No. 779,556. PATENTED JAN. 10, 1905.

E. C. NORTHRUP.

MECHANICAL MOVEMENT.

APPLICATION FILED SEPT. 24, 1904.

Fig. 1.

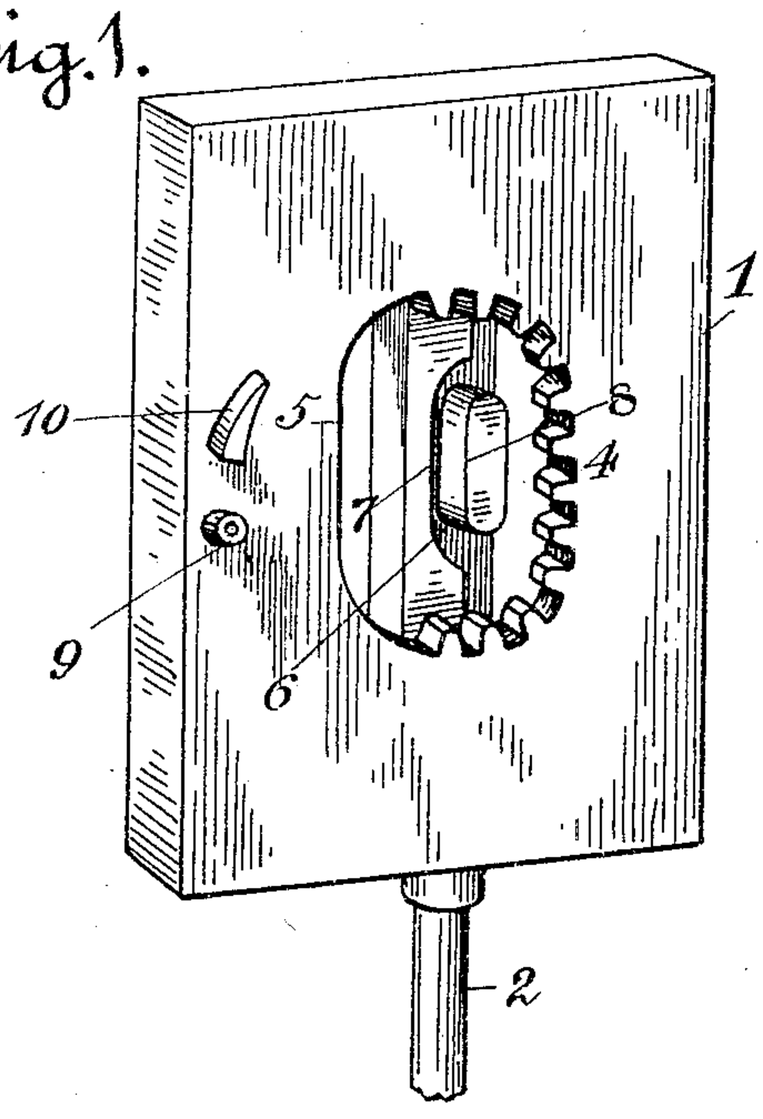


Fig. 2.

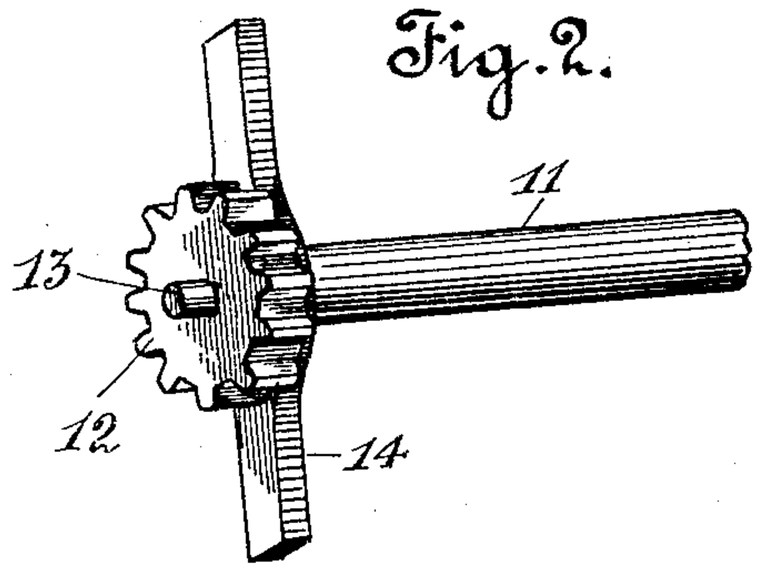


Fig. 3.

