

Sept. 25, 1928.

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W. A. DE HART
COUNTING MECHANISM

Filed Oct. 2, 1925

2 Sheets-Sheet 1

Fig. 1.

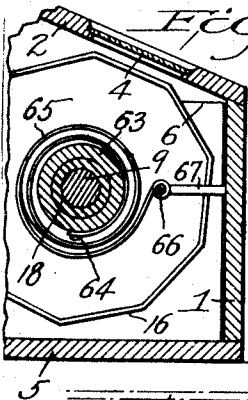
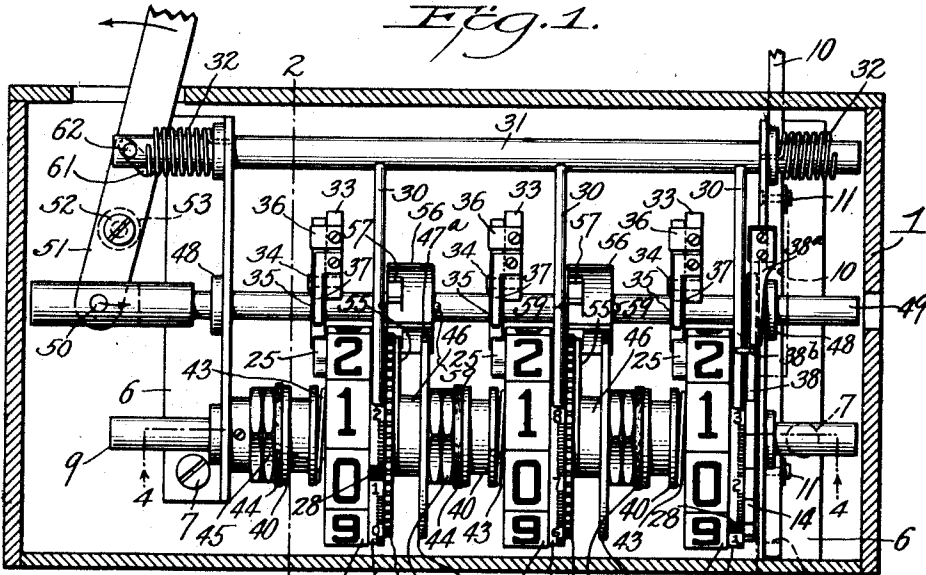
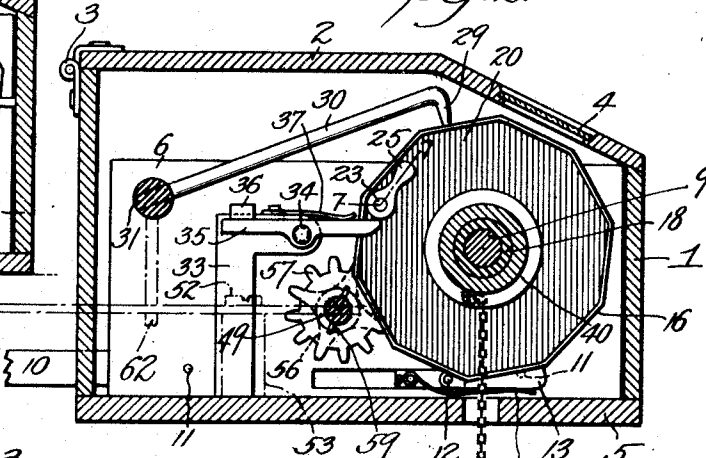


Fig. 10.

Fig. 2.



