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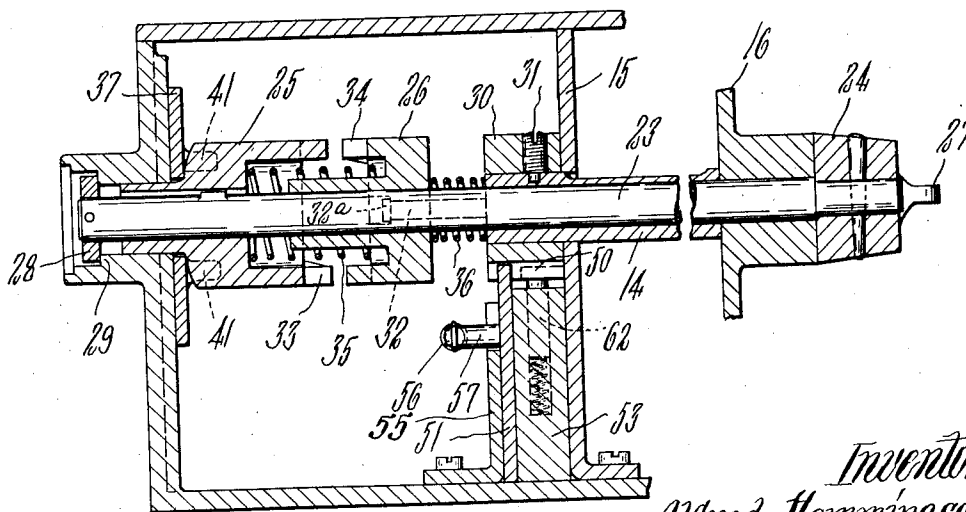
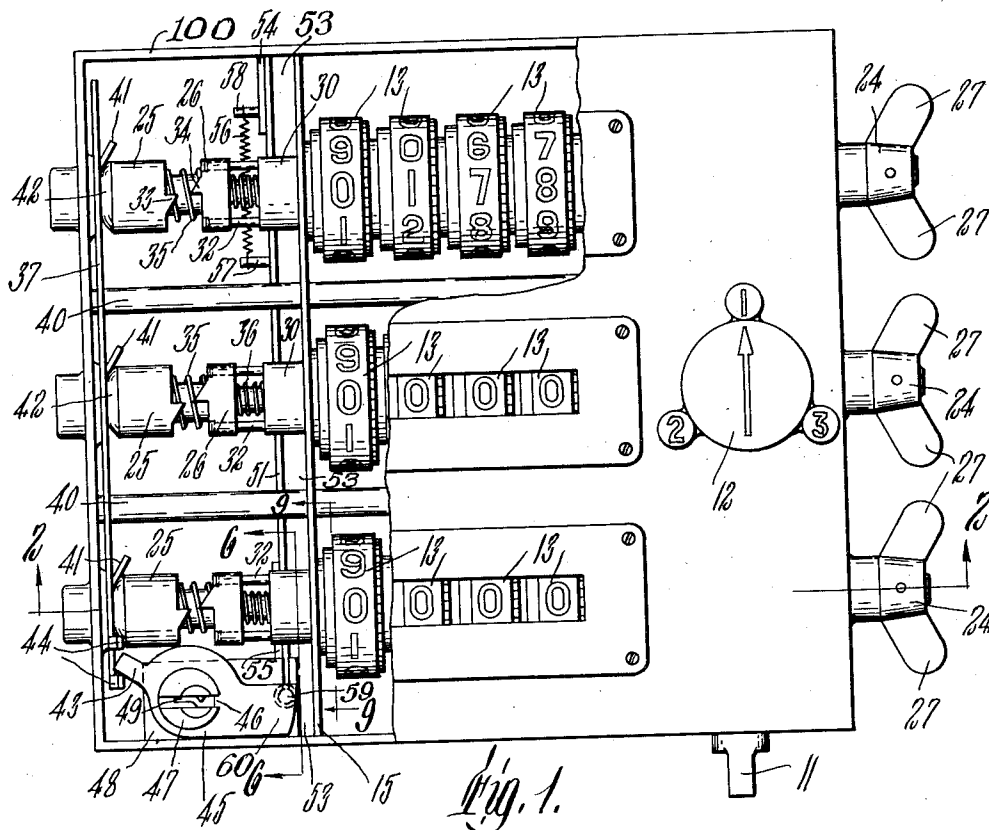
A. HEMMINGSON

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RESETTING MEANS FOR COUNTERS

Filed Dec. 11, 1936

2 Sheets-Sheet 1



Inventor
 Alfred Hemmingson
 by Wright, Brown, Smith & Tracy
 Attys.

