No. 846,749. PATENTED MAR. 12, 1907.

J. A. LAIRD

MECHANICAL MOVEMENT.

APPLICATION FILED SEPT. 11, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

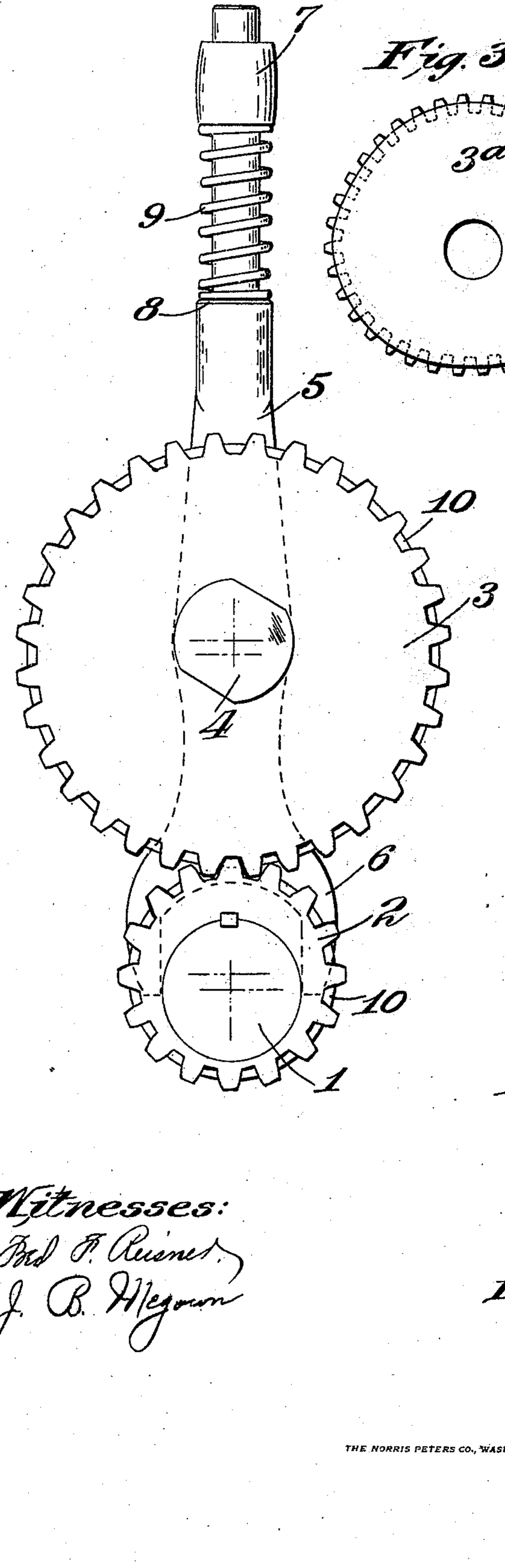
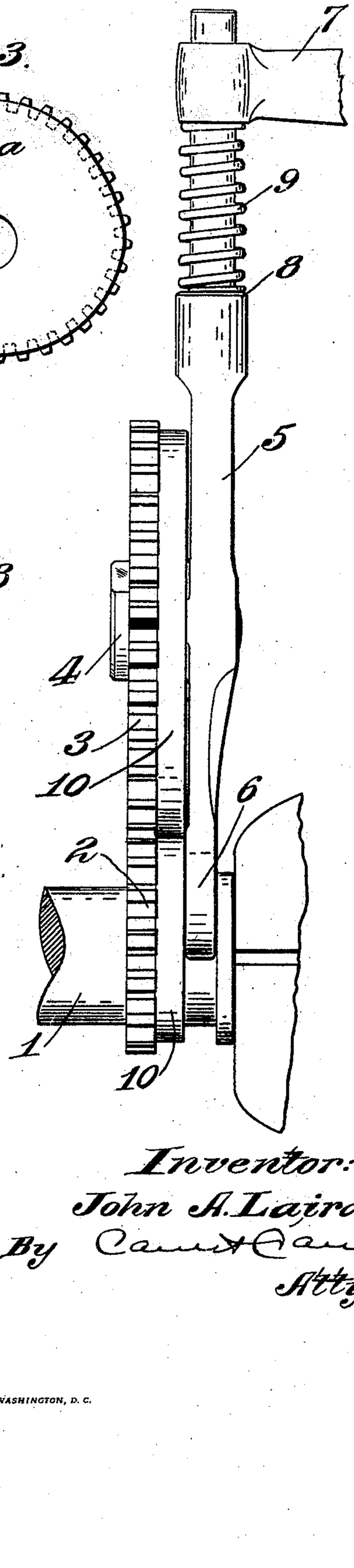


Fig. 3.

