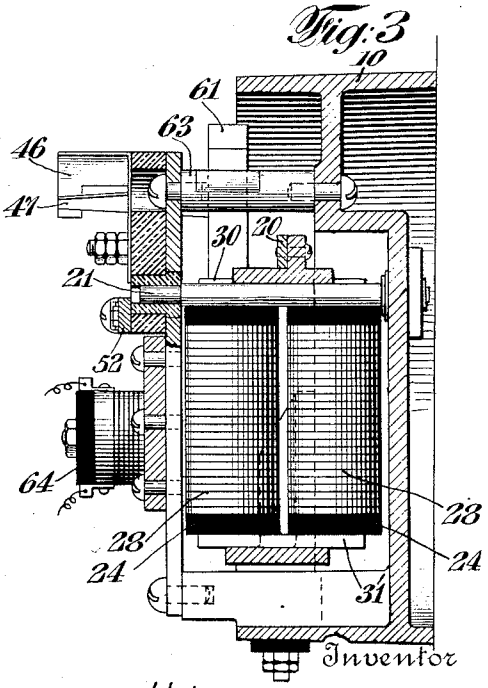


Fig. 3



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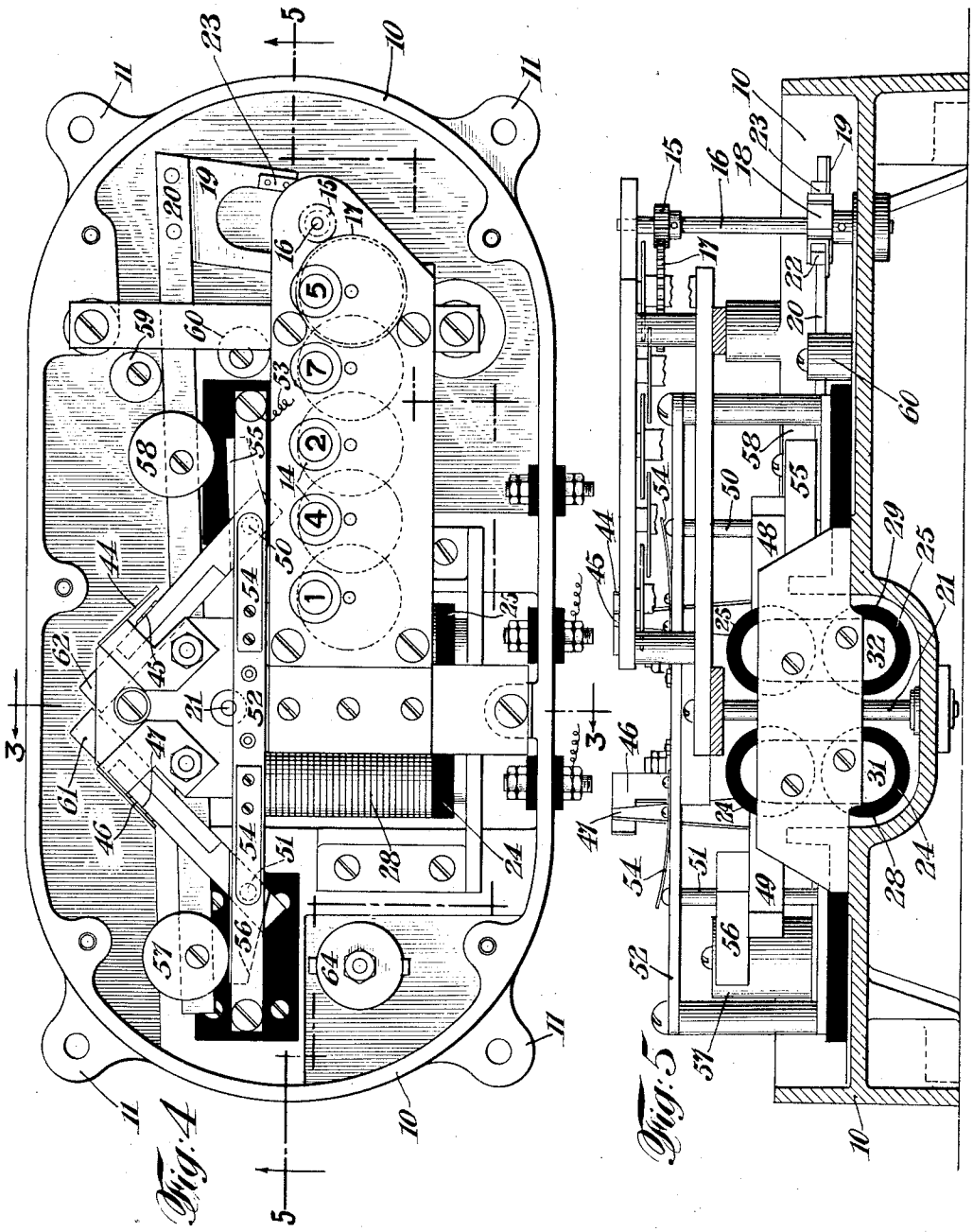