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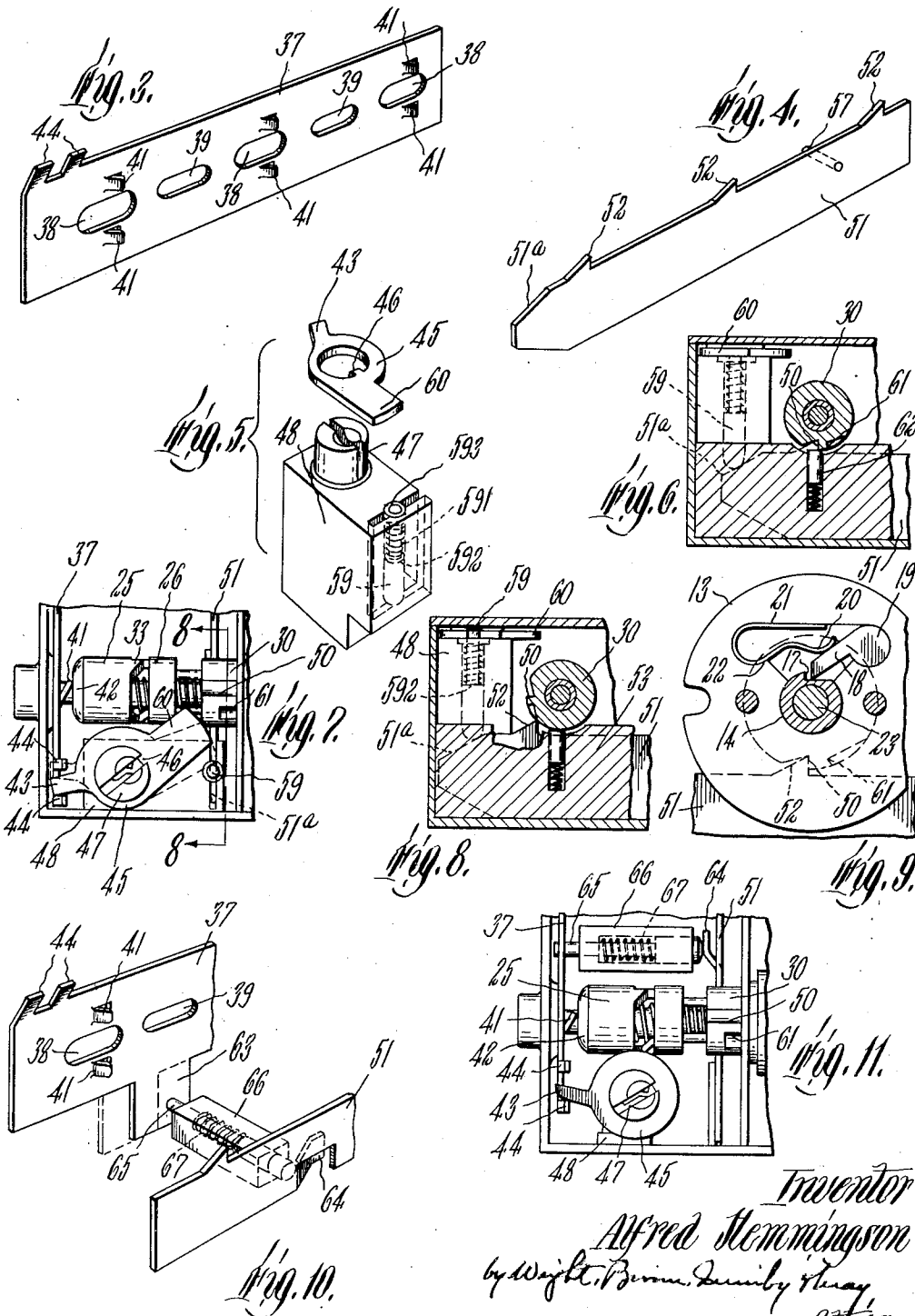
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2 Sheets-Sheet 2



Inventor
 Alfred Hemmingson
 by Wright, Pinner, Denny & Gray
 Attys.

