F. H. WALKER.

INTERMITTENT MECHANICAL MOVEMENT.

APPLICATION FILED MAY 6, 1918.

1,326,238.

Patented Dec. 30, 1919.

Fig. 1

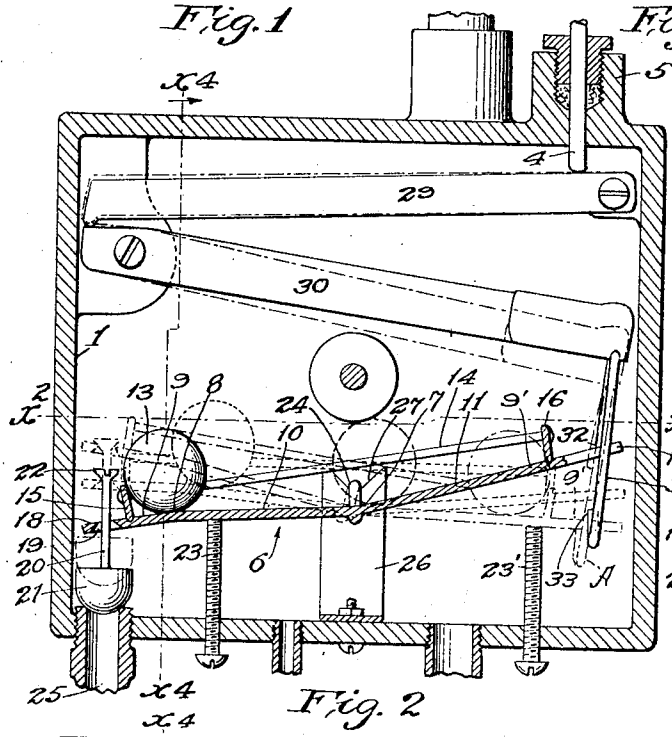


Fig. 4

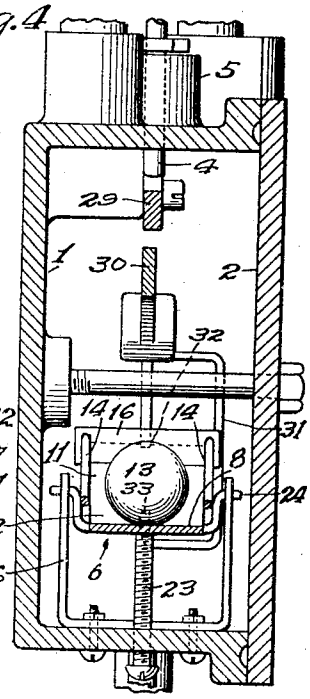


Fig. 2

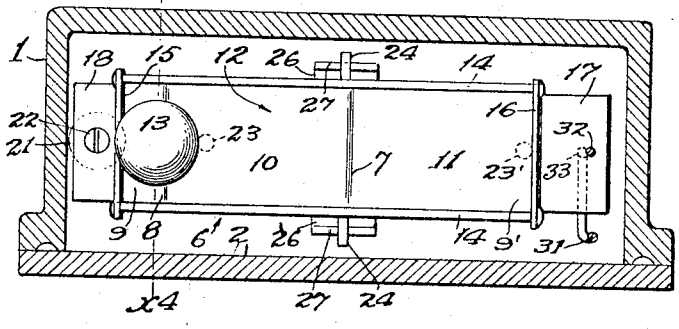
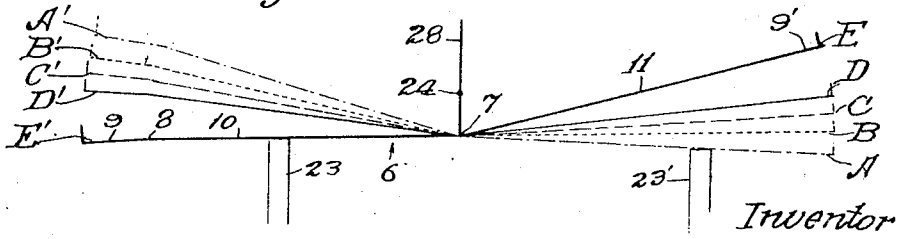


Fig. 3



Witness
C. C. Holly.

Inventor
Frank H. Walker
by James R. Townsend
his atty

UNITED STATES PATENT OFFICE.

FRANK H. WALKER, OF ALHAMBRA, CALIFORNIA.

INTERMITTENT MECHANICAL MOVEMENT.

1,326,238. Specification of Letters Patent. Patented Dec. 30, 1919.