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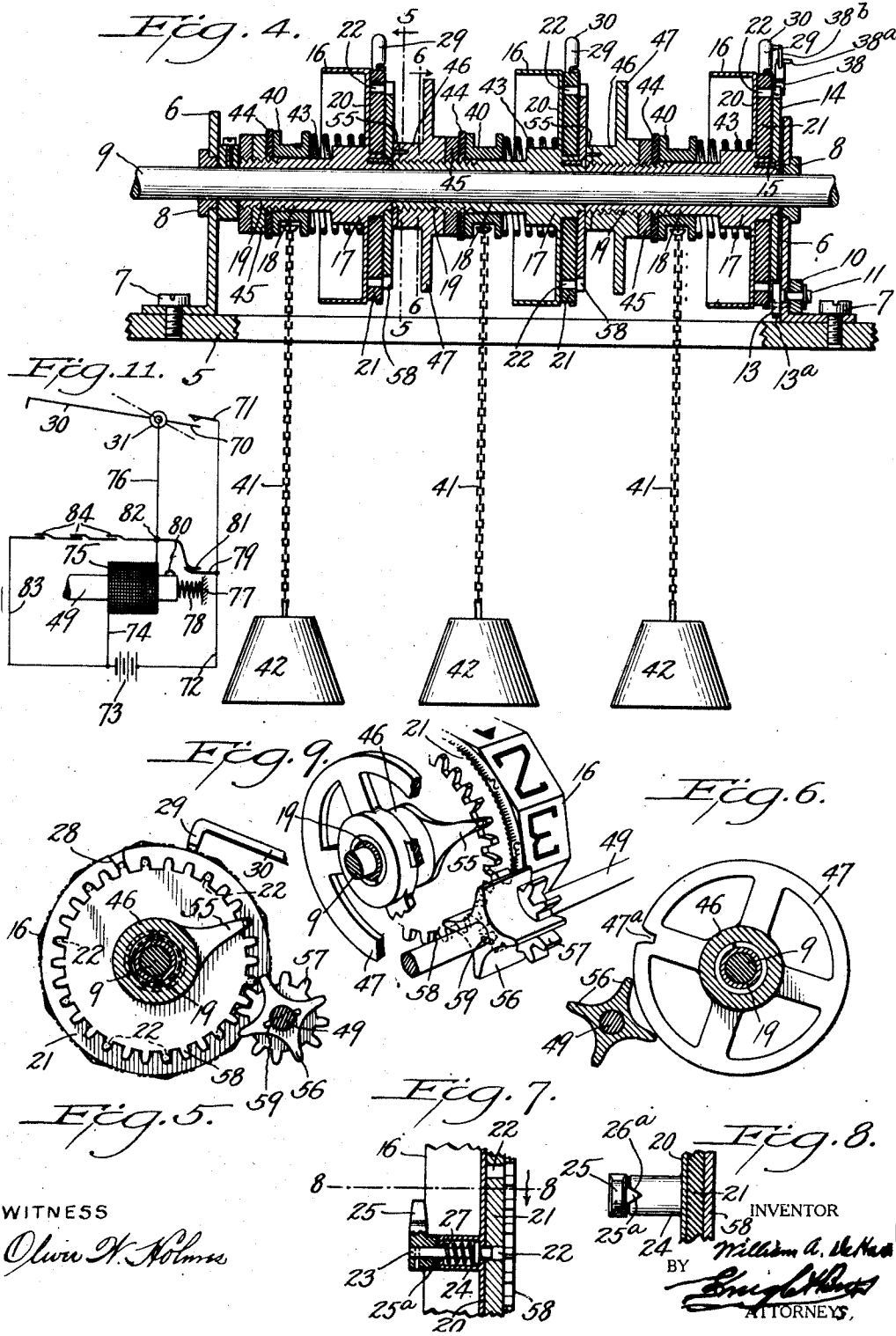
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2 Sheets-Sheet 2



WITNESS

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UNITED STATES PATENT OFFICE.

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COUNTING MECHANISM.

Application filed October 2, 1925. Serial No. 60,055.

This invention relates to counting mechanisms in general and in particular to that type of counting mechanisms in which certain automatic controls are related to the counting operation or in which the control of other mechanisms or machines are related to the counting operation.

The primary object of my invention is to provide an improved construction and arrangement of parts in mechanism of this character whereby an automatic control of the character referred to may be accomplished simply and effectively and automatically related to the prior counting operation.

Another object of invention is to provide a counting mechanism of improved construction according to which the counting units are automatically disconnected and separately returned to their initial positions from which they have been moved to a greater or less extent.

Another object of invention is to provide a releasable reduction gear of improved construction for transmitting power from one counting unit to the next and whereby the several counting units may be disconnected on the completion of a predetermined count and permitted to return to their initial positions.

Other and further objects will appear in the specification and be pointed out in the claims, reference being had to the accompanying drawings which show the adaptation of my invention to a preferred embodiment and a modification thereof.

In the drawings—

Figure 1 is a top plan view of the counting mechanism, the housing being shown in section;

Figure 2 is a section on the line 2—2, Figure 1;

Figure 3 is a section on the line 3—3, Figure 1, parts being broken away and parts shown in elevation;

Figure 4 is a section on the line 4—4, Figure 1;

Figure 5 is a section on the line 5—5, Figure 4;

Figure 6 is a section on the line 6—6, Figure 4;

Figure 7 is a fragmentary section on an enlarged scale, on the line 7—7, Figure 2;

Figure 8 is a detailed section on the line 8—8 of Figure 7;

Figure 9 is a perspective view showing the

operative connections between adjacent units of the counting mechanism;

Figure 10 is a fragmentary transverse section of a modification of the counting wheel shown in Figure 2 and

Figure 11 is a diagrammatic view of an automatic electrically actuated reset mechanism and controlling circuits therefor.