Fig. 4

Fig. 5

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Fig. 6

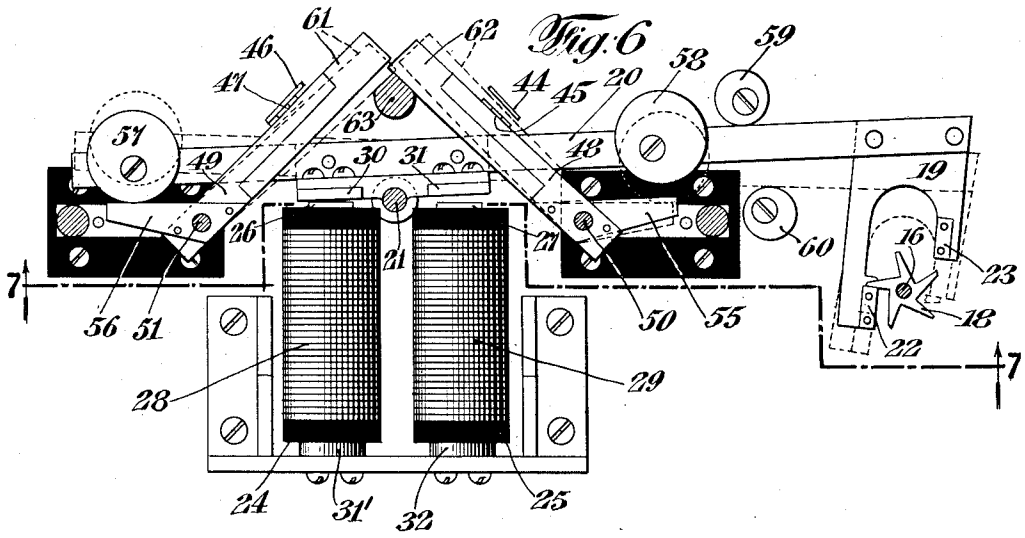


Fig. 7

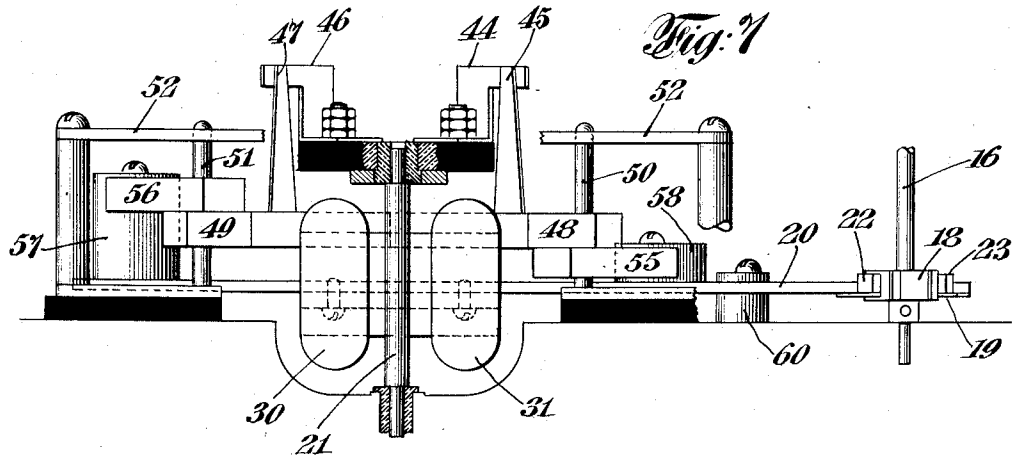