Original application filed January 27, 1917, Serial No. 148,902. Divided and this application filed May 6, 1918. Serial No. 233,182.

To all whom it may concern:

Be it known that I, FRANK H. WALKER, a citizen of the United States, residing at Alhambra, in the county of Los Angeles and State of California, have invented a new and useful Intermittent Mechanical Movement, of which the following is a specification.

This invention relates to a device set forth in my application for patent on automatic water heater, Serial No. 148902, filed Jan. 27, 1917, and of which this application is a division.

An object of this invention is to provide practical mechanical means for automatically operating a device offering a variable resistance to such operation.

This invention relates to means by which to produce practically instant valve action both at the time of valve opening and valve closing; and an object is to provide simple and certain means that are not likely to get out of order and that are adapted to accomplish practically instantaneous action for the opening and closing of a valve.

The invention is also adapted to operate mechanism for making and breaking an electric circuit or for use in other cases where a sudden, quick action is desired. It is applicable in combination with additional mechanism, which would bring about a practically instantaneous action in one direction and which, when working in the opposite direction would also bring about practically instantaneous action.

An object is to provide a practical snap action without the use of springs and without having to overcome any forceful resistance.

This invention is primary and pioneer in that an oscillatory element and a mobile weight are so constructed and arranged that the weight is intermittently operated to act upon the oscillatory element less forcibly in one direction than in the other, thus to reduce the pounding action and the noise of operation. The mechanism will be described and shown herein as operating a gas valve, but I do not limit it to that purpose specifically.

The invention is basic and primary in that it comprises in combination with a mobile weight, an oscillatory element oscillating on a horizontal axis and constructed and arranged to give to such weight during an oscillation of the oscillatory element, an impetus to forcibly complete the oscillation of the oscillatory elements; and this is done by constructing the oscillatory element to form for the mobile weight a way having two limbs in angular relation to each other converging toward the vertical plane of the axis of oscillation and being provided at one end with means to maintain the angle of repose of the weight until said weight has been sufficiently elevated by initial oscillation to give the weight such impetus down the adjacent long limb of the way as to cause the weight to ride upon the other limb and to forcibly and suddenly actuate said other limb to complete the oscillation of the oscillatory element and to cause the weight to reach, at the other end of said element, a seat constructed to afford an angle of repose for said weight only during the full depression of such other end of the oscillatory element.

This novel feature is embodied in a rocker formed with a way having two angles and three limbs, one of said angles being an inward bend formed of two limbs and the other angle being an outward bend formed by the junction of a third and shorter limb with one of the longer limbs; and the shorter limb forming a seat for the weight; the inner bend being adjacent the vertical plane of the axis of oscillation, and the way being so constructed that when, upon initial oscillation of the rocker the seat has been raised until the opposite ends of the way are at a common level, the short limb will yet form a seat to maintain the weight at repose; and upon a further oscillation raising said seat. the weight supported by the short limb of the rocker will pass beyond the angle of repose of said weight, thus releasing the weight and allowing it to move down the adjacent long limb of the rocker with such velocity that its momentum will cause it to act forcibly upon the other long limb thereby to suddenly and forcibly depress such other long limb with a snap action or jerk so as to operate a lost motion means with a jerk to unseat and lift a valve connected thereto. It is understood that the lost motion means thus operated may be of various constructions and applied to the operation of various devices other than gas valves.

Lost motion means will also be shown for imposing the initial oscillation upon the

rocker in either direction and it is understood that the invention is not limited to any specific lost motion means for giving initial oscillation to the rocker.

Some of the objects of the invention are simplicity, cheapness, easy installation and minimized liability to wear and getting out of order.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detail description and the appended claims.

The accompanying drawing illustrates the invention.

Figure 1 is a side elevation of apparatus embodying my invention as applied in an automatic gas cut-off for an automatic water heater. Solid lines show the parts in valve closing position.

The weight starting position is shown in dotted lines; the valve starting position of the weight is shown in dash lines; and the open valve position is shown in dot and dash lines;

Fig. 2 is a plan of the rocker or oscillatory member shown in Fig. 1, together with the housing which is sectioned on line x^2 Fig. 1.

Fig. 3 is an elevational diagram of the oscillatory member at various positions of the mobile weight.

Fig. 4 is a transverse section on line x^4, Figs. 1 and 2, looking in the direction of the arrow, the weight being intact.

1 is a gas box or gas chamber entirely open on one side, this side, however, being provided with a lid or cover 2 which when the valve is to be placed in operation, is securely bolted on to the box 1, and sealed gas-tight by gasket material 3.

