D. E. SCRAFFORD.

INDICATING MECHANISM.

APPLICATION FILED MAY 11, 1908.

947,948. **Patented Feb. 1, 1910.**

Fig. 1.

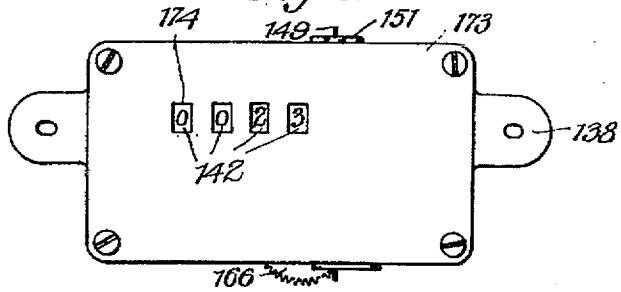


Fig. 2.

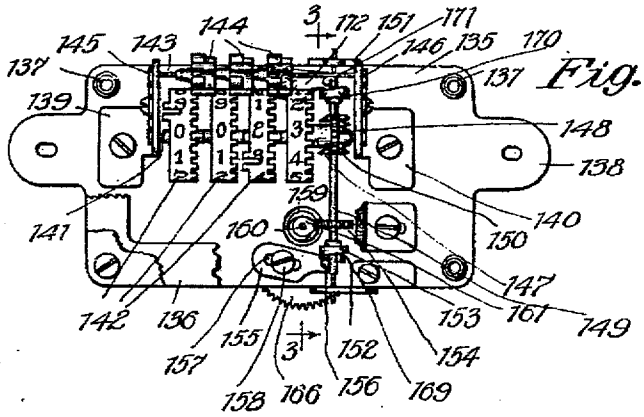


Fig. 3.

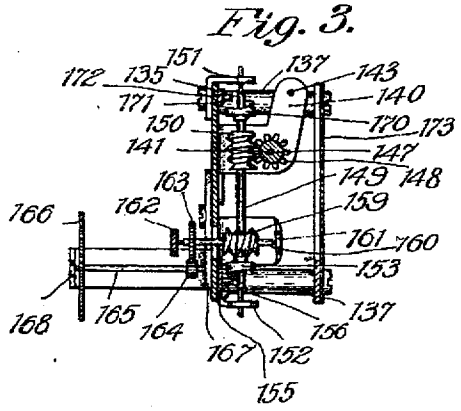
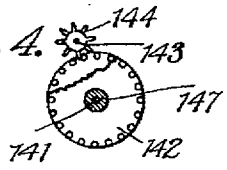


Fig. 4.



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UNITED STATES PATENT OFFICE.

DANIEL E. SCRAFFORD, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO WILLIS ELECTRIC METER COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

INDICATING MECHANISM.

947,948. Specification of Letters Patent. Patented Feb. 1, 1910.

Application filed May 11, 1908. Serial No. 432,303.

To all whom it may concern:

Be it known that I, DANIEL E. SCRAFFORD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Indicating Mechanism, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to indicator mechanism, particularly to indicator mechanism for use on measuring instruments, such as meters.

My invention may be considered as an improvement over the indicator mechanism disclosed in my application Serial No. 331,957, filed August 25, 1906, and allowed March 13, 1908. The register mechanism in this co-pending application is more especially adaptable for use in connection with gas meters or other meters in which the driving torque can be made considerable.

The device of my present invention is more adaptable for use in electric measuring instruments, such as electric watt meters, where the driving force for the indicating mechanism should be as small as possible. The arrangement of the various parts of the device is therefore somewhat modified, in order that very little driving force is necessary. The counting, or order wheels, are arranged in a horizontal row, and the driving worm is mounted on an arbor which is in an upright position, preferably vertical, the worm being connected directly with a pinion carried by the units order wheel. The worm wheel arbor carries a spiral cam which travels on a cam roller, so that the weight of the arbor is always supported from the frame of the indicating mechanism and the only power necessary will be that which causes rotation of the arbor, and this power is extremely small.

In the accompanying drawings illustrating my invention, Figure 1 is a front view of the indicating mechanism; Fig. 2 is a front view with the cover and parts of the framework removed; Fig. 3 is a sectional view taken on plane 3—3 of Fig. 2, and Fig. 4 is a view showing the arrangement of a carry over wheel with reference to the order wheels.