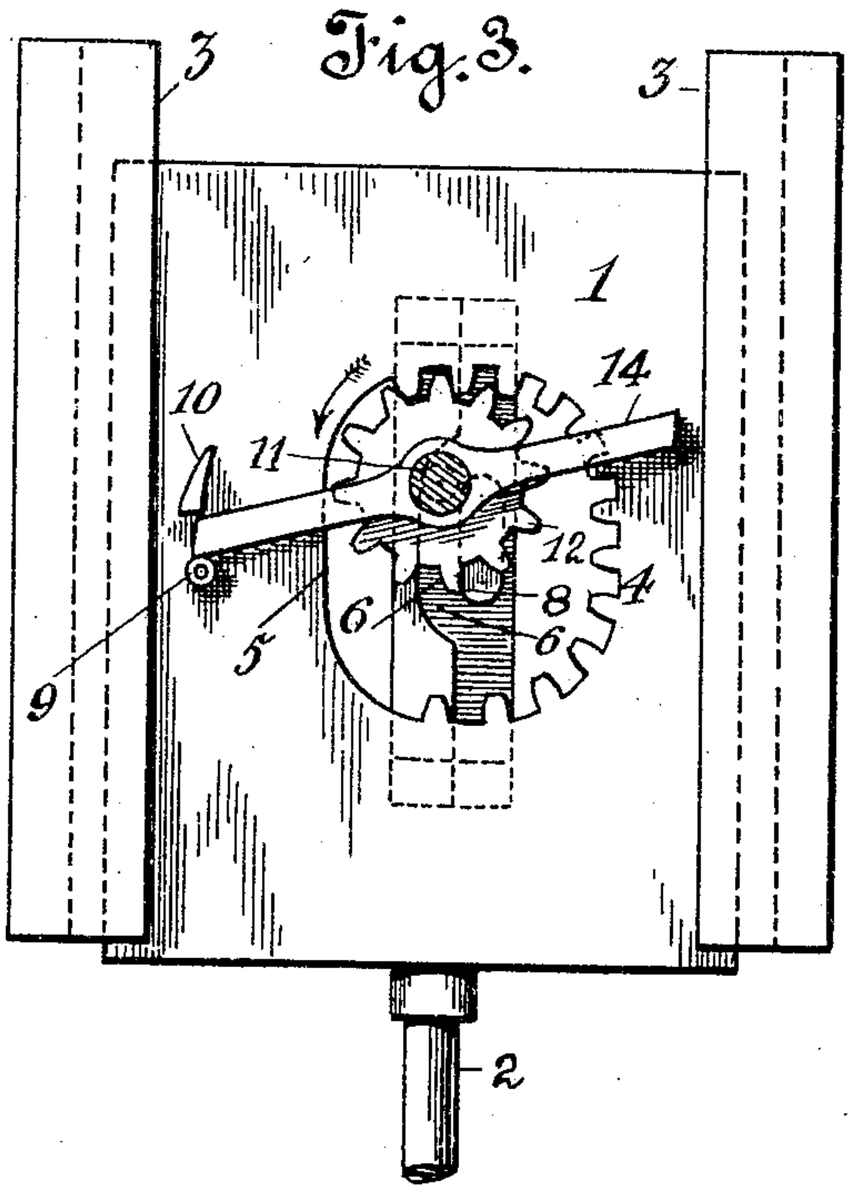
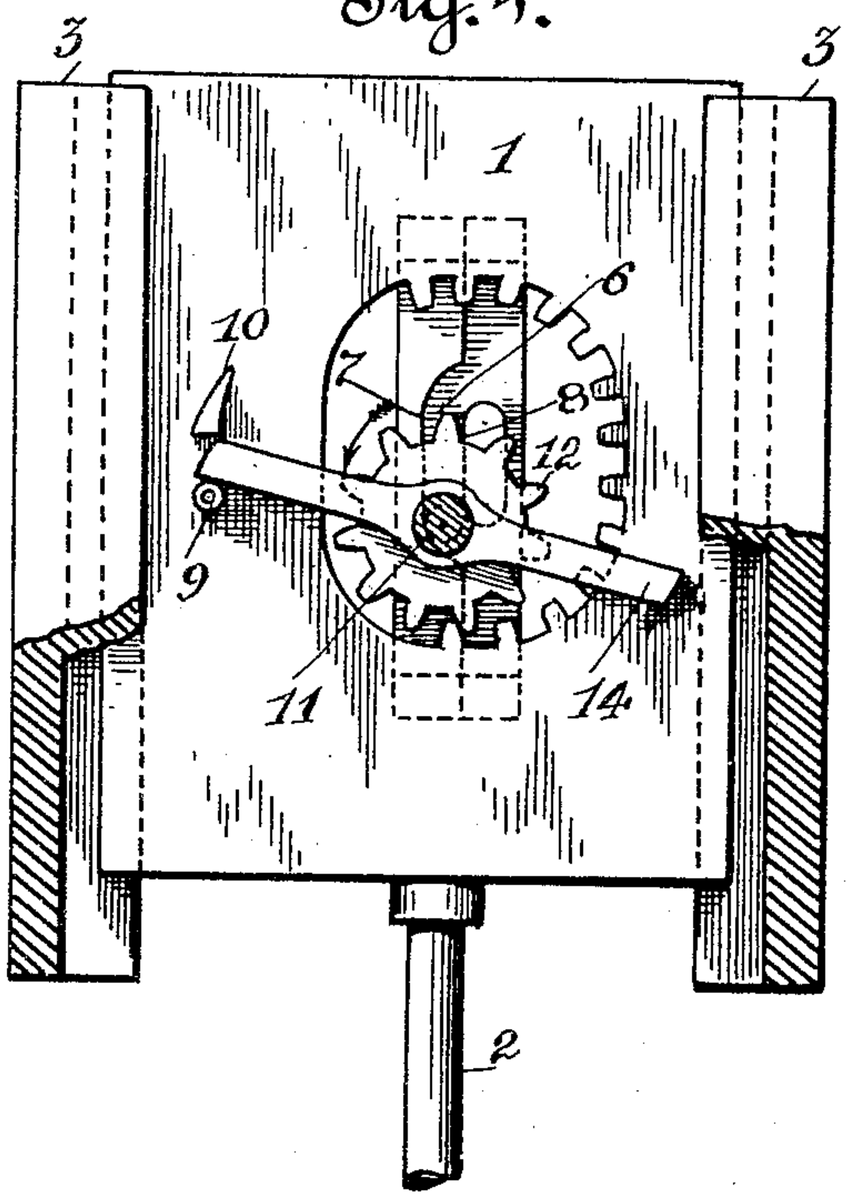


