

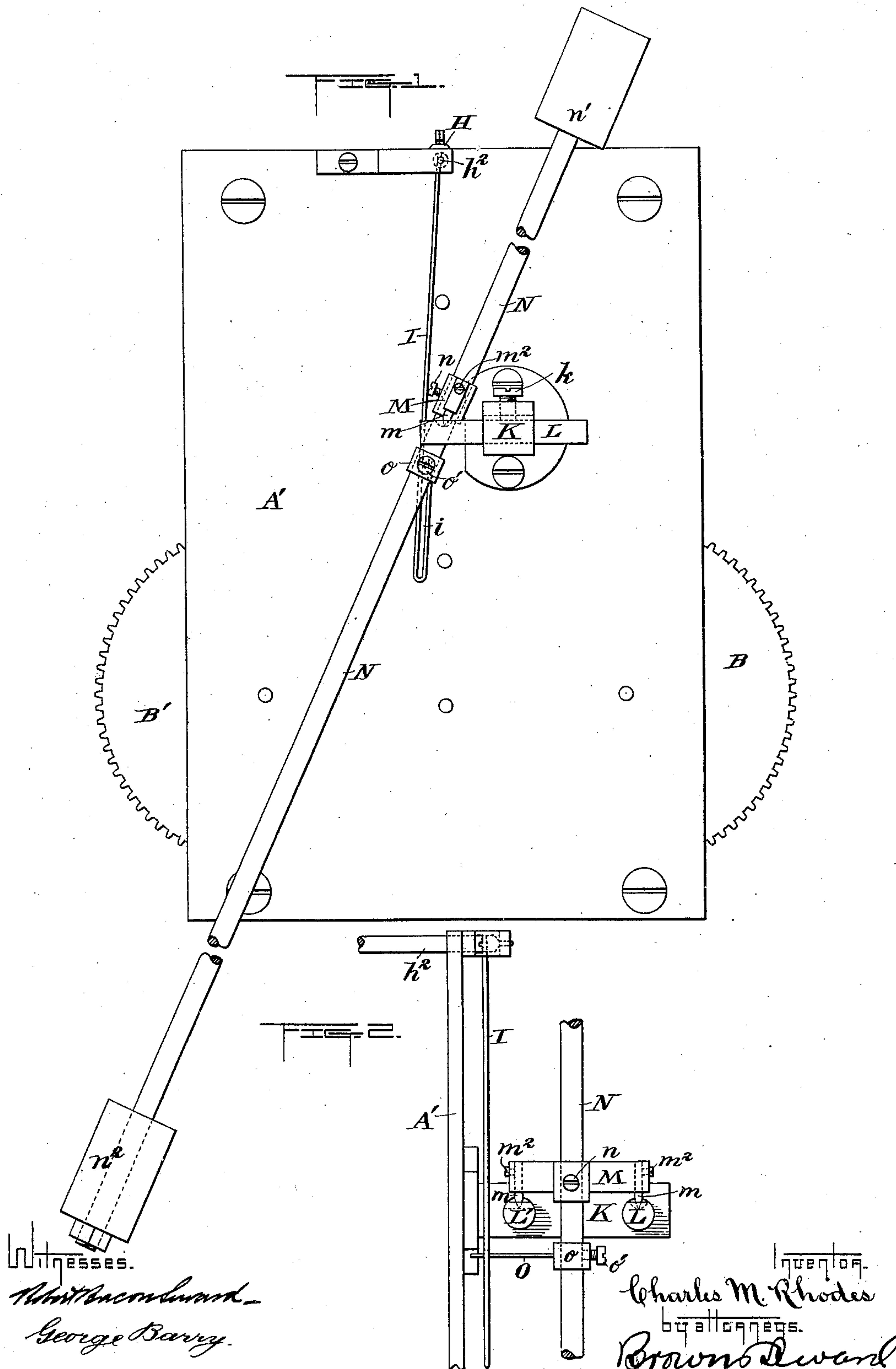
(No Model.)

2 Sheets—Sheet 1.

C. M. RHODES.
CLOCK PENDULUM.

No. 563,618.

