

W. C. REED.
PAWL AND RATCHET MECHANISM.
APPLICATION FILED DEC. 1, 1910.

1,165,902.

Patented Dec. 28, 1915.
3 SHEETS—SHEET 1.

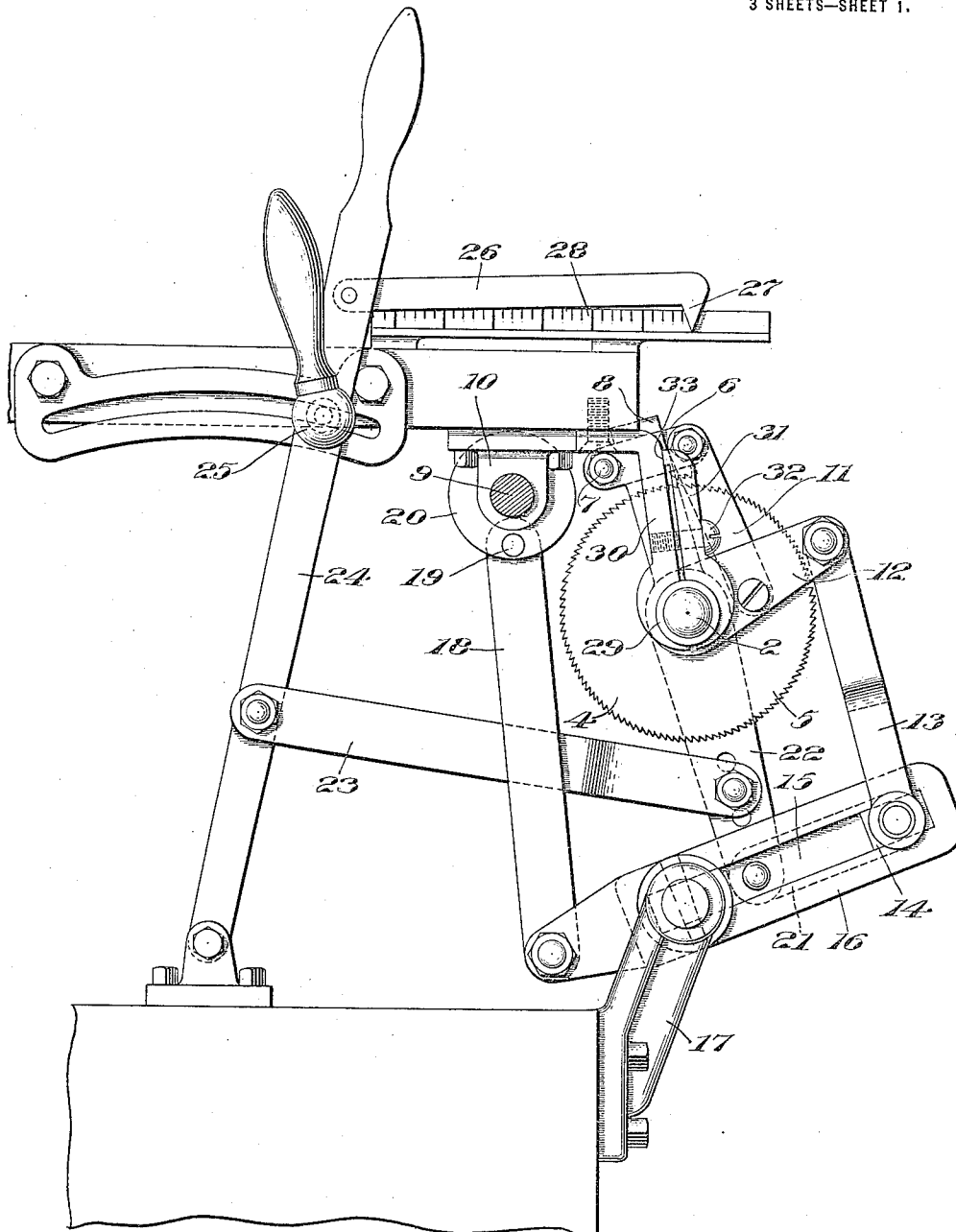


Fig. 1.