The supporting protecting frame comprises the rear plate 135 and the front U-shaped supporting frame 136 connected with the rear plate by means of posts 137. The rear plate has the supporting lugs 138, by means of which the mechanism may be supported from the frame of a meter. Extending forwardly from the rear plate are the supporting brackets 139 and 140. Supported on these brackets at an intermediary point is the arbor 141, on which are loosely pivoted the various order wheels 142. Supported in the ends of the brackets is a second shaft or arbor 143, on which are loosely pivoted the various carry over wheels 144. The two arbors just mentioned pass through openings in the brackets, and to secure the arbors in place end plates 145 and 146 are secured to the brackets to cover the openings after the arbors are inserted. Extending from the units order wheel is a sleeve 147, carrying a driving pinion 148. To the rear of this pinion is the upright or vertical arbor 149, carrying the worm 150, which meshes with the driving pinion 148. The arbor 149 engages at its ends in openings provided in supporting brackets 151 and 152 secured to the upper and lower edges respectively of the rear plate. Near the lower end of this arbor is secured the spiral cam 153, and above this cam is mounted a pinion 154. Pivoted to the end of a supporting piece 155 is the cam roller 156, this supporting piece having the slot 157 and being secured by means of screw 158 to the rear plate, the position of the cam roller being thus adjustable with reference to the spiral cam. A second worm 159 is carried on arbor 160, which is pivoted in brackets 161 and 162, secured respectively to the front and rear of the rear plate, as shown. At its outer end this arbor mounts the pinion 163 which engages with another pinion 164 mounted on the inner end of the arbor 165, which carries at its outer end the main gear 166. When the indicating mechanism is secured in proper position on the meter structure, this main gear 166 will mesh with a worm suitably connected with the movable element of the meter in a manner well known in the art. The arbor 165 is pinioned in brackets 167 and 168 secured in any suitable manner to the supporting structure.

It is desirable to slot all these various supporting brackets, and to secure them by means of screws, so that they may be moved to give the desired adjustment to the various arbors or other members supported thereby.

The main gear transmits its rotation through the gear train described to the worm 159 and to the pinion 154 and driving arbor 149. Upon rotation of the arbor 149, the spiral cam 153 travels over the cam roller to lift the arbor at the same time that it is rotating. The pitches of the spiral cam and the worm wheels and pinion 148 are so adjusted that this upward movement of the arbor 149 will not cause rotation of the pinion 148, and consequently the counting train will not be moved during such longitudinal movement of the driving arbor. When, however, the abrupt offset 169 of the spiral cam reaches the cam roller, the force of gravity will cause the arbor to drop. During this dropping of the arbor, which is practically instantaneous, the worm 150 will not rotate, and will therefore act as a gear rack with reference to the pinion 148 engaged thereby, and this pinion and the units order wheel will consequently be rotated, the drop of the shaft being such that the units wheel will be rotated one division. Only sufficient power must be provided the main driving gear to cause the driving arbor to be rotated until the spiral cam has raised the arbor to its upper position; the force of gravity then acting upon the arbor and the various members supported thereby will be the force which will operate the counting mechanism, and this force can be made sufficient to operate a plurality or all of the counting wheels, the counting wheels, as is well known, sometimes moving simultaneously as during a carry-over period. To assure return movement of the arbor 149 after it has been raised sufficiently by the spiral cam, I mount a second spiral cam 170 at the upper end of the arbor, which coöperates with a cam roller 171 pivoted to the adjustable supporting member 172. The adjustment is such that if after the offset of the lower spiral cam has passed the roller 156, the arbor 149 does not drop but keeps on moving upwardly, the upper spiral cam member will come into engagement with its cam roller and the arbor given a downward impetus, to cause it to drop to its normal position. Thus, the operation of the indicating mechanism is always assured without the necessity of applying a weight to the arbor, as is the case in my copending application referred to, such weight imposing an unnecessary burden and calling for greater driving power, which, as before stated, should be cut down as low as possible in electrical instruments, particularly watt meters. As shown in Fig. 1, a front plate or cover 173 is provided having the sight openings 174 which register with the order wheels. If desired, the sides and ends of the frame may also be inclosed in any suitable manner.

The indicating mechanism which I have described is very efficient for registering the work of electrical watt meters. A very small fraction of the power of the meter moving element is necessary to cause efficient operation of the indicating mechanism and the required power is constant, irrespective of the number of order wheels operated, the force of gravity as described being the driving force directly controlling the operation of the counting mechanism, the power derived from the meter being used only for causing rotation of the driving arbor to gradually raise this arbor by means of the cam mechanism. The connection of the driving arbor with the order wheels is also as direct as possible, there being therefore very little lost motion or power. The construction and arrangement of the various parts is very simple and efficient, provision being made for close and accurate adjustment. I do not wish to be limited, however, to the precise form and arrangement shown, as modifications are possible which would still come within the scope of my invention.

I desire to secure the following claims by United States Letters Patent:

1. In indicating or registering mechanism of the class described, the combination of a supporting frame, indicating order members arranged in a row on said frame, an upright driving spindle, a worm on said spindle, a pinion connected with the order wheels and meshing with the worm, means connected with said upright spindle for causing rotation thereof, means for causing upward longitudinal movement of the spindle during rotation thereof, said upward movement adapted to prevent rotation of the engaged order wheels, and a cam mechanism for causing restoration of the spindle after a predetermined amount of upward movement thereof, said order wheels being driven upon such downward movement of the spindle.