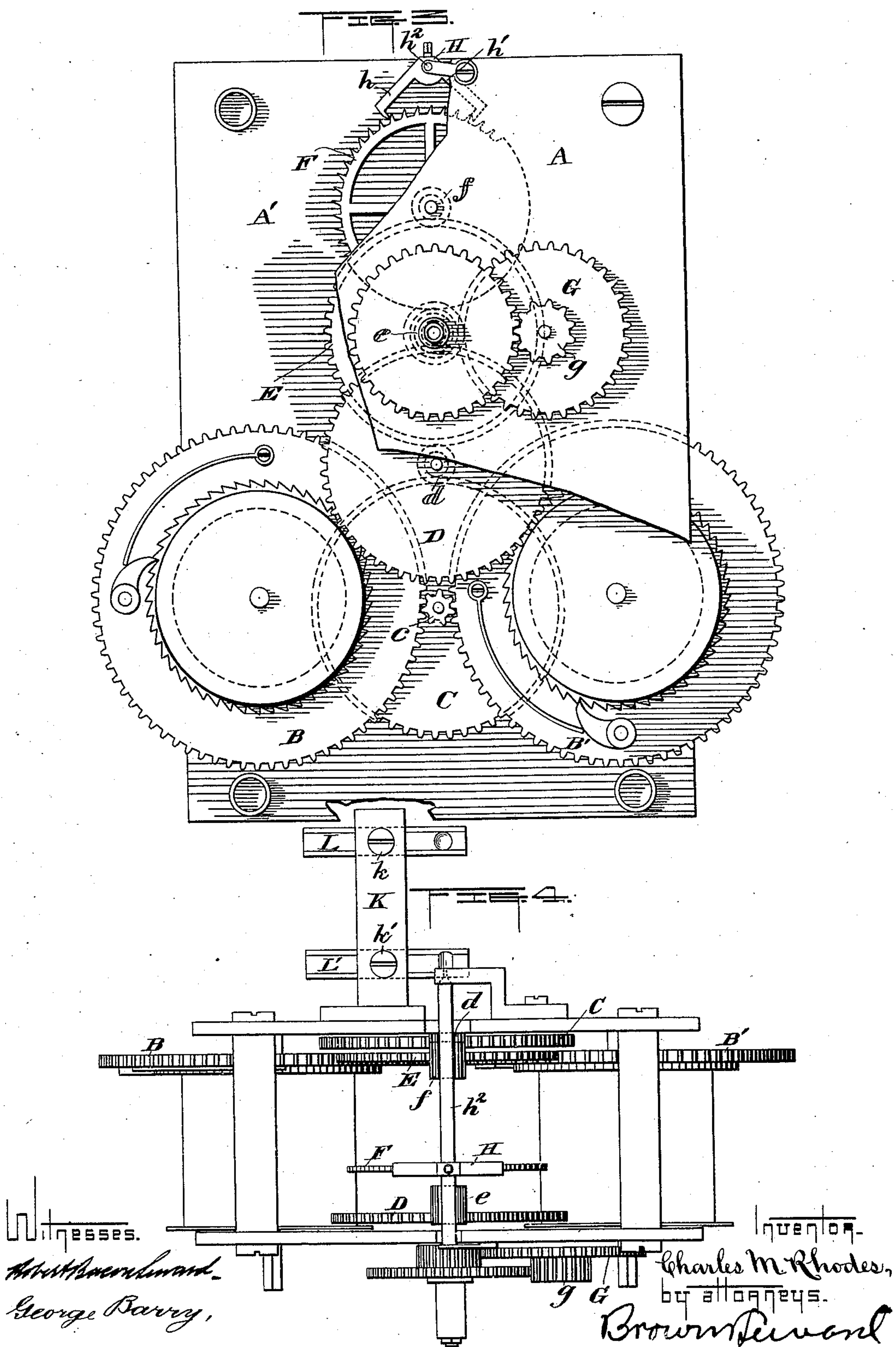
Patented July 7, 1896.



2 Sheets—Sheet 2.

No. 563,618.

Patented July 7, 1896.



UNITED STATES PATENT OFFICE.

CHARLES M. RHODES, OF HIGHLAND, NEW YORK.

CLOCK-PENDULUM.

SPECIFICATION forming part of Letters Patent No. 563,618, dated July 7, 1896.

Application filed June 3, 1893. Serial No. 476,445. (No model.)

To all whom it may concern:

Be it known that I, CHARLES M. RHODES, of Highland, in the county of Ulster and State of New York, have invented a new and useful Improvement in Clock-Movements, of which the following is a specification.

My invention relates to an improvement in clock-movements in which a balance vibrating bar is employed in place of a pendulum proper, the vibrations of said bar being under the control of the escapement to receive an impulse both on its forward and backward stroke, with the object in view of reducing the resistance of the vibrating bar to a minimum and thereby providing a movement which will continue in operation a very long time under the actuating force of a light weight or a spring of ordinary or moderate length and stiffness.

A practical embodiment of my invention is represented in the accompanying drawings, in which—

Figure 1 is a rear view of the movement, showing the back plate in rear elevation and the balance-bar and its actuating-arm in operative position. Fig. 2 is a partial view in side elevation of the balance-bar, its operating-arm, and the parts immediately connected therewith. Fig. 3 is a front view of the movement, the front plate being partially broken away to show the position of the wheels; and Fig. 4 is a top plan view of the movement, omitting the balance-bar and its connections with the escapement-spindle.

The front plate is denoted by A and the back plate by A'. A pair of weight or spring actuated drive-wheels B B', mounted between the plates, exert pressure upon a common intermediate pinion c on the spindle of a spur-wheel C, the latter in gear with a pinion d on the spindle of a spur-wheel D, the latter in gear with a pinion e on the spindle of a spur-wheel E, which latter is in gear with a pinion f on the spindle of the escapement-wheel F. Ordinary gear, including a pinion g on the spindle of a spur-wheel G, the pinion g in gear with a wheel mounted to rotate with the wheel E, serves to actuate the hands of a clock. (Not shown.)