In the embodiment of my invention shown in Figures 1 to 9 inclusive, a suitable housing 1 is provided with a cover 2 hinged at 3 to the rear wall of said housing. Said cover is provided with a window 4 thru which the aggregate number of the count can be observed at any instant. As shown in Figure 4 a base member 5 serves to support spaced end frames or brackets 6, 6, which are secured to said base by means of screws 7 thru the base flanges of said end frames or brackets. Coaxially arranged bushings 8, 8 carried by end frames or brackets 6, 6, serve to mount a fixed shaft 9. Freely journaled upon the fixed shaft 9 and arranged end to end thereon, are a plurality of sleeves each of which comprises portions 17, 18 and 19 included in a series of similarly constructed counting units. In the embodiment of my invention shown on the drawings, there are three counting units which for convenience may be termed the first, second and third counting units.

Referring more especially to Figures 3 and 4, a reciprocatory bar 10 provided with slots 10^a cooperating with studs 11 for slidably supporting said bar, carries a bolt 12 upon which a pawl 13 is pivotally mounted. A spring 13^a presses the pawl 13 into engagement with a ratchet 14 secured by a set screw 15 to the enlarged portion 17 of the right-hand sleeve. The enlarged portion 17 of each of said sleeves carries a counting wheel comprising a number-carrying perimeter 16 which is supported upon and fixed to said enlarged portion 17 by a web 20.

Interposed between the web 20 and the ratchet 14, of the first counting unit and between the web 20 and spur gear 58 of the second and third counting units, is a setting disk 21 which may be variably adjusted with respect to the counting wheel and releasably secured thereto. For this purpose, said disk is provided with a circularly arranged series of holes or sockets 22. A bolt 23 (see Figure 7) which may be mounted in a suitable housing 24 which projects laterally from the web

20 adjacent to the numbered perimeter 16, is adapted to project into any one of said holes 22 with which it has been brought into register. A handle 25 is keyed to the bolt 23 and is provided with an inwardly presented wedge-shaped cam 25^a which normally rests within a wedge-shaped cam groove 26^a in the bolt housing 24. A spring 27 tends to retain the bolt 23 within the hole or socket 22, said bolt being retracted by the camming reaction between wedging elements 25^a and 26^a when the handle 25 is swung from normal position to permit the setting disk 21 to be moved to any desired position for predetermining which of the digits on the counting wheel corresponding thereto, will appear in the final number indicated.

As shown in Figure 3, the outer periphery of each setting disk is provided with a peripheral notch 28 which will be brought into register with the deflected end or detent 29 of a detector arm 30 carried by the oscillatory shaft 31. This position of registry between the detent 29 and notch 28 will occur sooner or later depending upon the set relation between the setting disk 25 and the number wheel 16. As shown in Figure 1, three detector arms 30 are arranged on a common shaft 31 which is oscillatably mounted in the end frames or brackets 6. The rock shaft 31 is provided at either end with a coil spring 32 which imparts a tendency to throw the detector arms 30 downwardly toward the axis of the counting wheel shaft 9. As shown best in Figure 2, a bracket 33 is mounted adjacent to each of the counting wheels 16, said bracket carrying a pin or pivot 34 upon which is pivotally mounted a latching lever 35, said latch being held against movement in a clockwise direction by means of a stop 36 rigid with the bracket 33. A leaf spring 37 bears against the other arm of said latch and tends to hold it against the stop 36. It will be seen from this description that as the laterally projecting handle 25 revolves in a clockwise direction according to Figure 2, the latch 35 will permit its continued revolution in this direction but will prevent a retrograde or anti-clockwise movement thereof. As the clockwise step by step movements are imparted to the first counting wheel 16 by the pawl 13, a dog or detent 38 which is pivotally mounted upon the pin 39, drags over the teeth of ratchet 14 and locks said ratchet against a retrograde movement. A spring 38^a tends to retain the dog or detent 38 in engagement with the ratchet 14 while a claw or hook 38^b carried by said dog or detent, is arranged to overhang the finger 30 so that when said finger is raised at the end of the counting operation, said dog or detent will be retracted from the ratchet 14. Freely journaled upon the intermediate portion 18 of the elongated hub of each counting wheel is a spool or drum 40 to which is connected a chain 41 for suspending