UNITED STATES PATENT OFFICE

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RESETTING MEANS FOR COUNTERS

Alfred Hemmingson, Cambridge, Mass., assignor
to Waltham Watch Company, Waltham, Mass.,
a corporation of Massachusetts

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14 Claims. (Cl. 235—144)

Counting machines are used in many situations to add and indicate the number of operations made by a machine or an operator in a given length of time, and at the end of that time are reset to zero preparatory to making a similar count of operations during the next working period. One such use is in connection with looms operated successively and in rotation by or under the control of different weavers. Counters made for this use and similar uses are provided with two or more sets of duplicate counting wheels or members adapted to be coupled selectively with a single driving connection from the loom, and each set of counting wheels (or counting unit as it may be called) is appropriated exclusively to indicating the work done under the control of one of the weavers who operate the same loom in rotation. In loom operation the count is made in terms of thousands of picks of filling placed in the cloth.

It has been found necessary heretofore to provide a lock for preventing operation of the means for setting the counting indicator to zero by any one except an authorized official entrusted with a key to such locking means or by some one under the supervision of such official, in order to prevent operation of the resetting means by the weaver in such a way as to show a count larger than the true number of picks placed in the cloth, in cases where the pay of the weaver is based on the number shown by the counter. But such locks have not been wholly effective, for ways have been discovered of advancing the counting disks when in locked condition. One mode of doing this, effective with the commonly used type of counter in which the resetting means is a shaft passing axially through the counting wheels and formed with a longitudinal shoulder arranged to impart rotation to the wheels through pawls carried by the latter, is by striking the exposed handle of the resetting shaft a sharp sudden blow. Even though the shaft be locked against turning, it still has enough torsional elasticity to turn slightly under a sufficiently intense application of force, and, when such motion is imparted suddenly, to jolt one or more of the number wheels a full step forward.

The object of this invention is to make impossible any such tampering with a counter; and to do so by eliminating the previously used reset lock. Accordingly in carrying the invention into effect, I have provided as the manipulable element of the resetting means an external handle and connected shaft which are free to rotate independently of all other parts except when in

coupled resetting connection with the counting wheels; and have provided a normally disconnected clutch between such shaft and the counting wheels, together with key operated means by which the clutch may be coupled prior to resetting. I have also provided related accessories for insuring pick up and forwarding of all the number wheels of the counter in resetting, and for preventing the resetting clutch from being left in the coupled condition when the supervisor's control key is withdrawn, as explained in detail in the following specification.

In the drawings—

Fig. 1 is a front elevation of a plural counter embodying this invention, the front or cover wall being partly broken away to show the resetting clutches and their control means;

Fig. 2 is a sectional view on line 2—2 of Fig. 1, the counting wheels being omitted and the resetting shaft and sleeve being represented as shortened by breaking out of an intermediate portion;

Fig. 3 is a perspective view of the cam slide by which the resetting clutches are coupled;

Fig. 4 is a perspective view of a slide by which the number wheels are turned backward after being set to zero, in order to insure forwarding in a subsequent resetting operation;

Fig. 5 is a perspective view of a key operated lever and the key controlled cylinder by which it is turned, for shifting the clutch controlling slide;

Fig. 6 is a detail sectional view taken on line 6—6 of Fig. 1;

Fig. 7 is a fragmentary plan view of the key operated lever and adjacent parts showing means for preventing release of the resetting clutch prior to placement of the number wheels in zero position;

Fig. 8 is a sectional view taken on line 8—8 of Fig. 7;

Fig. 9 is a detail sectional view on an enlarged scale taken on line 9—9 of Fig. 1;

Fig. 10 is a perspective view, and Fig. 11 a plan view, of means alternative to that shown in Figs. 1 and 7 for preventing premature disengagement of the resetting clutch.

Like reference characters designate the same parts wherever they occur in all the figures.