2. In indicating or registering mechanism of the class described, the combination of a supporting frame, a plurality of indicating order wheels arranged in a row on said frame, a pinion connected with one of said order wheels, a worm meshing with said pinion, an upright spindle supporting said worm, a spiral cam on said spindle, a cam roller for said spiral cam, means for rotating said spindle whereby said spindle will be moved bodily in one direction, said upward movement adapted to prevent rotation of the pinion by said worm, a cam mechanism for restoring the spindle to its normal position after a predetermined amount of bodily movement thereof, said re-

turn movement of the spindle causing rotation of the order wheels.

3. In an indicating or registering device of the class described, the combination of a supporting frame, an indicating rotary member, a pinion connected with said member, a vertical spindle, a worm on said spindle for meshing with the pinion, means for continuously rotating said spindle, cam mechanism rendered operative upon rotation of the spindle to raise the spindle, said upward movement of the spindle adapted to prevent movement of the indicating member, and a cam mechanism causing said spindle to return to its normal position after a predetermined amount of bodily movement thereof, said return movement adapted to cause said worm wheel to drive the pinion and indicating member.

4. In a registering or indicating device of the class described, the combination of an upright spindle, a worm on said spindle, a gear meshing with said worm, indicating or registering mechanism connected with the gear, means adapted for connection with a driving source and having connection with the spindle to cause rotation thereof, cam mechanism carried by the spindle, associate cam mechanism carried by the frame, said cam mechanism becoming effective upon rotation of the spindle to cause longitudinal upward movement of the spindle, said upward movement adapted to prevent rotation of the gear and indicating mechanism by the rotary movement of the spindle, said cam mechanism being adapted to suddenly release the spindle to allow sudden return thereof to its normal position, said gear being rotated by the worm upon such sudden return movement of the spindle to its normal position, a second cam carried by the spindle, and associated cam mechanism carried by the frame, said second cam adapted to force the return movement of said spindle to its normal position.

5. In a registering or indicating device of the class described, the combination of a supporting frame, indicating or registering mechanism supported on said frame, a driving gear for said indicating or registering mechanism, a vertical spindle, a worm on said spindle meshing with the driving gear, a gearing train connected with the spindle and adapted for connection with a driving source whereby the spindle may be rotated, a spiral cam carried by the spindle, a cam roller carried by the frame, said spiral gear and cam roller being relatively adjustable, rotation of the spindle and relative movement of the spiral cam and cam roller causing said spindle to be raised, the pitches of the spiral gear, worm and driving gear being such that the driving gear will not be rotated upon such rotary and vertical movement of the spindle, said cam being adapted to suddenly release the spindle to allow it to suddenly restore to its normal position by the force of gravity, said driving gear being rotated by the worm upon restoration of the spindle whereby the indicating mechanism is actuated, a second cam carried by the spindle, and associated cam mechanism carried by the frame, said second cam mechanism adapted to force the return movement of said spindle to its normal position.

6. In a registering or indicating device of the class described, the combination of a vertical rotary member, means for gradually displacing said member during a predetermined amount of rotation thereof, a cam mechanism for insuring the return of said member to its initial position at the end of said predetermined amount of restoration, and indicating or registering mechanism having connection with the rotary member but operated only by the return movement of said member.

7. In registering or indicating mechanism of the class described, the combination of a supporting frame, a horizontal row of indicating order wheels, a common shaft for said order wheels, a driving gear connected with one of said order wheels, carry-over mechanism associated with the order wheels, a worm engaging the driving gear, a vertical spindle supporting said worm, means for causing rotation of said spindle, means for raising said spindle at a certain rate during rotation thereof, said upward movement of the spindle preventing rotation of the driving gear by the worm, means for suddenly releasing the spindle to allow it to return to its normal position, said gear being rotated by the worm during such sudden return movement of the spindle whereby the indicating order wheels are actuated, and a cam mechanism for insuring the return of said spindle to its normal position.

8. In indicating or registering mechanism of the class described, the combination of a supporting frame, a horizontal shaft supported on said frame, a row of order wheels mounted on said shaft, carry-over gears associated with the order wheels and forming therewith an indicating mechanism, a driving gear connected with the units order wheel, a worm meshing with said driving gear, a vertical spindle supporting said worm, a spiral gear on said spindle, an adjustable cam roller carried by the frame, means for rotating said spindle to cause the cam to travel over the roller and thereby to cause the spindle to be raised, the adjustment being such that the driving gear will not be rotated during the combined rotational and upward movement of the spindle, said spiral cam being adapted to suddenly release the spindle after a predetermined amount of upward movement thereof.

whereby said spindle falls to its normal position, said driving gear being rotated during the restoring movement of the spindle to cause indication on the order wheels, a second spiral cam carried by the spindle, and a second adjustable cam roller coöperating with the second spiral cam to cause the spindle to move downwardly after a predetermined amount of upward movement thereof by the first spiral gear and cam roller.

In witness whereof, I hereunto subscribe my name this 7th day of May, A. D. 1908.

DANIEL E. SCRAFFORD.

Witnesses:

CHARLES J. SCHMIDT,

GEORGE E. HIGHAM.