The motive power to operate the mechanism constituting the present invention may be communicated to such mechanism by a rod 4 working through a stuffing box 5 in the wall of the gas chamber,—or by other suitable well known means not necessary to be illustrated herein as they do not involve this invention.

The mechanism of the present invention comprises an oscillatory member 6 in the form of a rocker having two bends, one bend 7 being in the center and another 8, at one end. The bent way thus has three limbs 9, 10, 11 arranged in certain angular relations to each other so as to produce certain results as described below.

This rocker is balanced or nearly balanced, as may be desired for adjustment, on a transverse fulcrum arranged near the middle of the rocker.

On the upper portion of the rocker there is provided a run way 12 in which a mobile weight, shown as a steel ball 13 moves from one end to the other with practically no friction.

Said way is formed by the bent upper surface of the rocker and is limited by the smooth cylindrical rods 14, and the end bars 15, 16.

Protruding from each end of the rocker, beyond the ball inclosure, are two lips, 17, 18, the same simply being extensions of the floor of the rocker.

In one of these lips is a hole, 19 through which the stem 20 of the valve member 21 may slide freely between such member and a head 22 at the top of the valve stem. Said head is shown as of a conical form, resting at its lower reduced end on the margin of the hole 19 through which the stem moves. Said hole flares downwardly and the valve stem, the head and the rocker, constitute lost motion mechanism for operating the valve.

The lip at the other end of the rocker is adapted in this particular form of construction to be acted upon by whatever motive force may be used to produce action of the valve operating mechanism.

The stops 23, 23′ which are shown as adjustable, being screw threaded into the floor of gas chamber are provided and so placed that whichever end of the rocker may be in depressed position will rest on its respective stop and not be allowed to descend farther than desirable. That is to say, the oscillation of the rocker is confined to predetermined limits.

The two bends of the rocker must be in predetermined relation to each other. For instance, in the construction shown the bend 8 at the valve seating end of the rocker, must be far enough from the valve seating end of the run-way to cause the limb 9 to form a light pocket or seat of repose to retain the ball, so as to form an elevator for the weight; and limbs 9 and 10 must be at such an angle with relation to the unseating limb 11 at the motive end of the rocker, that the ball will not roll from the valve operating end of the rocket until such end has attained an elevation great enough and has inclined the limb 10 enough toward the middle bend 7, to give the ball such an impulse as it moves down the inclined limb 10 as to cause the weight, through the force of its own momentum, to run past the middle bend 7 of the rocker and on toward the motive end thereof and to act against the sloping face of limb 11, and run along the same so as to carry the farther end of the rocker down to the position of rest with the ball in repose at that end and weighting it down. The ball is of such weight relative to the valve and valve-stem and other parts, that it will hold the rocker in the position A until motive power external to the rocker is applied to initiate an oscillation of the rocker in an opposite direction.

The limb 11 is at such an angle to the limbs 10 and 9 and the fulcrum 24 of the rocker, that the angle of repose of the

weight when at the valve unseating end is less than the angle of repose of the weight at the valve seating end of the rocker so that at the return action the weight will roll from its seat at the valve unseating end of the rocker before the limb 11 has been elevated to an incline equal to that to which it had descended when the ball had begun to depress the limb 11.

It will be seen by the reference to Figs. 1 and 3 that the end to be attained by these bends and the consequent ball and rocker action is: that while the left end of the rocker as shown in said figure is slowly rising, immediately upon its reaching a certain point, the rest of the rising action will be turned into a practically instantaneous rising action by the impact and rolling of the steel ball, on limb 11; and it will also be seen that the other point to be attained is that when the reverse action is brought about, the ball will roll from the right end of the rocker and bring about a sudden descent of the left end of the rocker before the left end has descended to the point mentioned above at which the left end of the rocker, when it was rising, had commenced its sudden action.

It will be seen that I have produced a mechanism, one end of which, though it be slowly rising, will reach a point where its action will suddenly be changed to a very rapid action, and that vice versa, when this end is slowly descending, it will reach a position where its slowly descending motion will be turned into a practically instantaneous motion and this latter position will be considerably above the position previously mentioned, at which when the left end of the rocker is rising slightly, the slow motion is turned into the practically instantaneous motion.

In Fig. 3, five positions of the rocker are shown to illustrate the action by reason of the two weight seats 9 and 9′ being of different angles of repose. At position A the weight is held stably in seat 9′. At position B the angle of repose for the rolling weight 13 has been overcome at seat 9′ so that the rolling weight will roll toward seat 9. The weight of the valve and stem pull the rocker down at the valve seating end so that the ball readily rolls to the pocket or elevator seat formed by limb 9. The rocker therefore will oscillate almost instantaneously from position with the ball at B to position with the ball at E′.