ing a weight 42 and upon which said chain may be wound by the rotation of counting wheel 16. Interposed between the spool or drum 40 and the web 20 of the counting wheel is a compression spring 43 which presses said spool axially against a fibre disk or washer 44 in lateral abutment with a lock nut 45. Said lock nut is threaded to the reduced portion 19 of the elongated hub and serves to axially locate the hub 46 of a notched wheel 47. It will be seen from Figure 6 that the wheel 47 is provided with a notch 47^a which periodically meshes with one or another of the rays 56 of a star-wheel to be presently referred to.

As shown in Figure 1, suitable bearings 48 are arranged in the end brackets 6 for reciprocally mounting a reset shaft 49 which is pivotally connected by a pin 50 to the lower arm of a lever 51 which is fulcrumed on a stud 52 at the upper end of a post 53. Said lever 51 may serve a variety of purposes and may be thrown by hand or automatically actuated by the counting mechanism in any suitable or desired manner, such, for example, as by the completion of an energizing circuit by the falling fingers 30 which may be employed to control an electro-responsive device for throwing said lever as hereinafter explained with reference to Figure 11 of the drawings.

Suitable transmission means may be arranged between the first and second counting wheels and the second and third counting wheels and so forth as follows. An inspection of Figures 1 and 4 will show that each wheel 47 is provided with a hub 46. Rigid with this hub 46 and projecting radially from the shaft 9 is an impulse finger 55 (see Figures 1, 5 and 9) which is presented alongside of a spur gear 58. Rotatably journaled upon the reciprocatory shaft 49 are two gears of peculiar construction, each comprising in the present embodiment a four-rayed star-wheel 56 at one end and a twelve-toothed spur gear 57 at the other end. It will be noted from Figures 1 and 9 that the spur gear portion 57 has a face of sufficient breadth to normally lie in the path of the impulse finger 55 while remaining in mesh with the adjacent spur gear 58, these being two of said spur gears 58 non-rotatably connected to the second and third counting wheels 16 respectively in positions corresponding to that of the ratchet 14 with respect to the first counting wheel 16. Each combined star-wheel and spur gear 56, 57 is axially confined on the shaft 49 by pins 59 which project radially from said shaft.

The impulse finger 55, between the first and second counting units, is revolved thru one complete revolution at each complete turn of the first counting wheel 16. In the present embodiment of my invention, each impulse imparted to the ratchet wheel 14 by the pawl 13 serves to move the first counting wheel far enough to add one to the right hand digit

shown below the window 4. This movement of the first counting wheel is accompanied by a movement of impulse finger 55 over an arc equal to thrice the circular pitch of the gear wheel 58 on the second counting wheel. It thus follows that at the end of a complete revolution of the first counting wheel 16, the impulse finger 55 operating thru star-wheel 56 and spur pinion 57, will have moved the second counting wheel into position to show its next higher digit below the window 4. It will thus take ten actuations of the first counting wheel 16 to change from one digit to another on the second counting wheel 16. Similarly, ten actuations of the second number wheel 16 will produce a revolution of the third number wheel, and so on.

From an inspection of Figure 1, it will be seen that the reset lever 51 is provided with an inclined slot 61 which slidably engages a radial arm 62 carried by the oscillatory shaft 31, there being a slight play between the arm 62 and the upper end of slot 61 so as to permit detents 29 of the detector arms to drop into the notches 28 in the corresponding adjustment disks 21 as soon as said detents 29 come into register with the peripheral notches 28 in the previously adjusted setting disks 21.

According to the modification shown in Figure 10, a spiral spring 65 may take the place of weight 42 for returning each of the spools or drums to initial position. Thus, the inner end of spiral spring 65 may be connected at 64 to a spool or drum 63 journaled upon the elongated hub of each counting wheel and having frictional engagement therewith as in the preferred form above described. The outer end of each of said spiral springs may be connected to a pin 66 carried by a post or bracket 67, which projects from an adjacent portion of the housing.