Fig. 4.



Witnesses.

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UNITED STATES PATENT OFFICE.

ELMER C. NORTHRUP, OF SAN JOSE, CALIFORNIA.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 779,556, dated January 10, 1905.

Application filed September 24, 1904. Serial No. 225,771.

To all whom it may concern:

Be it known that I, ELMER C. NORTHRUP, a citizen of the United States, residing at San Jose, Santa Clara county, State of California, have invented certain new and useful Improvements in Mechanical Movements; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to that class of mechanical movements in which continuous rotary motion is converted into lineally-reciprocating motion, or vice versa, by means of the engagement of a pinion and rack. My invention, while applicable to any mechanism which requires such conversion, is especially useful for a windmill and pump, in which connection its special advantages are two—namely, a quick return stroke of the pump-rod and the realization of two complete strokes of the rod, each comprising one up and one down stroke to one evolution of the wind-wheel.

My invention consists in the novel construction, arrangement, and combinations, which I shall hereinafter fully describe by reference to the accompanying drawings, in which—

Figure 1 is a perspective view of the head-plate of the lineally-reciprocating rod. Fig. 2 is a perspective view of the rotating shaft and pinion. Fig. 3 is an elevation of the mechanical movement, showing the head-plate at the lower limit of its stroke. Fig. 4 is an elevation of same, showing the head-plate at the upper limit of its stroke and about to descend.

1 is the head-plate of a lineally-movable rod 2, which may be the vertically-reciprocating rod of a pump or of any other device to which a lineally-reciprocating movement is to be imparted. The head-plate 1 is mounted in suitable guides 3, in which it may have sufficient side play to make and break its rack engagement with the pinion, as will presently appear. In the head 1 is formed an internal partial or mutilated rack comprising teeth 4 on one side and a plane surface 5 on the opposite side. Within the area of the mutilated rack is formed a guideway 6 between opposing separated walls 7 and 8, the longer wall 7 having its extremities curved toward the toothed side of the rack and the shorter wall 8 having rounded ends, whereby the guideway 6 has a straight middle portion and has ends which curve toward or in the direction of the toothed side of the rack.