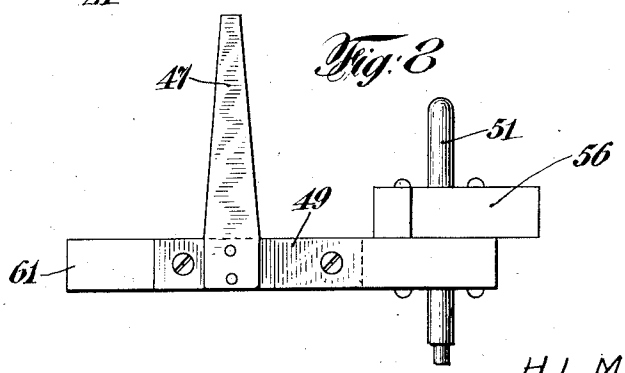


Fig. 8



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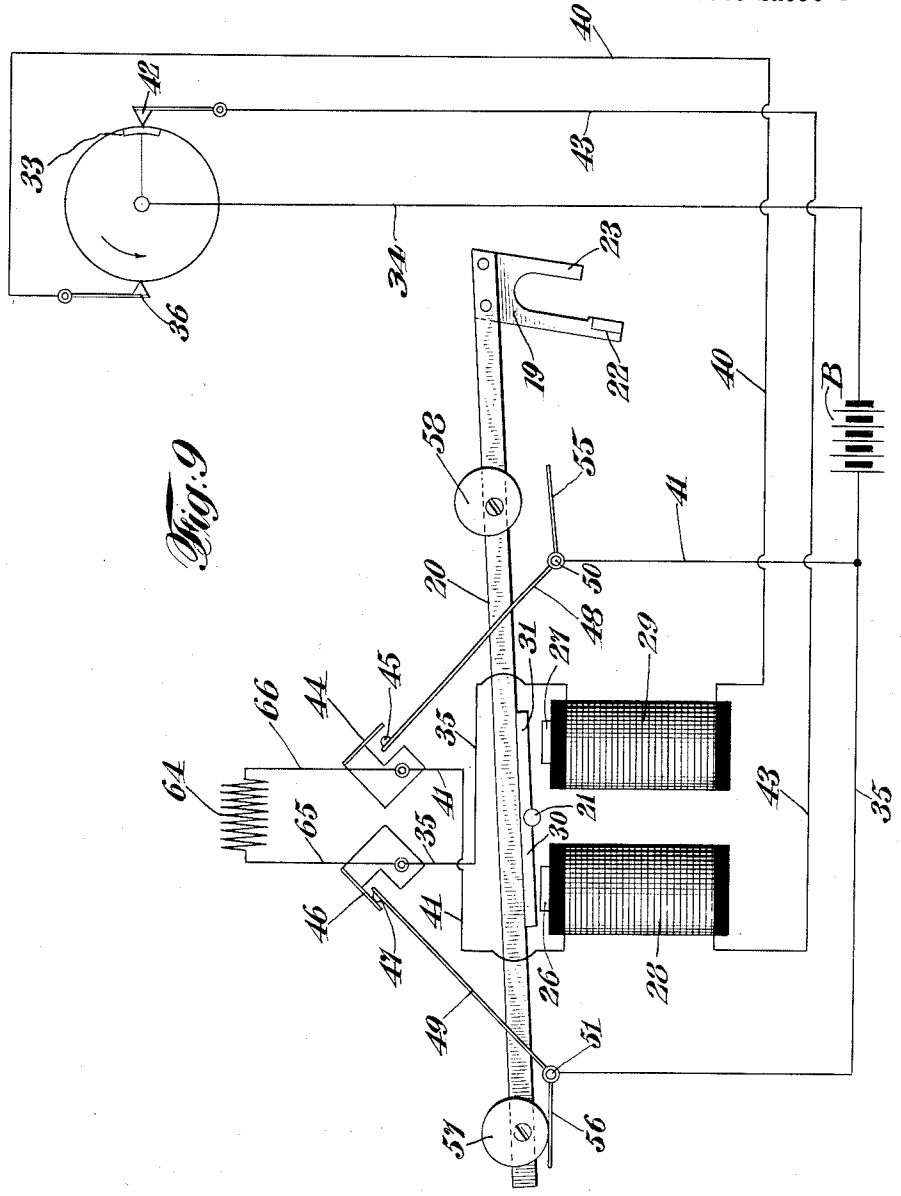