The counter here shown is one having three counting units adapted to serve for separately registering the work done by three shifts of operators. These counting units are essentially alike and a description of one will suffice for all. They are driven selectively from a shaft 11 (Fig. 1),

one end of which protrudes from the casing of the counter for connection by any suitable means with a moving part of the machine of which the operations are to be counted. A knob 12 on the front of the case may be locked in either of three positions in which it causes exclusive connection of one or another of the counting units with the drive shaft. The means for thus selectively connecting the counting units with the drive do not constitute any part of the present invention, hence are not shown herein, and may be of any suitable character.

Each counting unit comprises a series of four, more or less, counting wheels 13 rotatably mounted in axial alinement and associated with toothed driving wheels and carrying mechanism by which one step of rotation is imparted to each wheel of higher order when the next wheel of lower order has completed one rotation. The wheels which exhibit the numbers on their circumferential faces are advanced by their respective driving gears through one way clutch devices which permit them to be moved independently in the same direction by the resetting means, whereby they may be placed in zero indicating position. Known and commercially used driving gears, transfer mechanism, and forwarding clutches are used in this counter, wherefore they need not be, and are not, shown in these drawings. Illustrations of mechanisms substantially like that used here are shown in many prior patents, of which Stosick 1,566,628, December 22, 1925, may be mentioned as an example.

In order to set the wheels in the zero indicating position they are moved ahead in the same direction in which they are turned in counting. The means for doing this consists of a sleeve 14 (Figs. 2 and 9) on which the number wheels and their propelling gears are rotatably mounted. Said sleeve is rotatably supported in bearings in walls 15 and 16 of the casing, or other suitable supports. It is freely rotatable itself and is normally disconnected from both the driving and the resetting means. It is provided with a longitudinal ledge or shoulder 17 (Fig. 9) which cooperates with a pawl 18 carried by each number wheel, to turn the wheels in one direction, while the pawl is so arranged that it may slip freely over the shoulder when turned in the normal manner by the driving mechanism for counting. The pawl is located in a recess in the number wheel, which recess opens into the bearing for the sleeve 14. A cylindrical enlargement 19 of the pawl, fitting an arcuate offset of the recess, forms a pivot for the pawl. A leaf spring 20 confined between the bounding wall 21 and a shoulder 22 of the recess bears on the pawl and holds it yielding in contact with the surface of sleeve 14.

The resetting means comprises a shaft 23, a handle 24 and complementary clutch members 25, 26 connected respectively with this shaft and with the sleeve 14. Shaft 23 is coaxial with the sleeve 14, in which it has a rotative bearing. Upon one of its ends, which protrudes from the casing, is secured the handle 24 having wings 27 for convenience in the manual application of torque. This shaft is freely rotatable, but is restrained from movement endwise. Various means for thus restraining it may be used, one of which is here shown illustratively (in Fig. 2) as consisting of a collar 28 pinned to the shaft and seated against a shoulder 29 within a recessed boss on the end wall of the casing opposite to that against which the handle hub abuts. Clutch member 25 is coupled to the shaft by a spline, or a pin and

slot connection, or any other means suitable to permit relative axial movement and transmit rotative movement. The complementary clutch member 26 is free to slide and rotate on the shaft and is connected to the sleeve 14 by means equivalent to a splined connection. Such means in the present illustration consist of a collar 30 secured by a key 31 to the inner extremity of sleeve 14, and guide rods 32 secured to this collar at diametrically opposite points and projecting parallel to the shaft into passageways in clutch member 26, in which they fit slidably. The clutch members 25 and 26 are provided with complementary ratchet teeth 33 and 34, respectively, formed to transmit movement from the shaft to the sleeve in the direction for advancing the counting wheels, and to slip idly past one another when the shaft is turned backward.

A spring 35 between the clutch members tends constantly to withdraw member 25 from member 26, and a spring 36 between clutch member 26 and the collar 30 holds the latter member in the location established by heads on the extremities of the guide rods 32 seated in counterbored enlargements of the passages through the member 26 in which such rods are contained. One of such heads and the shoulder which abuts against it are clearly shown by broken lines 32a in Fig. 2. Spring 36 is considerably stronger than spring 35 in order to retain the clutch member 26 in this position when the member 25 is advanced in the manner presently described for coupling; but is adapted to yield to permit slipping of the ratchet-like teeth past one another if the shaft is turned backward while the member 25 is in coupling location. The stopping means embodied in the heads on the guide rods 32 is one of a variety of equivalent means for the purpose, others of which may be used without departure from the protection claimed herein.