Witnesses

Adolph C. Kaiser
Joseph T. Brennan

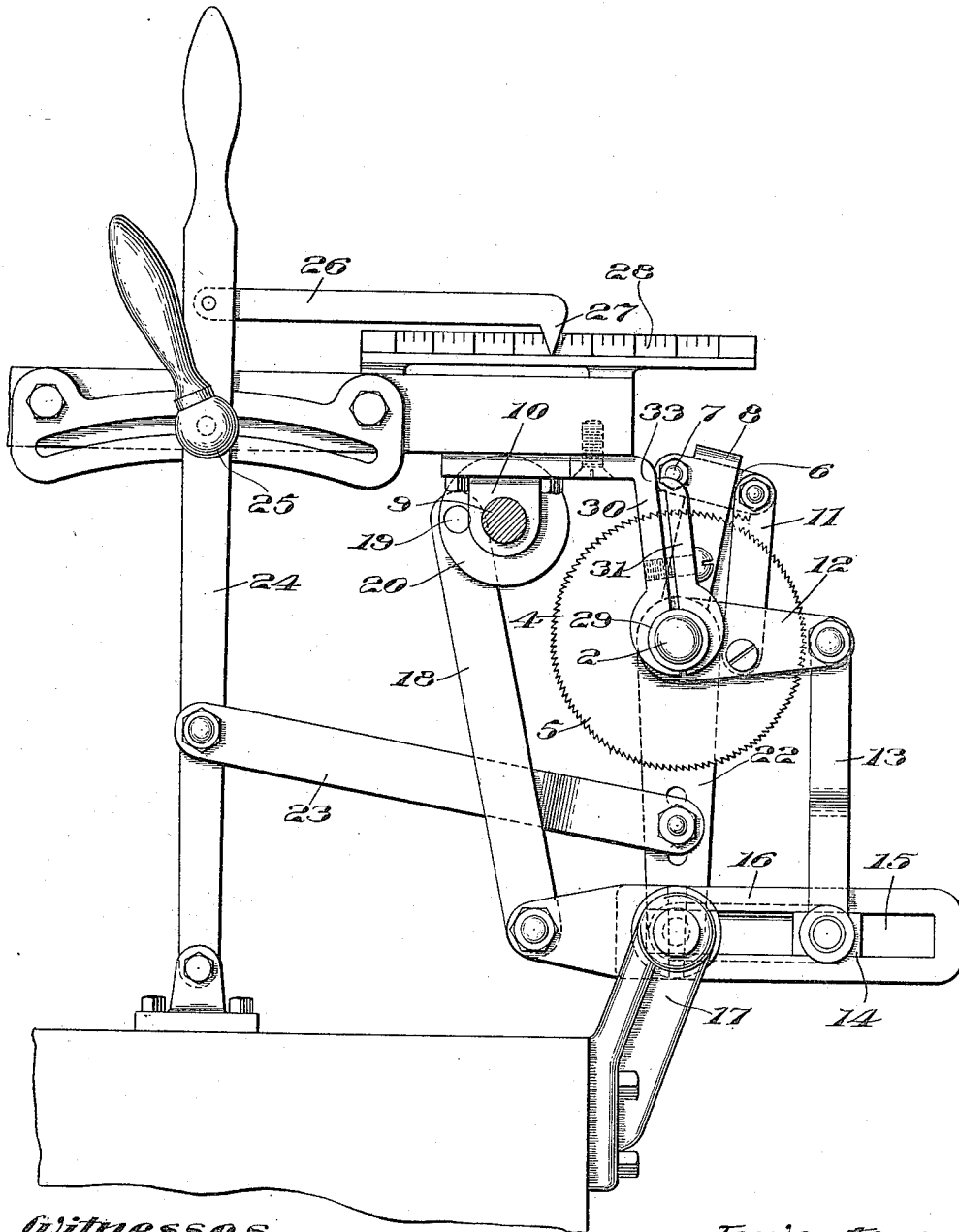
Inventor:

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By E. D. Chadwick,
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3 SHEETS—SHEET 2.