Fig. 9

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UNITED STATES PATENT OFFICE.

HERBERT L. MERRICK, OF PASSAIC, NEW JERSEY.

ELECTROMAGNETICALLY-OPERATED COUNTER.

Application filed June 13, 1917. Serial No. 174,420.

To all whom it may concern:

Be it known that I, HERBERT L. MERRICK, a citizen of the United States, and a resident of Passaic, in the county of Passaic and State of New Jersey, have invented certain new and useful Improvements in Electromagnetically-Operated Counters, of which the following is a specification.

This invention relates to electromagnetically actuated means to operate a counter or registering mechanism to register the movements of a mechanism or the revolutions of a rotatable element, or to transmit and register the movements of one counting mechnism to another located at some distance from each other, and it is the primary object of the invention to provide a mechanism of this character which will operate efficiently and positively under all conditions of use.

A further object of the invention is to provide means to retain the operating mechanism against movement after each operative movement to prevent accidental movement thereof and the counter or registering mechanism.

It is another object of the invention to provide a device of this character in which ratchet mechanism connected to the counter is actuated by a to and fro movable lever and movement imparted to the lever through electromagnets co-operating with armatures carried by the lever, and said lever actuating means during the movement thereof to open and close the circuit for the respective electromagnets to alternately energize the magnets.

With the foregoing objects, and other objects and advantages to be hereinafter described, in view I have shown in the accompanying drawings an embodiment of my invention in which Figure 1 is a front elevation of a casing in which the operative mechanism is enclosed and carried.

Figure 2 is a cross sectional view taken on the line 2—2 of Figure 1 and looking in the direction of the arrows.

Figure 3 is a cross sectional view taken on the line 3—3 of Figure 4 and looking in the direction of the arrows.

Figure 4 is a front elevation with the cover of the casing removed and illustrating the operative mechanism.

Figure 5 is a longitudinal sectional side elevation taken substantially on the line 5—5 of Figure 4 and looking in the direction of the arrows.

Figure 6 is a front elevation of electromagnetically operated means to operate ratchet mechanism to advance the counter mechanism.

Figure 7 is a sectional side elevation taken on the line 7—7 of Figure 6.

Figure 8 is a detail view of a contact terminal in the circuit of an electromagnet; and

Figure 9 is a diagrammatic view of the electric circuit for the electromagnetic means.

Similar characters of reference designate like parts through the different views of the drawings.

In the embodiment of my invention illustrated in the drawings the operative mechanism is enclosed and carried by a two-part casing, one part 10 carrying the operative parts and has perforated lugs or ears 11 for the engagement of screws to secure it to a suitable support, and the other part 12 in the form of a removable cover is removably secured to the part 10 by screws 13. The cover also has an opening with a window W to expose a row of numerals of the counter or registering mechanism therethrough.