A cam or wedge slide 37 is employed to couple the clutches. It is confined between the outer ends of the clutch members 25 of the several counting units, and bosses inwardly protruding on the adjacent wall of the casing. It has slots 38 through which the resetting shafts of the several counting units pass, and intermediate slots 39 through which structural rods 40 pass. These slots, shafts and rods guide the movements of the slide. On the slide at each side of each slot 38 are wedges 41 suitably arranged with respect to the beveled end faces 42 of the clutch members 25 to shift these members from the uncoupled position shown in Fig. 1 to the coupled position shown in Fig. 7 when the slide is moved endwise. In other words the wedges are substantially clear of the clutch members which they respectively control when the slide is at one limit of its movement, and are brought between the abutting bosses on the casing wall and the ends of said clutch members when the slide is at its other limit of movement.

Conveniently the slide is cut from stiff sheet metal and the wedges 41 are made by partially severing and bending up tongues from the substance of the slide; the material being thick enough to make the wedge tongues adequately stiff. This, however, is an optional construction and the wedges may be made otherwise if desired.

The slide is shifted between its above described positions by a key-operated lever having an arm 43 which extends between two lugs 44, or equivalent abutments, on the slide. Said lever arm projects from a ring 45 (Fig. 5) which surrounds and has a keyed connection, by means of a lug 46, 75

with a cylinder 47 which is mounted rotatably in a block 48 suitably secured to, or made as an integral part of, the casing within the bounding walls thereof. Such cylinder has a slot 49 adapted to receive a key and so arranged that such key may be inserted from the outside of the casing. It is equipped with means of known character to exclude all except the key or keys by which it is designed to be operated, to be turned only when such key is fully inserted, and to permit removal of the key only when the cylinder has been returned to starting position. Any of the familiar types of cylinder lock may be used at this point.

When the clutch of any counting unit is connected and the resetting handle turned in the right direction, the associated sleeve 14 is turned with it and the shoulder 17 strikes the ends of all of the number wheel pawls lying in front of it (successively in the case of wheels more advanced than others) until at the end of one revolution it places all the wheels in the zero indicating position. It is important when this action takes place that all of the wheels be so moved; any which may happen at that time to be in the zero position as well as all the others, in order to avoid imparting a forward step by the carrying mechanism to any such zero indicating wheel. Such a stepping forward might take place if, at the end of the counting period, a wheel should have been advanced nearly to the zero position, but not quite far enough to bring the toe of its pawl in front of the forwarding shoulder 17. Loose fitting of the parts and backlash in the tens-carrying mechanism may, and usually does, cause the wheels thus brought in the counting operation approximately to the zero position, to stop with their forwarding pawls 18 a few degrees back of the location to which the shoulder 17 is brought in resetting; wherefore the toes of such pawls would rest on top of the forwarding shoulder instead of in the space in front of the shoulder, if the latter were allowed to remain in that location.

I have insured against this result by providing means for turning the forwarding sleeve 14 backward through a sufficient angle, automatically, as soon as the handle 24 is released after resetting. This means consists of a ratchet tooth 50 (Figs. 6 and 8) formed by the radial face of a V-shaped notch in the circumference of the collar 30 of each forwarding sleeve, and a pawl slide 51 having pawl projections 52 to cooperate with the ratchet teeth in the respective counting units. This pawl slide is slidably mounted in a position transverse to the axes of the counter. It is confined between an abutment rib 53 on the one side and fixed guides 54, 55 at the other side. In this design the abutment rib extends all the way across the casing and the guides 54 and 55 are located in the corners between the opposite end walls and the back of the casing. A spring 56 stretched between an anchor pin 57 on the slide and a pin 58 on the guide 54 normally holds the pawl projections in engagement with the ratchet teeth of the several units, which later are so arranged that when they are so engaged (as shown in Fig. 6), the forwarding shoulder 17 is sufficiently retracted from the pawls of all the number wheels in zero position (substantially as shown in Fig. 9). The pawl slide then abuts against the upper side wall 100 of the casing (Fig. 1). The wall of the notch opposite to the ratchet tooth is so inclined as to overlap somewhat the ratchet teeth when in the position indicated by Figs. 6 and 9, whereby

the pawl is prevented from reentering it, after having once been displaced by the ratchet tooth in its rotation, until the collar has been turned through somewhat more than a complete rotation, i. e., a complete rotation plus an excess angle equal to the desired retraction of the forwarding shoulder. Turning of the collar 30 by the associated resetting means causes the ratchet tooth to push the pawl projection out of the way, where it is held by the circumference of the collar until the resetting rotation has been completed. Then the adjacent pawl projection slips into the space in front of the ratchet tooth and, when the operator releases the setting handle, turns the sleeve backward.

