

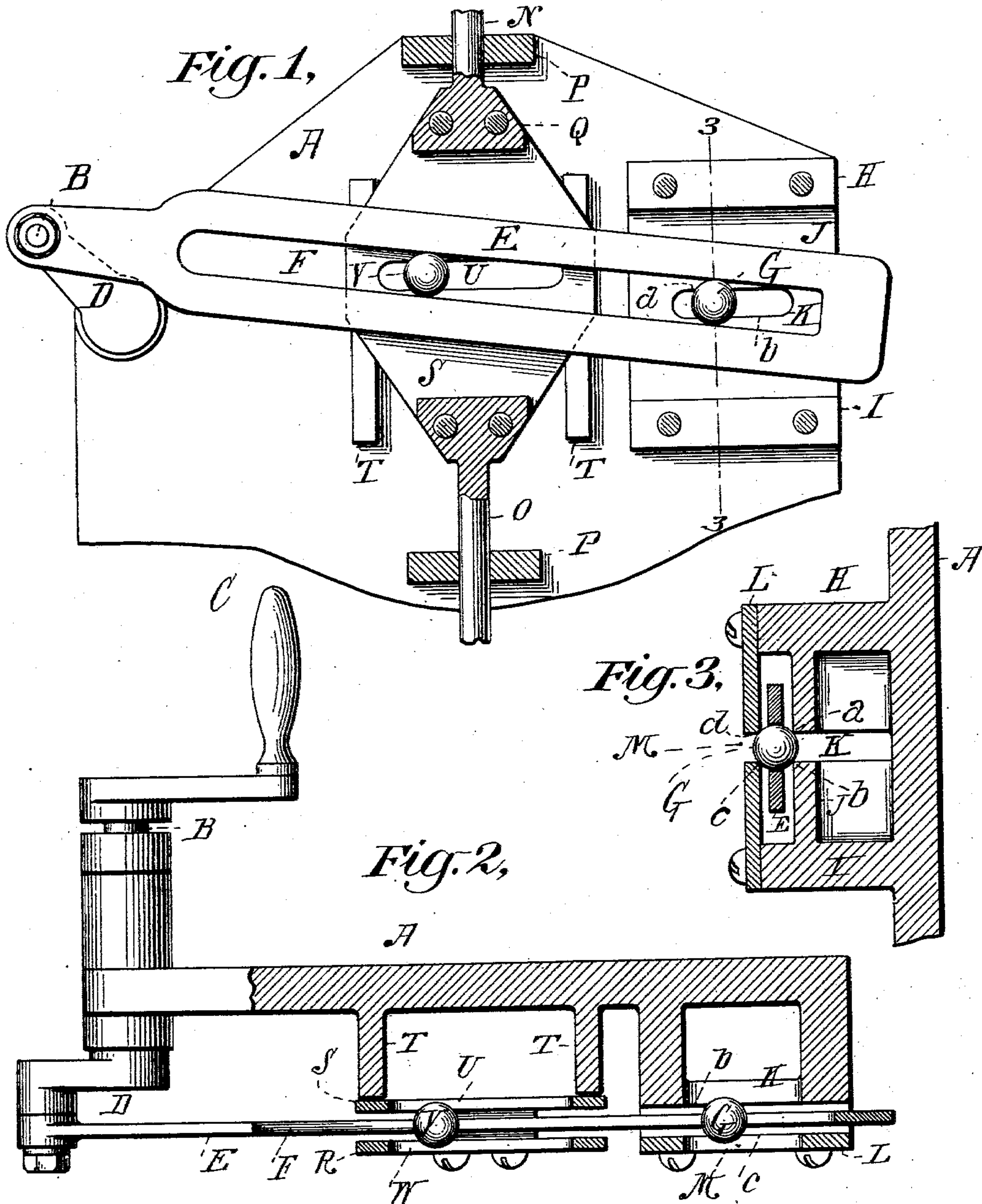
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Patented July 25, 1899.

C. C. PROTHEROE & A. H. MAN.  
MECHANICAL MOVEMENT.

(Application filed Dec. 29, 1898.)

(No Model.)



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 629,392, dated July 25, 1899.

Application filed December 29, 1898. Serial No. 700,611. (No model.)

*To all whom it may concern:*

Be it known that we, CHARLES C. PROTHEROE and ALRICK H. MAN, of Richmond Hill, borough of Queens, city and State of New York, have invented a new and useful Improvement in Mechanical Movements, of which the following is a specification.

Our invention is a new mechanism whereby rotary motion may be converted into reciprocation motion, or vice versa.

In the accompanying drawings, Figure 1 is a side view of our mechanical movement. Fig. 2 is a top view, partly in longitudinal section; and Fig. 3 is a section on the line 3 3 of Fig. 1.

Similar letters of reference indicate like parts.

A is any suitable support adapted to retain the members of our device in proper relative working position, as hereinafter set forth. It is here represented as a plate of metal provided with a bearing for the crank-shaft B and with guides or offsets on one face for the purposes also noted hereinafter. It is distinctly to be understood that we do not limit ourselves to the use of such a plate as A, but may substitute therefor any construction which will effect the desired object.

The crank-shaft B extends through the plate A and is here shown as provided with a handle C, whereby it may be rotated. This handle is merely one way of conveniently rotating the shaft. Any other means may be substituted, or when the device is used for converting reciprocating into rotary motion it may be omitted altogether.