A counter or registering mechanism is removably supported in the casing section 10. Said mechanism may be of any suitable construction and comprises a series of numeral carrying disks or wheels having means to transfer or transmit the movements of one numeral wheel upon a complete revolution to the numeral wheel of next higher denomination, an aligned row of characters on said wheels being adapted to be exposed through windows 14 in a plate constituting a part of the carrier for said wheels, and through the window W in the casing cover, as clearly shown in Figures 1 and 4.

The counter mechanism is advanced or operated through a pinion 15 fixed to a rotatable shaft 16 meshing with a gear 17 rotatable with the primary mover or unit wheel of the counter, said pinion 15 being rotated by pawl and ratchet mechanism comprising a toothed wheel 18 having an uneven number of teeth and a striker or pawl 19 carried at one end of an oscillatory lever 20 pivotally supported, as at 21, said pawl having a pair of pallets 22, 23 adapted to en-

gage at opposite sides of the ratchet wheel 18. The ratchet wheel is rotated and thereby the counter advanced through the pinion 15 and gear 16 by the pallet 22 engaging with a tooth of the wheel when the lever 20 moves in one direction, and the pallet 23 engaging with another tooth of the ratchet wheel when the lever is moved in a reverse direction.

The lever 20 is moved to and fro by electromagnetically operated means comprising magnets supported at opposite sides of the pivotal support 21 for the lever, said magnets in the present instance being shown as a pair of magnets 24, 24 connected in series at one side of the lever support and a pair of magnets 25, 25 connected in series at the opposite side of the lever support. These magnets comprise fixed cores 26, 27 (Figure 6) engaging spools carrying coils or windings 28, 29 for the respective cores. Armatures 30, 31 in the form of plates of magnetizable material are connected to and carried by the lever 20, the latter being of non-magnetizable material, at opposite sides of its pivotal support and in line with the cores of the magnets, the armature 30 being common to both the magnets 24 and the armature 31 being common to both the magnets 25.

It will be obvious that as the magnets 24 are energized the armature 30 will be attracted to the cores thereof raising the pawl carrying end of the lever 20, the pallet 22 during this movement of the lever engaging with a tooth of the rachet wheel, and the pallet 23 being moved out of the path of movement of the ratchet wheel, as shown in full lines in Figure 6, and that when the magnets 25 are energized the armature 31 will be attracted to the cores of said magnets lowering the pawl carrying end of the lever 20 and during this movement of the lever the pallet 23 will engage with a tooth of and advance the ratchet wheel, the pallet 22 being moved out of the path of movement of said wheel, as shown in dotted lines in Figure 6.

As stated it is an object of the invention to provide electromagnetically operated means to operate a counter or register to register the movements of a mechanism, or the revolutions of a rotatable member, or to transmit and register the movements of one counter to another located at some distance therefrom, for which purpose there is connected to such a mechanism or counter a terminal contact of an electric circuit, as shown at 33 in Figure 9, in circuit with a source of electricity, shown as a battery B, by a wire 34, which battery is connected in circuit with the electromagnets 24 by a wire 35 and in circuit with a contact terminal 36 through the magnets 25 by a wire 40, and the magnets 24 are connected in circuit with the battery by a branch wire 41 leading from the wire 35 and in circuit with a terminal contact 42 through the magnets 24 by wire 43. Assuming it is desired to transmit the movement of one counter to another the movable contact 33 is connected to and rotatable with the primary mover of the counter the movements of which are to be transmitted to another counter. It will be obvious that as the contact 33 rotates, for instance in the direction indicated by the arrow, it will be alternately placed in contact with the contact terminals 36 and 42 thereby alternately closing and opening or making and breaking the circuit for and energizing the respective magnets, and alternatively attracting the armatures 30 and 31 to the cores of the magnets and imparting a to and fro movement to the lever 20, which movements of the lever through the pawl-pallets 22, 23 impart rotative movement to the ratchet wheel 16 and thereby to the pinion 15 and gear 17 to the primary mover or unit wheel of the counter.