The pawl slide 51 serves also to prevent the counter being left, after resetting, with the number wheels showing what is called a "split figure". The term "split figure" indicates the condition where a counter stops with a space between two figures in central register with the sight opening, or nearly so, whereby the lower part of one number and the upper part of the next number are exposed to view at the same time. Two forms of means for doing this are shown here. The preferred form, shown in Figs. 1 and 4-8 inclusive consists of a stop pin 59 cooperating with an arm 60 projecting from the key-operated lever 43. The pin is mounted to move endwise in the block 48 which contains the key cylinder in a position such that one end may be protruded from the surface of the block over which the arm 60 lies. A spring 591, surrounding a part of the pin and reacting between a shoulder 592 on the pin and a washer 593 secured in the upper face of the block normally retracts the pin. The pawl slide 51 has a beveled edge 51a at its forward end extending beneath the pin and confined within a slot in the block. The dimensions of these parts are such that, when the pawl slide is retracted, the extremity of pin 59 is withdrawn flush with the upper surface of the block, whereby the arm 60 may pass over it without obstruction; and the wedge incline 51a is of such value that, when the ratchet tooth 50 is turned only a few degrees, i. e., little, if any, more than the angle of backing off previously described, and less than enough to move the number wheels half way from "0" to "1" the pin is projected far enough to obstruct arm 60. This arm in turn is disposed at one side of the pin when the wedge slide 37 is in the clutch coupling position, (see Fig. 7), which enables the pin to be thus projected. Arm 60, even though it may be loosely associated with the key cylinder, is held by the cover of the case, or other equivalent restraining means, so that it cannot ride over the end of the pin when the latter has been projected even slightly. When thus obstructed, the lever arms 60 and 43 can be returned only as far as the dotted line positions shown in Fig. 7, and this is not far enough to move the wedges 41 clear of the clutch member 25. As the key cannot be withdrawn until turned back to the first position, due to the tumblers with which the cylinder 47 is provided, the pawl slide thus prevents the counter from being left with its wheels appreciably displaced from the zero indicating position.

The ratchet tooth 50 cannot be turned backward to release the pin 59 from its obstructing position, because a second ratchet tooth 61 on the collar 30 and a cooperating spring-pressed plunger 62 in the casing positively stop the collar in the course of a retrograde movement (counterclockwise with respect to Figs. 6 and 8) before the

space beside the ratchet tooth 50 has been brought to the position where it admits the cooperating pawl projection 52. This second ratchet tooth is wholly in a zone of the collar at one side of the pawl slide, as shown in Fig. 7, wherefore it does not obstruct or interfere in any way with the pawl 52. Its angular displacement from tooth 50 around the axis of the collar and the location of the spring pressed plunger are so determined that these members will be interengaged, or interengageable, before the number wheels can be turned as much as one tenth of a rotation beyond the zero position in order that the wheels may not be left showing a row of 1's for instance. While this device is ordinarily unnecessary, because when the clutch members move with their normal freedom, the member 26 cannot be reversely rotated, nevertheless conditions may arise where, due to friction or other cause, the inclined faces of the teeth may not slip past one another in backward movement. But the tooth 61 and plunger 62 provide a safeguard against fraudulent setting of the counter.