Witnesses.
Adolph C. Kase *Fig. 2.*
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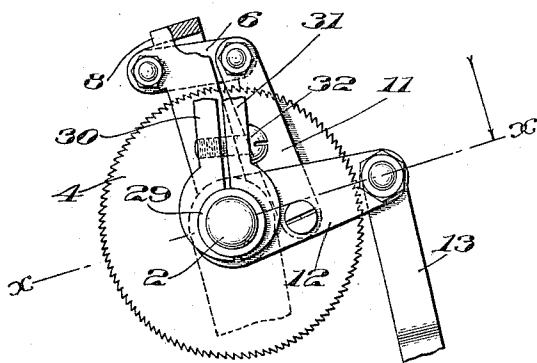


Fig. 4.

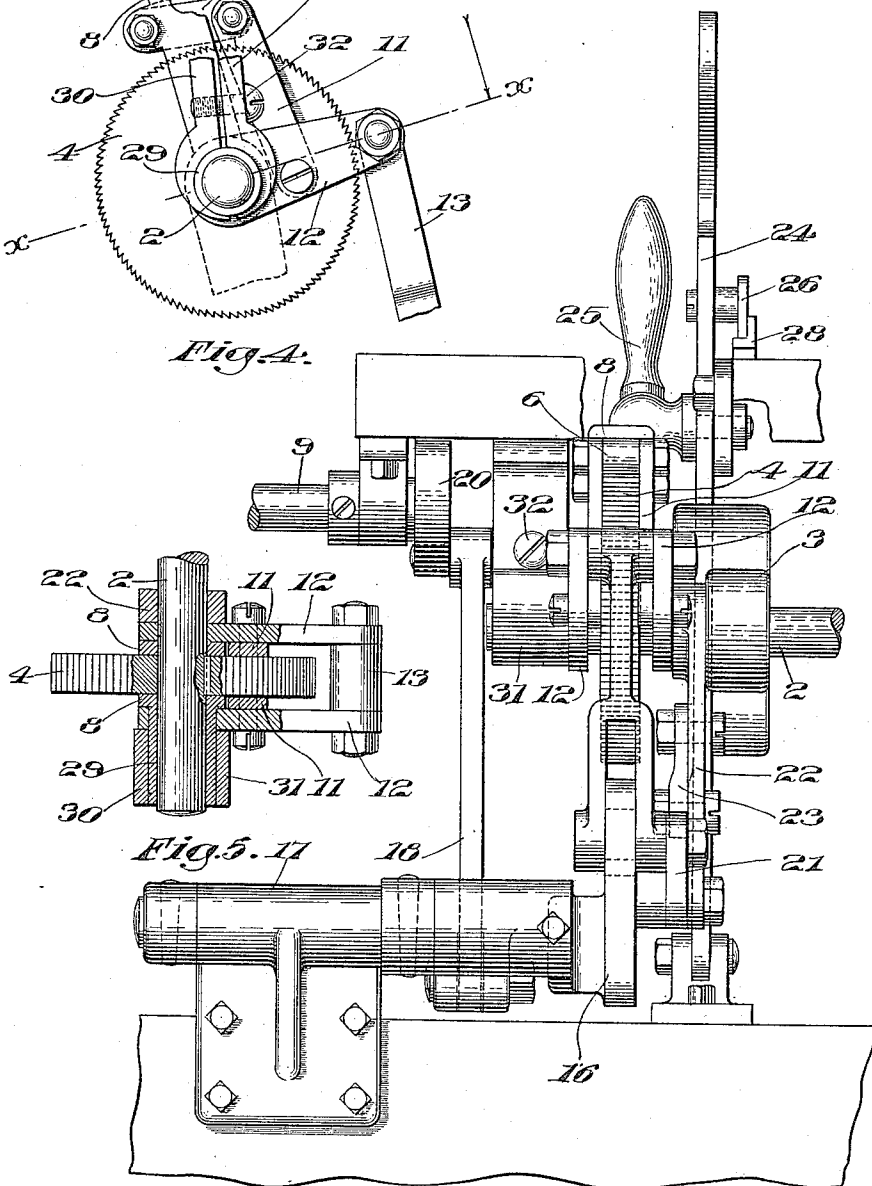


Fig. 5.

Fig. 3.

Witnesses.

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UNITED STATES PATENT OFFICE.