Fig. 2.



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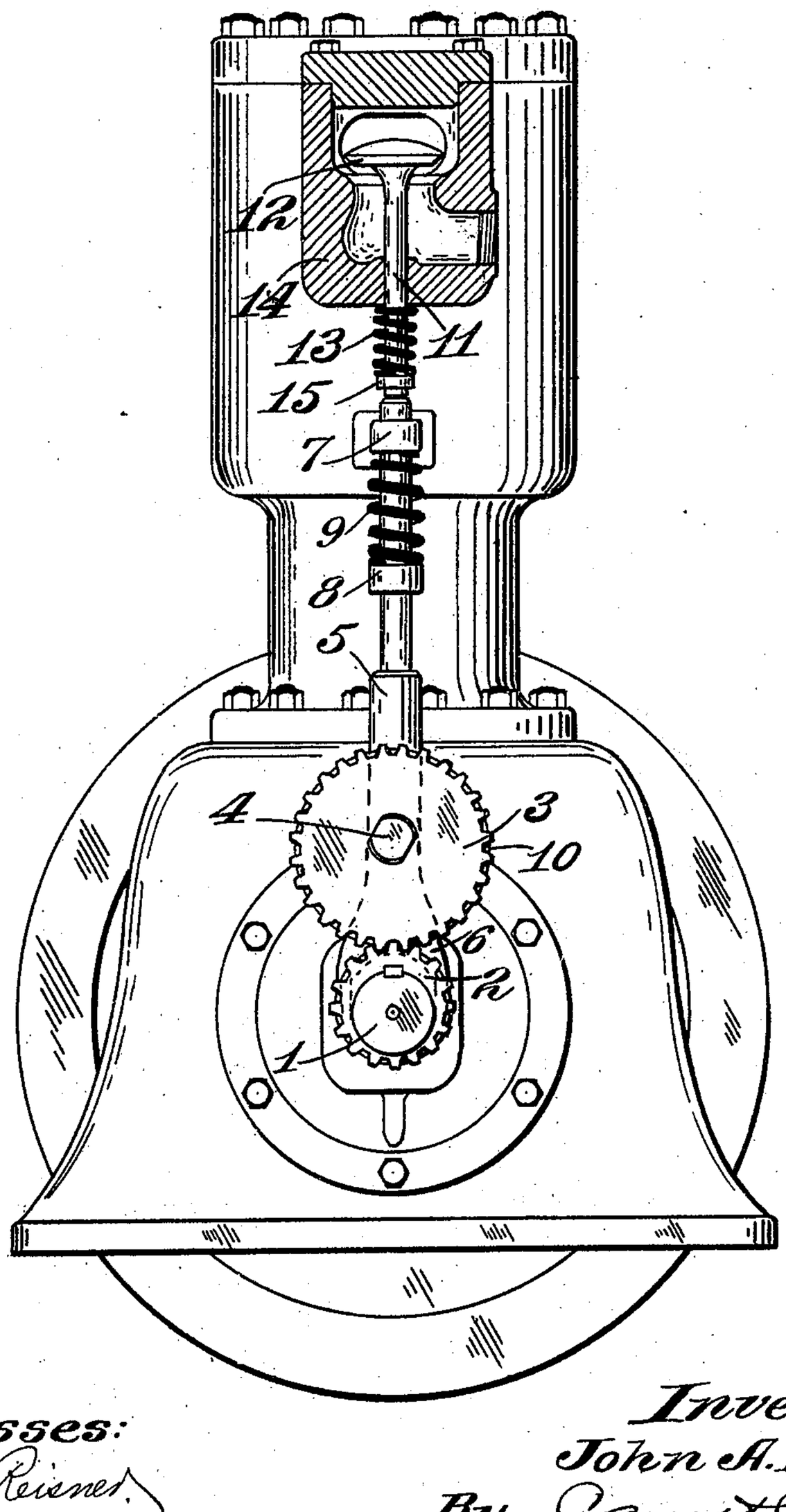
2 SHEETS—SHEET 2.

Fig. 4.



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MECHANICAL MOVEMENT.