Alternative means for preventing premature release of the clutch is shown in Figs. 10 and 11. Here the cam slide 37 has a depending lug 63 and the pawl slide 51 has a wedge element 64 extending laterally toward the cam slide. Between the two slides is a plunger 65 guided in a block 66 which is rigid with the back of the casing. A spring 67 in the guide block 66 reacts on the latter and presses on the plunger so as to hold one end against the pawl slide and its opposite end clear of the lug 63. The lug 63 lies across the end of the plunger 65 when the cam slide is in the idle or retracted position, and is shifted to one side of the plunger when the slide is advanced for coupling the clutches, as shown by broken lines in Fig. 10. The wedge 64 travels in a path crossing the adjacent end of the plunger and is at one side of the plunger when the pawl slide is in the normal position, but travels across the plunger, as shown in Fig. 11, when this slide is retracted by the pawl tooth 50 and the major part of the circumference of collar 30 in the act of resetting. The wedge then shifts the plunger far enough to bring the advancing end of the latter across the plane of the wedge slide close beside the advanced lug 63, thus preventing the cam slide from being retracted until the pawl slide has been retracted.

Although the slides 37 and 51 cooperate with all of the counting units in the manner described, it is not an essential of the invention that they do so. It is of advantage from the point of view of simplicity to control all of the counting units by the same key and by a single combined clutch operating member and shoulder-backing member. Fraudulent, surreptitious setting of any other unit when the key is used to prepare a given unit for resetting is made impossible because the key cannot afterward be withdrawn unless all of the units are in zero indicating position.

The casing in which the counters and their operating means are confined may be of any desired design and construction, provided only that it is equipped with suitable supports, bearings and guides for the various moving parts adapted to hold such parts in place and permit their prescribed movements. The cover or other closure which prevents access to these parts after they have been assembled may be fastened and sealed in any one of many ways suitable to prevent fraudulent opening and tampering with the counter by a dishonest workman.

What I claim and desire to secure by Letters Patent is:

1. The combination with a counter having number wheels and a shouldered forwarding sleeve coaxial with said wheels, of resetting means comprising a shaft passing through said sleeve and rotatable therein, a clutch for coupling said sleeve and shaft together, force applying means acting on said clutch with uncoupling tendency, and means for actuating the clutch in opposition to said force applying means to couple the shaft and sleeve together.

2. The combination with a counter having independently rotatable indicating elements and a forwarding member engageable therewith for turning them to the zero indicating position, of a zero setting means comprising a freely rotatable manually operable member normally disconnected from the forwarding member, and rotatable in either direction independently of the forwarding member through more than a complete rotation, and means for putting said manually operable member into rotation transmitting connection with the forwarding member.

3. The combination with a counter having independently rotatable indicating elements and a forwarding member engageable therewith for turning them to the zero indicating position, of a zero setting means comprising a freely rotatable manually operable member, a normally disconnected clutch between said manually operable member and said forwarding member, and key operated means for coupling said clutch.

4. The combination with a counter having independently rotatable indicating elements and a forwarding member engageable therewith for turning them to the zero indicating position, of a zero setting means comprising a freely rotatable manually operable member, means for temporarily connecting the manually operable member and forwarding member for torque transmission from one to the other, and automatic means for turning the forwarding member backward when the indicating elements have reached zero position.

5. The combination with a counter having indicating wheels mounted side by side in coaxial alignment, each having a forwarding pawl, and a rotatable element surrounded coaxially by said wheels having a forwarding shoulder located to engage said pawls and advance the wheels when turned in one direction, a collar on said rotatable element having a circumference coaxial with the element and a single notch of which one boundary forms a ratchet tooth, a slidable spring actuated pawl arranged to enter said notch and bear on said tooth to hold the rotatable element normally in a position where its forwarding shoulder is retracted from the forwarding pawls when the indicating members are in zero position, a freely rotatable zero setting member and normally disconnected clutch means operable to couple said setting member with said rotatable element.

6. The combination with a counter having indicating wheels, a rotatable forwarding member on which said wheels are coaxially and rotatably mounted, having a longitudinal forwarding shoulder, the indicating wheels having pawls arranged to be engaged by said shoulder and to advance the wheels when the rotatable element is turned in one direction, a zero setting member rotatably independently of said rotatable element, a normally disconnected clutch between said member and element adapted to be con-

5 nected for transmission of rotation from the former to the latter in that direction only which causes forward propulsion of the indicating means, a key operated clutch connector movable
10 by rotation of the operating key so as to couple the clutch, and means operated by said rotatable element for preventing return of said clutch connector into the position which permits uncoupling of the clutch when said rotatable element is in any position except that corresponding to the zero position of the indicating wheels.