Connected in the circuit wire 41 of the magnets 24 is a fixed contact terminal 44 and a movable contact terminal 45 to co-operate with the contact 44 to open and close the circuit for the magnets 24. Also connected in the circuit 35 of the magnets 25 is a fixed terminal contact 46 and a movable contact 47 to co-operate with the contact 46 to open and close the circuit for the magnets 25. By the provision of these contact terminals after the magnets 24 have been energized by the completion of the circuit through the contacts 33, 42 and the circuit wires 41, 43 and the armature 30 attracted to the cores of the magnets 24 the contact 45 will be moved away from the contact 44 to open the circuit for the magnets 24 and the latter de-energized. Simultaneously with the opening of the circuit for the magnets 24 the contact 47 will be moved into contact with the contact 46 thereby closing the circuit for the magnets 25 and putting them in condition to be energized when the contact 33 moves to position to contact with the contact 36 thereby completing the circuit through wires 40 and 35, and as the contact 33 comes in contact with the contact 36 and the magnets 25 are energized the armature 31 will be attracted to the cores of the magnets 25 imparting movement to the lever 20 reverse to that imparted thereto when the magnets 24 are energized.

The terminal contacts 45 and 47 are secured to carriers 48, 49 which are in the form of resilient fingers of current conducting material, said carriers being fixed to pins 50, 51 and the pins pivotally supported at one end in a bus bar 52 insulated from the casing and other mechanism and con-

nected in circuit with the source of electricity by a wire 53, (Figure 4). Spring fingers 54 are secured to said bar to yieldingly engage with the ends of the pins to assure electrical connection between the pins and bus bar. The contacts 45 and 47 are thrown into and out of contact with the contacts 46, 44 by the movement of the lever 20 and for which purpose arms 55, 56 are connected to the respective contact carriers 48, 49, these arms being insulated from said carriers or made of insulating material. With the parts in the positions shown in Figures 4 and 6 with the armature 30 attracted to the magnets 24 and the contacts 47, 46 for the magnets 25 in engagement the circuit for the latter magnets has been closed through said contacts and the circuit through the contacts 44, 45 for the magnets 24 has been opened due to a member 57 carried by the lever 20 having been brought into engagement with the arm 56 moving the contact carrier 49 so that the contact 47 engages with the contact 46. As the circuit through the contacts 33, 36 for the magnets 25 is closed and said magnets energized the armature 31 will be attracted to the magnets 25 thereby rocking the forward end of the lever 20 downward and simultaneously with this movement of the lever a member 58 carried by the lever will engage with the arm 55 and move the carrier 48 for the contact 45 so that the latter will engage with the contact 44 thereby closing the circuit for the magnets 24, and as the member 57 will be moved away from the arm 56 the contact carrier 49 will drop by gravity and move the contact 47 out of engagement with the contact 46 thereby opening the circuit for the magnets 25. To vary the movement imparted to the contact carriers 48, 49 the members 57, 58 are adjustably connected to the lever 20, and in the present instance are in the form of cylinders secured to the lever eccentric to the axes of the cylinders. To limit the oscillatory movement of the lever 20 a pair of stops 59, 60 are provided, one at the top and the other at the bottom of the lever. These stops are in the form of cylinders eccentrically supported and by the rotative adjustment of said cylinders the movement of the lever may be varied to compensate for wear of the pawl pallets 22, 23 or the teeth of the ratchet wheel.