As shown in Figure 11, the oscillatory shaft 31 may carry a contact arm 70 which is adapted to engage a stationary contact 71 when the detector arms 30 fall at the end of a counting operation. Leading from said stationary contact 71 is a wire 72 which is connected to one pole of a battery 73. The other pole of said battery is connected by a wire 74 to a solenoid 75, another wire 76 leading from said solenoid to the oscillatory shaft 31. The solenoid 75 may be disposed about one end of the reciprocatory shaft 49 which carries the combined star-wheel spur-pinion members 56, 57. Interposed between the end of shaft 49 and a fixed support 77, is a compression spring 78 which tends to hold the reciprocatory shaft 49 in its extreme left-hand position according to Figure 1. A spring contact 79 which is connected to wire 72, is suitably disposed to be engaged by a lug 80 on the end of shaft 49 whenever said shaft is shifted toward the right by the energization of solenoid 75. When thus engaged, contact 79 is moved into engagement with a contact 81. It will be seen

therefore that as soon as solenoid becomes energized by the closure of contacts 70 and 71, the resultant shifting of reciprocatory shaft 49 operates to close the contacts 79 and 81 whereby the energization of solenoid 75 is maintained independently of contacts 70 and 71 thru a circuit including battery 73 and solenoid 75. For this purpose, the contact 81 is connected at 82 to wire 76. Leading from battery 73 is a wire 83 which includes a series of normally open spring contacts 84, 84, 84 which may be disposed in suitable positions to be closed by latch stop levers 35 (see Figure 2) which operate as stops for intercepting the setting handles 25 on the return movements of the respective counting wheels 16. It will thus be understood that the energizing circuit for solenoid 75 which is first completed thru contacts 70 and 71 and later maintained thru contacts 79 and 81, is finally short-circuited thru spring contacts 84 and contacts 79 and 81.

Operation.

As the counting operation proceeds, a step by step rotation imparted to each counting wheel 16, produces a similar movement in the winding drum 40, power being transmitted by friction thru the fibre disk or washer 44. A movement of any one of the spools or drums 40 elevates the corresponding weight 42 or tightens the spiral spring 65 as the case may be. In the event that one or more of the weights 42 have reached their upper limit or where one or more of the springs 65 have been wound to their limit, continued rotation of the counting wheels 16 produces a slippage between the friction disks 44 and the spool or drums (40 or 63). As each counting wheel reaches its final position, the notch 28 in the setting disk 21 attached thereto will be brought into position below the crooked end or detent 29 of the detector arm 30 corresponding thereto. As soon as all setting disks have reached their final positions with their notches 28 arranged below their corresponding detector arms 30, said arms drop together into said notches. The resulting angular movement of oscillatory shaft 31 under the action of springs 32, 32, closes contacts 70 and 71 and thus completes the energizing circuit which includes battery 73 and solenoid 75. At once, there is a movement of reciprocatory shaft 49 toward the right which removes each of the spur pinions 57 out of mesh with spur gear 58. This movement also operates thru slot 61 and pin 62, to throw detector arms 30 out of engagement with notches 28 and into dotted line position shown in Figure 11. This action releases each of the counting wheels 16 which is immediately reset by being returned to initial position under the action of weight 42 or spiral spring 65. At the same time, the movement of shaft 49 toward the right closes contacts 79 and 81 and establishes the maintenance circuit thru battery 73 and solenoid

75. It will be understood that the return movement of each of the number wheels 16, is terminated positively and accurately by the stop latch 35 which intercepts the handle 25 by means of which the setting disk is prearranged with respect to said counting wheel. It will be seen also that under all conditions, the potential energy residing in the raised weights 42 or wound springs 65, will be sufficient to return said counting wheels to a positively located zero position with the ciphers displayed beneath the sight glass 4. As said counting wheels are brought to rest with handles 25 in abutment with latches 35, contacts 84, 84, 84, (see Figure 11) are closed, thus completing a circuit including contacts 79 and 81, battery 73, and said contacts 84, 84, 84. This lower resistance circuit short circuits solenoid 75 and hence permits reciprocatory shaft 49 to be returned to normal position. As shown in Figure 1, this return movement of shaft 49 will impart a clockwise movement to lever 51 which permits the detector arms or levers 30 to drop into engagement with setting disks 21 respectively under pressure of the springs 32. At the same time, spur pinions 57 are again placed into mesh with their respective spur gears 58 which completes the reset of the counting mechanism.

I claim:—

1. In counting mechanism of the character described, a counting wheel, a winding-drum, a yieldable driving connection between said counting wheel and winding drum, an impulse wheel, a ratchet for driving said counting wheel, a detent normally holding said counting wheel from its return movement, a friction disk interposed between said winding drum and impulse wheel, a setting disk adjustably secured to said counting wheel, a detent movable into and out of engagement with said setting disk, and means operated by the second-mentioned detent for operating the first-mentioned detent to release said counting wheel for its reset movement.