15 7. A counter having indicating wheels and a rotatable element for advancing said wheels into zero position, combined with a rotatable zero setting member, an automatically disconnectible clutch between said setting member and rotatable element adapted to transmit rotation from the former to the latter in only the direction which causes forwarding of the indicator wheels into
20 zero position, a shiftable clutch connector movable in one direction to effect coupling of the clutch and in the opposite direction to permit uncoupling thereof, and means operable by said rotatable element to prevent movement of said connector into the last named position after movement of the rotatable element has been initiated by the zero setting member and until said element has attained the zero setting position.

30 8. A counter including indicating wheels and a rotatable element engageable with said wheels in one direction of rotation only for forwarding the wheels to zero indicating position, a pawl and ratchet device arranged to give a limited backward rotation to said rotatable element from the zero position automatically, a second pawl and ratchet device arranged to prevent backward rotation of the rotatable element to starting position after having been advanced through an angle great enough to displace the pawl member of the first pawl and ratchet device, a zero
40 setting member normally unconnected with the rotatable element, a slide shiftable between two positions, in one of which it causes connection of the setting member with the rotatable element and in the second of which it causes disconnection, and means controlled by the first said pawl and ratchet device for preventing shifting of the slide to said second position when the rotatable element is in any position except that corresponding to zero position of the indicating wheels.

50 9. In a counter, the combination with counting wheels and a rotatable forwarding element, of an independently rotatable zero setting member, complementary one way clutch elements in splined engagement with the forwarding element and the setting member respectively, a spring tending to separate said clutch elements, and a cam slide having wedge means engaging one of said clutch elements and operable when moved in one direction to shift said clutch element into cooperative relation with the complementary clutch element.

60 10. In a counter, the combination with a rotatable counter forwarding element and an independently rotatable setting member, of complementary clutch members connected to the setting member and rotatable element respectively, one of which is shiftable into and out of driving relation to the other, a cam slide movable to cause

shifting of said clutch element into and out of coupled position, a key-operated member rotatable by an inserted key to shift said cam slide into clutch-coupling position and back, a pawl slide cooperating with the forwarding member to be displaced when the latter is in any position except that corresponding to zero indicating position of the counter, and means whereby said pawl slide prevents return of the key-operated member into the position which causes uncoupling of the clutch.

11. In a counter having number wheels adapted to be advanced for resetting, a normally disconnected, manually rotatable clutch, a key-operated member movable in one direction to couple said clutch whereby it may be manually moved to set the counter, and means operated by the clutch in the course of its setting movement to prevent return of said key-operated member to first position.

20 12. In a counter having indicating wheels mounted side by side and a rotatable element surrounded coaxially by said wheels, said element and wheels having cooperative means for advancing the wheels when the element is rotated in one direction, a collar on said element having a circumference coaxial therewith and a notch of which one boundary forms a ratchet tooth, a slide having a pawl projection adapted to enter said notch and to be displaced by said tooth when said element is rotated in the wheel-forwarding direction, and a spring acting on said slide with force application in the direction opposite to the movement which is imparted to the slide by said tooth.

35 13. In a counter having indicating wheels mounted side by side and a rotatable element coaxial with said wheels having means for rotating the wheels when turned in one direction, a collar on said rotatable element having a circumference coaxial therewith and a single notch of which one boundary forms a ratchet tooth, a slide guided to move transversely of said rotatable element and having a pawl projection adapted to enter said notch and bear on said tooth, a spring engaged with said slide to exert force thereon in the direction opposite to the movement imparted to the slide by said tooth, whereby the pawl projection is caused to enter said notch when the rotatable element has approximately completed one rotation, the ratchet tooth and pawl projection being so related that the rotatable member is turned reversely by the pawl projection in its spring-propelled movement after entering the notch.

55 14. In a counter having number wheels adapted to be advanced for resetting, resetting means including a normally disconnected manually rotatable clutch, a clutch coupler shiftable to cause coupling and uncoupling of said clutch, a key-operated member, operatively connected with said clutch coupler for placing the latter in its different clutch-controlling positions, and means operated by said resetting means in the course of its movement when resetting the wheels, for preventing return of said key-operated member to its first position.

ALFRED HEMMINGSON.