To maintain the contact 47 in operative engagement with the contact 46, or the contact 45 in engagement with the contact 44, the contact carriers 49, 48 have secured thereto interengaging stops in the form of extensions 61, 62 insulated from the carriers, or said extension stops may be made of insulating or non-conducting material. When the armature 30 has been attracted to the cores of the magnets 24, as shown in Figure 6, the member 57 carried by the lever 20 engaging with the arm 56 will rock the contact carrier 49 with the stop 61 to the full line position with the contact 47 in engagement with the contact 46 closing the circuit for the magnets 25, and the stop 62 being of such length so that it will clear the under face of the stop 61 and when in this position will drop by gravity and engage with an abutment 63, as shown in full lines in said Figure 6, with the contact 45 out of engagement with the contact 44. In this position of the lever it will engage with the stop 59 and the member 58 will be in the full line position. During this movement of the lever the pawl pallet 22 will move from the dotted line to the full line position and engage with a tooth of the ratchet wheel advancing such wheel. When the contact 33 is moved to engage with the contact 36 the magnets 25 will be energized drawing the armature 31 to the cores of the magnets 25 rocking the lever 20 to the dotted line position shown in Figure 6, and during this movement of the lever the member 58 will engage with the arm 55 connected to the contact carrier 48 rocking said carrier to the dotted line position and the contact 45 into engagement with the contact 44 closing the circuit for the magnets 24. The stop 61 also being of such length to clear the under face of the stop 62 will drop by gravity into engagement with the abutment 63 and the contact 47 will drop out of engagement with the contact 46 thereby opening the circuit for the magnets 25. During this latter movement of the lever 20 the pawl pallet 23 will move from the full line to the dotted line position engaging a tooth of the ratchet advancing the same. It will be obvious that as the contact 33 comes into engagement with the contact 42 the magnets 24 will be again energized and the operation repeated.

In operation should the armatures 30, 31 be drawn quickly to their respective magnets and a consequent quick rocking of the lever 20 there is a possibility of the lever rebounding, since the engagement of the contact 33 with the contacts 36 and 42 is a rapid one and the circuit for the respective magnets is rapidly closed and again opened and there might not be sufficient residual magnetism in the magnets to retain the armatures in engagement with the cores thereof. To provide sufficient magnetism in the respective magnets to prevent any such rebound I provide a coil 64 one end 65 of the windings of which coil is in circuit with the circuit breaker 46 of the magnet or magnets 25, and the other end 66 being in circuit with the circuit breaker 44 of the other magnet or magnets 24. As the respective magnets are energized by the closing of the respective circuits therefor the current will pass into the coil 64, and after the circuits are again opened sufficient current will remain in the

coil 64 and be allowed to pass through the magnets to energize the magnets sufficiently to retain the armatures in operative engagement with the magnets to prevent rebounding of the lever with the possibility of the pawl pallets 22, 23 engaging a second tooth of the ratchet wheel and thereby imparting more than one impulse to the ratchet wheel and interfering with the proper registering movements of the counter or register.

Having thus described my invention, I claim:

1. The combination with a counter, and a source of electricity, of a wheel having an uneven number of teeth operatively connected with the prime mover of the counter; an oscillatory lever; a pawl carried at one end of the lever having a pair of pallets to engage at opposite peripheral portions of the wheel and to have movement in a line parallel with the movement of the teeth of said wheel, said pallets being constructed and arranged so that one pallet will engage a tooth and advance the wheel when the lever is moved in one direction and the other pallet will engage another tooth and advance the wheel when the lever is moved in reversed direction; a casing in which said mechanism is mounted and enclosed; a pair of electromagnetic means in circuit with the source of electricity alternately operative to oscillate the lever; and a circuit breaker in the circuit of each magnet operative by the lever to open and close the circuit to one magnet alternately with the opening and closing of the circuit for the other magnet.

2. The combination with a counter and a source of electricity, of a toothed wheel connected to the counter; a lever pivotally supported to move on an horizontal axis; a pawl carried at one end of the lever to co-operate with said toothed wheel to rotate the same and advance the counter; magnets at opposite sides of the pivotal support of the lever; means operable to alternately open and close the circuits for the respective magnets to energize and deenergize the same; an armature for the respective magnets connected to the lever at opposite sides of its pivotal support and alternately attracted to the respective magnets; and means operable by the lever to open the circuit of the magnet toward which the armature is attracted and close the circuit for the other magnet, substantially as and for the purpose specified.