Upon the face of the head-plate 1 near one side are two spaced stops 9 and 10, the lower one, 9, being best made as a projecting anti-friction-roller and the upper one, 10, as a curvilinear lug, as shown.

11 is a shaft having rotation on its axis. This shaft is to be suitably mounted and may be the shaft of any rotating device—say, for example, the shaft of a wind-wheel. Upon this shaft is firmly keyed a pinion 12, which is adapted to engage with the rack of the head-plate 1. From the inner face of the pinion in the axis of the shaft projects a guide-pin 13, Fig. 2, which plays in and through the guideway 6 of the head-plate. (See dotted lines in Figs. 3 and 4.) To the opposite face of the pinion or to the shaft itself is firmly secured a cross-arm 14, projecting beyond the pinion in the line of its diameter. The ends of this cross-arm are beveled and extend far enough to pass between and engage the stops 9 and 10 of the head-plate.

The operation is as follows: Assume, as is shown in Fig. 3, that the head-plate 1 is down to the lower limit of its stroke. In this position the pinion 12 has just begun its engagement with the first teeth of the top of the rack, the guide-pin 13 is in the upper curved extremity of the guideway 6, and one end of the cross-arm 14 is lightly engaged between the stops 9 and 10. The direction of rotation of the pinion is shown by the arrow. The first effect of this rotation is by the engagement of the pinion with the uppermost teeth of the rack to move the head-plate 1 laterally to the left, thereby causing it to withdraw its stops 9 and 10 from the extremity of the cross-arm 14. Continued rotation of the pinion then causes the upper curved extremity of the guideway 6 to leave the guide-pin 13, and thereafter the pinion continuing to engage the rack along its side teeth lifts the head-plate, the back face of the short wall 8 passing up by the guide-pin 13. As the upper limit of the stroke of the head-plate 1 is reached said head-plate by reason of the engagement of the pinion with the lower teeth of the rack is moved laterally back

again—that is, to the right—the guide-pin 13 being received in the lower curved extremity of the guideway 6 and the other extremity of the cross-arm 14 being received between the stops 9 and 10, said extremity having passed down along and being accurately received and guided by the curved inner face of the stop 10. This is the position shown in Fig. 4. Continued rotation of the pinion by final engagement with the last of the rack-teeth moves the head-plate fully over laterally to the right, so that the guide-pin 13 is now entered into the clear straight portion of the guideway 6, whereupon the head-plate, having no support from the pinion and being clear thereof, moves down by gravity to its lowest limit, being the position first assumed. In this downward movement, which is a rapid one, the clear straight portion of the guideway 6 moves past the guide-pin 13, while the extremity of the cross-arm 14, rotating with the pinion and still being engaged between the stops 9 and 10, maintains the timely and continued connection between the shaft and head-plate to enable the pinion without lost rotary movement to re-engage the top of the rack, while the curved upper extremity of the guideway 6, acting on pin 13, renders this engagement precise. It will thus be seen that a slow upstroke of the rod 2 is had while a quick downstroke is permitted, and, further, it will be seen that there are two full strokes, each comprising an up and a down stroke, of the head-plate and rod to one revolution of the pinion.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A mechanical movement comprising a lineally-reciprocating part, a continuously-rotating shaft, a mutilated rack in the reciprocating part consisting of teeth on one side and a plain edge on the opposite side, a pinion on the rotating shaft adapted to alternately engage and disengage the rack-teeth, a guideway within the area of the mutilated rack, having curved extremities opening in the direction of the rack-teeth, a guide-pin in the axis of the shaft playing in said guideway, and a disengageable connection between the reciprocating part and the rotary shaft to synchronize their movements during the passage of the guide-pin through the guideway.

2. A mechanical movement comprising a lineally-reciprocating part, a continuously-rotating shaft, a mutilated rack in the reciprocating part consisting of teeth on one side and a plain edge on the opposite side, a pinion on the rotating shaft adapted to alternately engage and disengage the rack-teeth, a guideway within the area of the mutilated rack, having curved extremities opening in the direction of the rack-teeth, a guide-pin in the axis of the shaft playing in said guideway, and a disengageable connection between the reciprocating part and the rotary shaft to synchronize their movements during the passage of the guide-pin through the guideway consisting of a cross-arm secured on said shaft and spaced stops secured to the reciprocating part, with which the ends of the cross-arm alternately engage.

In witness whereof I have hereunto set my hand.

ELMER C. NORTHRUP.

Witnesses:
C. E. RANDALL,
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