WALTER C. REED, OF DALTON, MASSACHUSETTS, ASSIGNOR TO THE TELELECTRIC COMPANY, OF PITTSFIELD, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

PAWL-AND-RATCHET MECHANISM.

1,165,902.

Specification of Letters Patent.

Patented Dec. 28, 1915.

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To all whom it may concern:

Be it known that I, WALTER C. REED, a citizen of the United States, and resident of Dalton, in the county of Berkshire and State of Massachusetts, have invented certain new and useful Improvements in Pawl-and-Ratchet Mechanisms, of which the following is a specification.

This invention relates to mechanisms of the pawl and ratchet type such as are employed in various kinds of apparatus for imparting a step-by-step movement to some portion or element of the apparatus, and is intended to improve upon prior mechanisms of this character in respect to certainty and exactness of operation and capacity for accurate adjustment and regulation of the extent of the step-by-step movement imparted thereby.

An embodiment of my invention suitable for imparting step-by-step rotational movement to a shaft is illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of the mechanism as preferably constructed; Fig. 2 is a similar view showing the parts in another position; Fig. 3 is an edge view of the parts shown in Fig. 2 as viewed from the right of the latter figure; Fig. 4 is a detail view, partly broken away, showing the pawl and ratchet members; and Fig. 5 is a sectional view on the line $x-x$ of Fig. 4.

In the drawings the shaft to which the step-by-step movements are imparted is shown at 2, this shaft being journaled in a suitable support such as 3 secured to the frame-work of the apparatus in connection with which the mechanism is employed.

The ratchet member consisting of a wheel 4 having circumferential teeth 5 is rigidly secured to the shaft 2, and the pawl 6 is pivoted as at 7 to a pawl carrier 8 preferably consisting of a U-shaped frame the arms of which embrace the ratchet wheel 4 and are pivotally mounted on the shaft 2 or concentrically therewith, the pawl 6 being located between the arms of the carrier adjacent to the periphery of the wheel 4.

The pawl 6 and its carrier are oscillated forward and backward by means of connections between the same and a driving member such as a shaft 9 journaled in a support 10 and driven by any suitable means (not shown), and these connections are so

constructed and combined with the pawl 55 and carrier that they not only impart the desired forward and backward movements thereto but also positively force the pawl into engagement with the teeth of the ratchet and hold it there during the forward movement of the latter, being broadly differentiated in this respect from pawl and ratchet mechanisms of the usual construction, in which the driving member positively operates the pawl carrier only, while the pawl is moved into engagement with the ratchet by means of a spring or by gravity only.

The connections above referred to may be constructed and combined with the pawl and pawl carrier in a variety of different ways, but preferably, as in the construction illustrated, these connections comprise two links 11 pivoted at their upper ends to the pawl 6 on opposite sides of the latter and at their lower ends to a pair of arms 12 mounted to turn on the shaft 2 and pivotally connected at their free ends to another link 13, to which reciprocating movements are imparted when the driving shaft 9 is rotated.

In order that the step-by-step movements imparted to the ratchet 4 and shaft 2 may be varied in extent as desired, the reciprocation of the link 13 is preferably accomplished by pivotally mounting in its forked lower end a block 14 adapted to slide in a longitudinal guideway 15 formed in a lever 16, which lever is pivotally mounted on a suitable fixed support 17 and is connected by a link 18 to a crank pin 19 on a disk 20 carried by the driving shaft 9. The rotation of said shaft will thus result in oscillating the lever 16, and the arms 12 will be oscillated thereby to an extent determined by the position of the block 14 in the guideway 15. This position is adjusted as desired by pivoting said block 14 on one side of the lever 16 to a link 21 which is pivoted to an arm 22 mounted to turn on the shaft 2 and connected by another link 23 to a hand lever 24 having a locking clamp 25, whereby the block 14 can be moved into any desired position in the guideway 15 and there securely held. An arm 26 connected to the hand lever 24 and having a pointer 27 arranged to slide along a fixed scale 28 may be provided for determining the adjustment of the mechanism.