An anchor-escapement H is suitably mounted so that the beveled-faced ends of its branches h h' will engage the teeth of the es-

capement-wheel F, the pressure of the teeth on the ends of the branches h h' serving to rock the escapement in one direction or the other, according as the pressure is exerted upon the end of the branch h or upon that of the branch h'.

The spindle of the anchor-escapement H is denoted by H², and is continued to the rear of the rear plate A', where it is provided with a depending arm I, fixed thereto so as to swing back and forth as the escapement is oscillated by the pressure of the escapement-wheel. The lower end of the depending arm I is provided with an elongated slot i for the reception of a pin on the balance-bar, as will hereinafter appear.

To the rear face of the rear plate A' there is secured a rearwardly-projecting bracket K, in which a pair of sliding bearings L L' are mounted so that they may be adjusted at pleasure laterally to the bracket K and locked in their adjusted position by means of set-screws k k'. The upper faces of the bearings L L' are provided with curved bottom depressions for the reception of the pointed suspension-pins m on the cross-head M, in which the vibrating balance-arm N is secured. In practice I prefer to make the recess in the top of one of the arms, L, for example, in the shape of a portion of the surface of a sphere, while the recess in the top of the other arm, L', for example, is made in the shape of a part of the surface of a cylinder, so that, the suspension-pin having centered itself in the spherical-shaped recess, the point of the opposite suspension-pin will find its proper position along the length of the cylindrical-shaped recess in the opposite bearing-arm L', and this will permit the suspension-pins on the balance-bar to automatically adjust themselves and will account for any slight variation which may occur in the distances between the two bearing-bars L L'. The suspension-pins m may be conveniently adjusted in sockets in the ends of the cross-head M by means of set-screws m², extending through the walls of the sockets into contact with the pins, and the balance-bar N may be conveniently adjusted in the cross-head by means of a set-screw n, extending through the wall of the cross-head engaged with the bar.

The bar N is provided with weights n' n²

upon its ends, and is so centered with respect to the points of its support that it will have a very slight preponderance of weight below the points of suspension, just enough to keep
 5 it from a tendency to swing clear around upon its support. A pin O is secured to a slide piece o, fitted to the bar N, and said pin extends forwardly from the bar within the elongated slot i in the depending arm I. The pin
 10 O may be adjusted along the balance-bar and locked in position by means of a slide o and a set-screw o', extending through the wall of the slide into contact with the bar.

In operation the pressure exerted upon the
 15 arms of the anchor-escapement H will be transmitted through its spindle to the depending arm I, to the bar N at a point distant from its points of suspension, and the arm I will exert a push upon the bar N in opposite directions—first, in one direction to vibrate the
 20 bar in that direction, and then in the opposite direction to vibrate the bar in that direction. The bar N, being so nearly balanced upon its support, requires but the slightest appreci-
 25 able amount of pressure to keep its vibrations constant, and this slight pressure, being exerted first in one direction and then in the opposite direction, requires only about one-half the pressure that would be required were
 30 it to be exerted in one direction only and at the same time insures a movement of greater regularity. In practice, five or six turns of the key to wind the weight or spring will be sufficient to keep the clock going continu-
 35 ously for six months, and with slightly-increased power and a further reduction of movement by additional gearing it may be made to run thirteen months with the same amount of winding. So delicate is the bal-
 40 ance and so little the power required to start the vibrations that in whatever position the balance-bar be held, the moment it is released it will begin to vibrate without any starting movement other than the pressure
 45 from the depending arm I, and in a few moments the vibrations will have increased to a

point where the clock-movement will be in full operation.

What I claim is—

1. The combination with the oscillating es- 50
 capement and its actuating mechanism, of an arm fixed to swing with the rocking escape-
 ment and a normally vertical balance-bar mounted near its center of gravity to vibrate
 and engaged with the said swinging arm to 55
 receive an impulse in each direction of the vibratory movement, substantially as set forth.

2. In combination, an oscillating escape- 60
 ment, means for actuating it, a spindle on which the escapement is fixed, an arm fixed to the spindle and extending laterally there-
 from, a normally vertical balance-bar sup-
 ported near its center of gravity to vibrate, 65
 and a connection between the said arm and the vibrating balance-bar at a point distant from its support, whereby the arm exerts pres-
 sure upon the balance-bar alternately in op-
 posite directions as the escapement oscillates, 70
 substantially as set forth.

3. In combination, a normally vertical bal- 75
 ance-bar provided with suspension-bearings upon its opposite sides, adjustable bearings for receiving the suspension-bearings to sup-
 port the balance-bar, an escapement, means 75
 for oscillating it, an arm fixed to oscillate with the escapement and a pin fixed to the bar, and engaged with the arm for transmitting the
 motion of the arm to the bar, substantially 80
 as set forth.

4. The combination with the balance-bar 85
 and its suspension, pointed bearings, of the supporting-bearings one provided with a part-spherical-shaped recess and the other with a
 part-cylindrical-shaped recess for the recep-
 tion of the suspension-points; substantially 85
 as set forth.

CHARLES M. RHODES.

Witnesses:

FREDK. HAYNES,
 ROBERT BACON SEWARD.