No. 846,749. Specification of Letters Patent. Patented March 12, 1907.

Application filed September 11, 1905. Serial No. 277,860.

To all whom it may concern:

Be it known that I, JOHN A. LAIRD, a citizen of the United States, and a resident of the city of St. Louis, and State of Missouri, have invented a new and useful Improvement in Mechanical Movements, of which the following is a specification.

My invention relates to a mechanical movement whereby a rectilinear reciprocation may be effected by a revolving shaft; and it relates particularly to means whereby a valve of a four-cycle gas-engine may be actuated once for every two or more revolutions of the shaft.

It consists principally in a gear-wheel mounted eccentrically upon a driving-shaft and meshing with a larger gear-wheel mounted eccentrically upon a frame free to move radially of the main shaft.

It also consists in the arrangements and combinations of parts hereinafter described and claimed.

In the accompanying drawing, which forms part of this specification, and wherein like symbols refer to like parts wherever they occur, Figure 1 is a vertical face view of my device. Fig. 2 is a vertical edge view thereof. Fig. 3 is a view of a modified form of gear-wheel, and Fig. 4 is a vertical view showing the device applied to a valve of a gas-engine.

Mounted eccentrically upon a driving-shaft 1 is a gear-wheel 2. Meshing with this gear-wheel 2 is a second gear-wheel 3, having twice the number of teeth of the gear-wheel 2. This second gear-wheel 3 is mounted eccentrically upon a spindle 4, which is supported by a frame 5, provided for the purpose. One end of this frame 5 is bifurcated to form a yoke 6, which straddles the driving-shaft 1. The yoke thus constitutes a guide for one end of the frame 5. The other end of the frame 5 extends through a hole or guideway provided therefor in a supporting-arm 7, in which hole it fits loosely, so as to permit the frame to slide therein. The frame is provided with a shoulder or abutment 8, against which bears one end of a coiled spring 9, which surrounds the frame and bears at its other end against the supporting-arm. The spring 9 is arranged to push the frame normally toward the driving-shaft, so as to keep the teeth of the gear-wheels intermeshed. In order to secure the proper action of the gear-wheels, they are both backed with disks 10 of smooth peripheries, which coincide with the pitch-circles of the gear-wheels. These disks 10 may be formed integral with the gear-wheels or may be made of separate parts. Their principal function is to relieve the teeth of the pressure of the spring, and with them it is practicable to use cast gears.

The operation of the device is as follows: The spring 9 pushes the frame toward the driving-shaft, and thereby keeps the large gear-wheel 13 in engagement with the gear-wheel 2 on the driving-shaft. As the driving-shaft revolves its motion is transmitted through the smaller gear-wheel 2 to the larger gear-wheel 3, in consequence of which the larger wheel revolves once for every two revolutions of the shaft. The gear-wheels are originally set so that their points of maximum eccentricity coincide, in which position the distance between the center of the driving-shaft 1 and the center of the spindle 4 is the sum of the radii of the two gear-wheels plus their eccentricities. Consequently when the smaller wheel has completed its revolution and the larger wheel has only half completed its revolution the eccentricities of the two wheels neutralize or offset each other, and the distance between the center of the driving-shaft and the center of the spindle is the sum of the radii of the two gears less the difference of their eccentricities. The range of movement of the frame is therefore approximately double the eccentricity of the gear whose eccentricity is the greater.

It is noted that in the case of circular gears the movement of the frame from one limit to the other is not a continuous reciprocation, but is accompanied by a secondary reciprocation. To minimize this secondary reciprocation, the larger gear may be made in the form of a cam, such as shown at 3^a in Fig. 3. The pitch-line of this cam may be designed with reference to the smaller gear-wheel so that the sum of the radii at all contacting-points throughout the revolution of the larger gear will increase or decrease substantially continuously. The use of such a cam is especially useful when it is desired to have only one reciprocation of the frame for three or more revolutions of the driving-shaft. So,

too, the periphery of the larger gear may be so designed as to effect a pause at the limiting position of the frame—as, for instance, to determine the open period of a valve.