That part of the lever 16 in which the guideway 15 is formed is preferably offset from the remaining parts of said lever in the direction of its pivotal axis, as shown in Fig. 3, so that the guideway can be extended to a point opposite the end of said axis, the advantage gained by this arrangement being that the block 14 can be slid along the guideway to a point where it will have no up-and-down movement when the lever 16 is oscillated, thus providing for any desired variation of the throw of the pawl carrier, from zero up to the maximum throw resulting when the block 14 is at the outer end of the guideway 15.

It will be evident that a downward movement of the links 11 in the construction above described will tend to move the pawl carrier 8 forward, and in order to insure the engagement of the pawl 6 with the ratchet teeth 5 before any forward movement of the pawl carrier takes place, I prefer to provide said pawl carrier with a frictional resisting device such as is shown in detail in Figs. 4 and 5, in which 29 represents a thimble mounted to turn on the shaft 2 and connected to one of the arms of the pawl carrier 8, so as to move therewith. That part of said thimble which projects laterally beyond the pawl carrier is held in a friction grip between two clamps 30 and 31, of which the clamp 30 is secured to the supporting framework while the other clamp 31 is held against the clamp 30 by means of a set screw 32. Said clamp 31 has a projection 33 at its upper end which bears against the clamp 30 and provides a fulcrum, so that the tightening of the screw 32 will cause the ends of said clamps to grip the thimble 29 as firmly as may be desired, thus tending to hold the pawl carrier stationary but permitting it to be moved when sufficient force is applied thereto. The clamps 30 and 31 also provide an additional support for the shaft 2.

As thus constructed, the operation is as follows. When the block 14 moves upward the links 11 also move upward, and the first effect of such movement is to lift the pawl 6 out of engagement with the ratchet teeth 5, the pawl carrier 8 being held stationary by the friction grip above described. As soon as the pawl is disengaged from the ratchet teeth, however, it strikes against the overhanging top portion of the pawl carrier 8, which serves as a fixed stop to limit the upward movement of the pawl, and thereupon the further upward movement of the links 11 causes the pawl and pawl carrier to move backward over the teeth of the ratchet wheel 4 through a distance determined by the location of the block 14 in the guideway 15. When the downward movement of said block commences, the first effect of the resulting downward movement of the links 11

is to force the pawl 6 into engagement with the teeth of the ratchet wheel 4, and thereafter the continued downward movement of said links results in pulling the ratchet wheel forward with the pawl, which is positively held in engagement with the ratchet teeth during such movement. All possibility of slip between the pawl and the ratchet is thus prevented, since the same force which moves the ratchet wheel also holds the pawl in engagement therewith.

It will be observed that in the construction illustrated the ratchet wheel 4 is provided with a large number of fine teeth and that the pawl 6 is provided with several co-operating teeth of corresponding dimensions. This is one of the features of my invention, and makes it possible to avoid lost motion without sacrificing the strength and durability requisite for transmitting considerable power, since the strain on the engaging teeth is divided among several teeth, and much finer teeth can therefore be employed for transmitting a given amount of power without danger of stripping them.

If a single-toothed pawl and coarser teeth were employed, there would be so much the greater possibility of lost motion between the pawl and the ratchet at the beginning of the forward movement of the pawl carrier, and a corresponding lack of capacity for fine adjustment of the step-by-step movement. Teeth of any desired degree of fineness can be employed in connection with the positive pawl-operating mechanism above described, since this mechanism effectively prevents any slip between the pawl and the ratchet during their forward movement, as already pointed out.

Mechanism such as above described is particularly useful in apparatus in which a step-by-step feed is required, but it may be employed for a variety of purposes, and it will be understood that the details of construction and arrangement of the mechanism and its parts may be widely modified without departing from the broad characteristics of my invention.

I claim as my invention:—

1. In a pawl and ratchet mechanism, the combination of a ratchet wheel, a pawl carrier movable along the line of ratchet teeth thereon, a pawl movable on said carrier into and out of engagement with said teeth, pawl-reciprocating mechanism connected directly to the pawl independently of the pawl carrier and arranged to first move the pawl into engagement with the ratchet teeth and then move the pawl carrier and ratchet wheel forward through such engagement, means for frictionally resisting the movement of the pawl carrier, and a stop mounted on said carrier in position to limit the movement of the pawl away from the ratchet teeth after it has been disengaged there-

from, whereby further movement of said pawl is caused to move the carrier backward.