The crank-shaft B carries the crank-arm D, to which is secured the lever E, in which lever there is a longitudinal slot F. The fulcrum of lever E is the ball G, which is preferably of hard steel. The guideway in which the ball G is free to move is produced as follows: The projections H I on the face of plate A carry a plate J, in which there is a slot K. The outer faces of the projections H I extend beyond the plate J, so as to form a recess, which is closed by a plate L, bolted on said faces. In the plate L is a slot M, parallel and corresponding to the slot K. The width of the recess or space between plates L and J is less than the diameter of the ball G, and the transverse width of the slots K M

is also less than the diameter of ball G. The preferable arrangement is as shown in Fig. 3—that is to say, the ball is received and retained by the four parallel edges *a b c d* of the slots K M, which meet its circumference at equidistant points. The lever E extends longitudinally through the recess and incloses the ball G in its slot F, the transverse width of said slot being greater than the diameter of said ball, so that said ball may have a free movement in said slot. It will be observed that the ball G constitutes a movable fulcrum for the lever E.

The reciprocating member of our mechanical movement includes the rods N O, which pass through guide-brackets P on plate A. These rods have enlarged ends, as Q, which are secured between the parallel plates R S. The plate S bears against the guide projections T on the face of plate A. In the plates R S are parallel and corresponding slots W U, in which is received and retained a ball V, preferably of hard steel. The arrangement of the edges of slots W U with respect to the ball V is similar to that of the edges of slots K M with respect to ball G, and ball V, as shown in the drawings, is received in the slot F of lever E in the same way as is ball G. In lieu of a single slot in the lever E receiving both balls it is obvious that we may use two separate slots with a ball in each.

Power may be applied either to the crank or to either of the reciprocating rods N O. When the crank-shaft B is rotated, as by the handle C, then the lever E is of the second order, the load being between power and fulcrum, and the effect of rotation of said crank-shaft is the reciprocation of rods N O. When power is applied to either of the rods N O to cause them to reciprocate, then the lever E is of the third order, the power being between the fulcrum and the load, and the effect of reciprocation of said rods is the rotation of the crank-shaft. It will be obvious that we may readily place the fulcrum between the power and the load by merely substituting the ball G and its associated parts in the place of the ball V and its associated parts on the plate A, and in that case whether the power be applied to crank or rods N O the lever will be of the first order. We prefer the arrangement illustrated on account of its compactness.



The invention is applicable to any and all purposes for which the designated conversion of motion is desired. Thus a rod, as N or O, may be the piston-rod of a reciprocating engine and B the main shaft which is caused to rotate, or power may be applied to rotate shaft B, in which case a rod, as N or O, may actuate a pump-piston or the plunger of a press.

10 We claim—

1. In a mechanical movement, a member having a movement of vibration and also of translation in a plane passing through its own longitudinal axis, a second member having a longitudinal reciprocating movement and disposed at an angle to the first, and a freely-movable connection between said members, whereby the before-stated movement of the one is suitably transmitted to produce the before-stated movement of the other, substantially as described.

2. In a mechanical movement, a crank-arm, a second member connected thereto and having a movement of vibration and also of translation in a plane passing through its own longitudinal axis, a third member having a longitudinal reciprocating motion and disposed at an angle to said second member, and a freely-movable connection between said second and third members; whereby rotary motion of said crank-arm and reciprocating movement of said third member may mutually cause one another through the before-stated movement of said second member, substantially as described.

3. In a mechanical movement, two mechanical members each having a guideway, in combination with a loose ball received and retained in both of said guideways whereby one of said members is permitted a movement of vibration around said ball and also of translation in a plane passing through its own longitudinal axis, and the other of said members is permitted a longitudinal movement of reciprocation, substantially as described.

4. In a mechanical movement, the combination of a lever, a movable fulcrum for said lever, a ball, a reciprocating member having a guideway adapted to receive and retain said ball—and a longitudinal slot in said lever receiving said ball—whereby vibratory movement of said lever and reciprocating move-

ment of said member may mutually cause one another, substantially as described.

5. In a mechanical movement, a lever, a reciprocating member disposed at an angle to said lever, a crank-arm connected to and rotated by said lever, and a freely-movable connection between said reciprocating member and said lever; whereby the rotary movement of said crank and the reciprocating movement of said member may mutually cause one another through the vibration of said lever, substantially as described.

6. In a mechanical movement, a lever, a fulcrum variable in position with respect to and controlled by said lever, a reciprocating member, a crank-arm connected to and rotated by said lever and a freely-movable connection between said reciprocating member and said lever; whereby rotary movement of said crank and reciprocating movement of said member may mutually cause one another through the vibration of said lever, substantially as described.

7. In a mechanical movement, a lever, a fulcrum variable in position with respect to and controlled by said lever, a ball, a reciprocating member having a guideway adapted to receive and retain said ball, a lever engaging with said ball, and a crank-arm connected to said lever; whereby rotary movement of said crank and reciprocating movement of said member may mutually cause one another through the vibration of said lever, substantially as described.

8. In a mechanical movement, a lever, a ball-fulcrum therefor movable in a fixed guideway and controlled by said lever, a ball, a reciprocating member having a guideway adapted to receive and retain said ball; a lever engaging with said ball, and a crank-arm connected to said lever; whereby rotary movement of said crank and reciprocating movement of said member may mutually cause one another through the vibration of said lever, substantially as described.

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