The mechanical movement above described is capable of considerable modification in other ways and is adapted for a variety of purposes. For instance, as shown in Fig. 4, it is adapted for the operation of a valve of a four-cycle gas-engine. As shown in Fig. 4, the upper end of the frame abuts against the stem 11 of a valve 12. This valve-stem 11 is surrounded by a coiled spring 13, which abuts at one end against the valve-case 14 and at its other end against a shoulder 15 of the valve-stem and is so arranged as to normally hold the valve against its seat. As hereinbefore described, the frame reaches its uppermost limit once for every two revolutions of the driving-shaft, and the end of the frame is so located with reference to the end of the valve-stem that they abut only while the frame is near its uppermost limits. By this arrangement the valve is lifted from its seat by the reciprocating frame once for every two revolutions of the driving-shaft. The valve is automatically returned to its seat by the spring 13 and remains seated without being affected by the minor or secondary reciprocations of the frame until the frame again approaches its uppermost limit. Obviously other forms of lost-motion connecting devices may be substituted for that shown.

While the number of teeth in the larger gear-wheel should be a definite multiple of the number of teeth of the smaller gear, it is obviously unnecessary that the smaller gear should be eccentric or that its eccentricity should be the same as that of the larger gear.

What I claim is—

1. A mechanical movement comprising a gear-wheel mounted upon a driving-shaft, a larger gear-wheel meshing therewith mounted eccentrically upon a spindle on a reciprocating frame and means for keeping said gears in engagement with each other, the number of teeth of the larger gear-wheel being a definite multiple of the number of teeth of the driving-gear.

2. A mechanical movement comprising a gear-wheel mounted upon a driving-shaft, a larger gear-wheel meshing therewith mounted eccentrically upon a spindle in a movable frame and means for keeping said gears in engagement with each other, the number of teeth of the large gear-wheel being double the number of teeth of the driving-gear.

3. A mechanical movement comprising a gear-wheel eccentrically mounted upon a driving-shaft, a larger gear-wheel meshing therewith eccentrically mounted upon a spindle on a movable frame and means for keeping said gears in engagement with each other, the number of teeth of the larger gear-wheel being a definite multiple of the number of teeth of the driving-gear.

4. A mechanical movement comprising a gear-wheel mounted upon a driving-shaft, a cam-gear meshing therewith mounted upon a spindle on a movable frame and means for keeping said gears in engagement with each other, the number of teeth of the cam-gear being a definite multiple of the number of teeth of the driving-gear.

5. A mechanical movement comprising a gear-wheel mounted upon a driving-shaft, a larger gear-wheel meshing therewith and mounted eccentrically upon a spindle on a movable frame, and means for keeping said gears in engagement with each other, the number of teeth of the larger gear being a definite multiple of the number of teeth of the driving-gear, and both of said gears being backed with disks whose peripheries coincide with the pitch-lines of the gear-teeth.

6. A mechanical movement comprising a gear-wheel mounted upon a driving-shaft, a larger gear-wheel meshing therewith mounted eccentrically upon a spindle on a movable frame and means for keeping said gears in engagement with each other, the number of teeth of the larger gear-wheel being a definite multiple of the number of teeth of the driving-gear and a lost-motion connecting device for transmitting motion from said frame.

7. A mechanical movement comprising a main frame, a driving-shaft mounted thereon, a gear-wheel mounted on said driving-shaft, a frame movable in guides provided therefor on the main frame, a larger gear-wheel eccentrically mounted in said movable frame and meshing with the gear on the driving-shaft, the number of teeth of said larger gear-wheel being a definite multiple of the number of teeth of the gear-wheel on the driving-shaft, means for keeping said gears in engagement with each other, a rod mounted in guides in the main frame and a lost-motion connecting device for transmitting motion from the movable frame to said rod.

8. A mechanical movement comprising a main frame, a driving-shaft mounted therein, a gear-wheel mounted on said driving-shaft, a movable frame having one end mounted in a guide provided therefor on the main frame and having at its opposite end a yoke astraddle the driving-shaft, a larger gear-wheel eccentrically mounted on said movable frame and meshing with said first-mentioned gear, the number of teeth of the larger gear-wheel being a definite multiple of the number of teeth of the driving-gear, a movable rod arranged in alinement with the outer end of said movable frame in position to be moved out by

said frame, and means for retracting said rod to its normal position.

9. A mechanical movement comprising a gear-wheel mounted upon a driving-shaft, a larger gear-wheel meshing therewith mounted eccentrically upon a spindle in a movable frame, means for keeping said gears in engagement with each other, the number of teeth of the larger gear being a definite multiple of the number of teeth of the driving-gear and a lost-motion connecting device for transmitting the movement of said frame to a valve.

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