2. In a pawl and ratchet mechanism, the combination of a wheel having its periphery provided with a plurality of fine ratchet teeth, a pawl carrier pivotally mounted on an axis concentric to the axis of said wheel and movable independently of the latter, means for frictionally resisting the movement of said carrier, a pawl mounted on the carrier and provided with a plurality of fine teeth movable into and out of simultaneous engagement with the ratchet teeth, a stop mounted on the pawl carrier in position to limit the movement of the pawl away from the ratchet wheel after its teeth have been disengaged therefrom, whereby further movement of said pawl is caused to move the carrier backward along the periphery of the wheel, and pawl-reciprocating mechanism connected directly to the pawl independently of the pawl carrier and arranged to first move the pawl into engagement with the ratchet teeth and then move the pawl carrier and ratchet wheel forward through such engagement.

3. In a pawl and ratchet mechanism, the combination of a wheel having its periphery provided with a plurality of fine ratchet teeth, a pawl carrier pivotally mounted on an axis concentric to the axis of said wheel and movable independently of the latter, a pawl mounted on the carrier and provided with a plurality of fine teeth adapted to move into and out of simultaneous engagement with the ratchet teeth, means for frictionally resisting the movement of the pawl carrier, a stop mounted on said carrier in position to limit the movement of the pawl away from the ratchet wheel after its teeth have been disengaged therefrom, whereby further movement of the pawl is caused to move the carrier backward along the line of ratchet teeth, a link directly connected to said pawl, means for positively reciprocating said link, and means for progressively varying the reciprocating movement of the link.

4. In a pawl and ratchet mechanism, the combination of a ratchet wheel, a pawl carrier pivotally mounted on an axis concentric to the axis of said wheel and movable independently of the latter, means for frictionally resisting the movement of the pawl carrier, a pawl mounted on said carrier and movable into and out of engagement with the ratchet teeth, a stop mounted on the pawl carrier in position to be engaged by the pawl after the latter has been moved out of engagement with the ratchet teeth, an arm pivotally mounted on an axis concentric to

that of the ratchet wheel, means for positively oscillating said arm, and a link directly connecting said arm and pawl.

5. In a pawl and ratchet mechanism, the combination of a ratchet wheel, a pawl carrier pivotally mounted on an axis concentric to the axis of said wheel and movable independently of the latter, means for frictionally resisting the movement of the pawl carrier, a pawl mounted on said carrier and movable into and out of engagement with the ratchet teeth, a stop mounted on the pawl carrier in position to be engaged by the pawl after the latter has been moved out of engagement with the ratchet teeth, a pawl-operating link connected directly to the pawl independently of said carrier, and means for reciprocating said link comprising a pivotally-mounted lever provided with a guide-way, means for oscillating said lever, a block arranged to slide in the guide way and operatively connected to said link, and means for sliding said block along the guide way and holding it in any desired position therein.

6. In a pawl and ratchet mechanism, the combination of a ratchet wheel, a pawl carrier mounted to turn on an axis concentric to the axis of said wheel, a pawl mounted on the carrier, a pivotally-mounted arm, a link positively connecting said arm and pawl, and means for operating said arm comprising a pivotally-mounted lever provided with a guide way, means for oscillating said lever, a block arranged to slide in said guide way and connected to said arm, and means for sliding said block along the guide way and holding it in any desired position therein.

7. In a pawl and ratchet mechanism, the combination of a ratchet wheel, a pawl carrier mounted to turn on an axis concentric to the axis of said wheel, a pawl mounted on the carrier, a link connected directly to the pawl independently of the pawl carrier, and means for positively reciprocating said link comprising a pivotally-mounted lever having a laterally offset portion provided with a guide way, a block arranged to slide in the guide way and connected to said link, means for sliding the block along the guide way and holding it in any desired position therein, and means for oscillating said lever, said guide way being of such length as to permit the block to be located in line with the axis of oscillation of said lever.

In testimony whereof, I have hereunto subscribed my name this 12th day of November, 1910.

WALTER C. REED.

Witnesses:

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JOSEPH T. BRENNAN.