2. In counting mechanism having a plurality of counting units, a freely-journalled sleeve, a counting wheel mounted on said sleeve, a winding-drum freely journalled upon said sleeve, an impulse wheel carried by said sleeve and axially-spaced from said winding drum, a friction disk interposed between said winding drum and impulse wheel, and a helical spring interposed between said counting wheel and said winding drum for yieldably thrusting the latter against said friction disk.

3. In counting mechanism having a plurality of counting units, a counting wheel shaft, a counting wheel carried thereby, a friction disk mounted on said shaft and held against axial displacement thereon, a winding-drum freely journalled upon said shaft and contacting at one end with said friction disk, a compression spring interposed between said

counting wheel and the other end of said winding drum, a releasable connection for transmitting power to the counting unit of the next higher order, a setting disk adjustably secured to said counting wheel, a detent movable into and out of engagement with said setting disk, and means operated by the movement of said detent for releasing said releasable connection.

4. In counting mechanism having a plurality of counting units, a counting wheel, a winding-drum freely journalled with respect to said counting wheel, an impulse wheel axially-spaced from said winding drum, said impulse wheel being secured to the hub of said counting wheel and provided with a peripheral notch, a star-wheel provided with rays successively engaging the notched impulse wheel, a drive gear for a counting unit of the next higher order, a pinion integral with said star-wheel and meshing into said drive gear, said pinion and star-wheel being movable axially for demeshing the former from said drive gear, a friction disk interposed between said winding drum and impulse wheel, a helical spring interposed between said counting wheel and said winding drum for yieldably pressing the latter against said friction disk, an impulse finger non-rotatably connected to said impulse wheel for periodically engaging said star-wheel, a setting disk adjustably secured to said counting wheel, and means under the control of said setting disk for imparting an axial displacement to said pinion and star-wheel.

5. In counting mechanism having a plurality of counting units, a rotary sleeve, a counting wheel secured to said sleeve, means for returning said counting wheel to initial position when released, an impulse wheel secured to said counting wheel and provided with a peripheral notch, a star-wheel provided with rays successively interengaging with said notch, a drive gear for a counting unit of the next higher order, a pinion integral with said star-wheel and meshing into said drive gear, said pinion and star-wheel being movable axially for demeshing the former from said drive gear, an impulse finger non-rotatably connected to said impulse wheel for periodically engaging said star-wheel, a setting disk adjustably secured to said counting wheel, said setting disk being provided with a peripheral notch, a detent movable into and out of engagement with said notch, and means operated by the movement of said detent for imparting an axial movement to said pinion and star-wheel.

6. In counting mechanism having a plurality of counting units, a counting wheel, an impulse wheel provided with a peripheral notch, a freely-journalled winding-drum axially-interposed between said wheels, means for frictionally connecting said winding drum to said impulse and counting wheel, a

star-wheel provided with rays successively engaging said notched impulse wheels, means driven by said star-wheel for imparting impulses to the counting wheel of the next higher order, and an impulse finger non-rotatably connected to said impulse wheel for periodically engaging said star-wheel.

7. In counting mechanism of the character described, the combination with a rotary sleeve, of a counting wheel mounted thereon, a power-transmitting impulse wheel mounted on said sleeve and rotatable with said counting wheel, means for returning said counting wheel to initial position, a setting disk secured to said counting wheel, said setting disk being provided with a peripheral notch, an oscillatable shaft, a detector arm carried thereby and adapted to engage in said peripheral notch, a reciprocatory shaft, means carried by said reciprocatory shaft and movable into and out of position to transmit power from said impulse wheel to a counting wheel of higher order, a solenoid for reciprocating said reciprocatory shaft, and an energizing circuit for said solenoid under the control of said detector arm.

8. In counting mechanism, a counting wheel, a winding drum coaxial with said counting wheel, said winding drum being rotatable with and relatively to said counting wheel, a yieldable driving connection between said counting wheel and winding drum, a setting disk adjustably connected to said counting wheel, and means releasably connected to said winding drum under the control of said reset disk for controlling the resetting of said counting wheel.

9. In counting mechanism, a freely journaled shaft, a counting wheel mounted on said shaft, a winding drum freely journaled on said shaft, a yieldable driving connection between said counting wheel and the adjacent end of said winding drum, a setting disk adjustably connected to said counting wheel, power-transmitting means between said winding drum and a counting wheel of higher order, said power-transmitting means including a releasable connection, and means under the control of said setting disk for operating said releasable connection.

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