3. The combination with a counter, of a wheel having an uneven number of teeth operable with the prime mover of the counter; an oscillatory striker having a pair of pallets to engage at opposite peripheral portions of the wheel and move in a direction parallel with the movement of the teeth of said wheel, one of said pallets being arranged to co-operate with a tooth of the wheel when the striker is moved in one direction to advance the wheel and the other pallet to co-operate with another tooth of said wheel to advance the wheel upon the return movement of the striker; means to actuate said striker; and a casing in which said mechanism is mounted and enclosed.

4. The combination with a source of electricity having a make and break contact in circuit therewith and a counter having a toothed wheel fixed to the prime mover thereof, of electromagnets in circuit with the source of electricity; a pivoted lever carrying an armature and adapted to be rocked by the magnets co-operating with the armature; a pawl carried by the lever to co-operate with the toothed wheel of the counter to advance said wheel upon each movement of the lever; a pair of fixed contacts and movable contacts in circuit with the magnets, said movable contacts being adapted to be alternately moved by the lever into contact with the fixed contacts to open the circuit of the magnet toward which the armature has been moved and close the circuit of the other magnet, and when one movable contact is moved into contact with a fixed contact the other movable contact operating to lock it in such position.

5. The combination with a source of electricity having a make and break contact in circuit therewith and a counter having a toothed wheel fixed to the prime mover thereof, of an oscillatory lever carrying a pawl to co-operate with the toothed wheel to advance the same upon each movement of the lever; electromagnets in circuit with the source of electricity disposed at opposite sides of the pivotal support of the lever; armatures carried by the lever to co-operate with the magnets to oscillate the lever; two pairs of contacts in circuit with the electromagnets, one contact of each pair being fixed; movable carriers for the other contact of each pair, said carriers being moved by the lever during the oscillatory movements thereof to alternately place the movable contact of each pair of contacts into contact with the fixed contacts for the purpose specified.

6. The combination with a source of electricity and a counter having a toothed wheel fixed to the prime mover thereof, of a pivoted lever; magnets in circuit with the source of electicity arranged at opposite sides of the pivotal support of the lever; armatures carried by the lever to co-operate with the electromagnets to oscillate the lever; a pair of contacts for the magnets at each side of the pivotal support of the lever, one contact of each pair being fixed; a movable carrier for the other contact of each pair of said contacts; an arm integral with each carrier; and means arranged on the lever to co-operate with said carrier arms to place the movable contacts alternately into

contact with the fixed contacts to alternately energize and de-energize the magnets at opposite sides of the pivotal support of the lever; and a pawl carried by the lever to co-operate with the toothed wheel of the prime mover of the counter to advance the same upon each movement of the lever for the purpose specified.

7. The combination with a source of electricity, of a pivotally supported lever carrying armatures at opposite sides of its pivotal support; electromagnets in circuit with the source of electricity to co-operate with said armatures to oscillate the lever; a pair of pivotally supported contact carriers; an arm integral with each of said carriers; a pair of fixed contacts; and means carried by the lever at opposite sides of its pivotal support and adapted to co-operate with the arms of the contact carriers to alternately move said carriers to position the contacts carried thereby into and out of contact with the fixed contacts to alternately energize and de-energize the magnets at opposite sides of the lever, and said contact carriers arranged so that the carrier which is moved to the contact making position is locked in such position by the other contact carrier for the purpose specified.

8. The combination with a counter, of a toothed wheel having an odd number of teeth movable with the prime mover of the counter; an oscillatory lever carrying a striker to co-operate with the toothed wheel of the counter to advance the same upon each movement of the lever comprising a yoke shaped member arranged to straddle the toothed wheel and have movement in a direction tangential to the periphery of the wheel, one leg of which member is longer than the other and constituting pawl pallets and arranged so that as the lever is moved in one direction the longer pallet will engage a tooth and advance the wheel, and when the lever moves in reverse direction the short pallet will engage a tooth and advance the wheel for the purpose specified, and a casing in which said mechanism is mounted and enclosed.

Signed at New York City, in the County and State of New York, this 12 day of June A. D. 1917.

HERBERT L. MERRICK.