At positions C, D and E, therefore, the limb 11 is free from the weight and the weight 13 is imposed upon the limb 10.

On depression from E to D and consequent rising from E′ to D′, the weight has been elevated to a level considerably higher than the level B which overcame the angle of repose of the weight at B, and yet the angle of repose of the weight at D′ has not been overcome, nor is it overcome until the position C′ has been reached. The elevation from E′ to the weight unseating level at C′ is about three times the elevation from A to the weight unseating level B and at this juncture the ball being released and rolling down the incline will strike the limb 11 at the position C thereby acting to suddenly depress seat 9′ and jerk the valve 21 from its seat. This difference between the point of sudden rising motion and the point of sudden descending motion of a limb is made effective as follows: The valve stem 20 is of such a length that when the valve end 18 of the rocker commences its practically instantaneous upward motion, it has a slight distance to travel before it engages the head of the valve stem so that it acts thereon like a hammer. When it thus engages the head of the valve stem, the valve will be unseated with a practically instanteneous action and on the further oscillation of the rocker it is raised well above the valve seat.

Vice versa, when the closing action of the mechanism commences, there is enough difference between the closing points and opening points mentioned above to allow the practically instantaneous closing action to begin at a point before the valve has closely approached its seat, so that the valve may seat by the momentum of a considerable drop.

It will thus been seen that the valve is immediately and positively seated, so no gas, will pass through the outlet 25.

Vice versa, when the valve is descending toward the closed off position it will allow a full supply of gas to flow until the valve reaches a point where it starts to descend almost instantaneously and the gas is shut off from full flow to full shut off practically instantaneously.

The object attained by this double acting quick action in the case illustrated, is the prevention of flare-backs in air mixers on gas burners, and the advantage of having a burner always in normal desired condition; that is, with full flow of gas or absolutely shut-off with no flow of gas except at a pilot light not shown.

The oscillatory member is shown as fulcrumed on the axis 24 supported by the standards 26 having V-shaped notches or crotches 27 that establishes the vertical plane 28 produced from the axis 24 and across which the weight moves from limb 10 to 11, and vice versa.

The motive power is shown as applied from the rod 4 to the end 17 of the oscillatory member by means of the levers 29 and 30 and the lost motion device comprising a wire 31 having tips 32, 33 that engage respectively an upper and under side of the lip at 17. The movement by the means thus

shown to initiate the oscillation of the rocker 6 is very slow, but as the tip 32 depresses the limb 11 to the position C, thus elevating the seat 9 to the position C' the angle of repose of the weight is overcome with the result above stated, and vice versa, on the return movement of the lever 30 through pressure of the rod 4 upon lever 29, the tip 33 elevates the limb 11 from position A to position B, thus overcoming the angle of repose of the weight whereupon the action as described is completed.

It is noted that as the rolling weight passes the vertical plane 28 produced from the axis of oscillation 24, it is received by a yielding inclined surface that cushions the weight so that the sound of impact is minimized and that with the parts properly proportioned and adjusted as shown the ball successively comes to rest gently against bars respectively at the ends of the way, thus making the operation practically free from noise and destructive action.

I claim:—

1. A mechanical movement comprising a rocker having a floor provided with three limbs arranged to form concave and convex bends and provided with bars at the ends, and a rolling weight on said rocker; the concave bend being near the vertical plane of the axis of oscillation and the convex bend being near one end of the rocker, whereby the angle of repose of the weight is sufficient at one end of the rocker to be overcome only upon a considerable elevation of such end so as to give high momentum to the weight to carry it across the concave bend to cause it to suddenly depress the descending limb of the rocker and jerk up the rising limb.

2. A variable mechanical movement comprising an oscillatory member provided with a way and a mobile weight in said way, said way being constructed with two limbs inclined downward toward the produced vertical plane of the axis of oscillation, said way being provided at one end with means to maintain the angle of repose of the weight throughout a greater arc at that end than at the other end during reciprocal oscillations of said member, so that the greater momentum will be acquired by the weight in gravitationally moving from one end of the oscillatory member than from the other end of such member.

3. A variable mechanical movement comprising an oscillatory member provided with a way and a mobile weight in said way, said way being constructed with two limbs inclined downward toward the produced vertical plane of the axis of oscillation, said way being provided at one end with means to maintain the angle of repose of the weight throughout a greater arc at that end than at the other end during reciprocal oscillations of said member, so that the greater momentum will be acquired by the weight in gravitationally moving from one end of the oscillatory member than from the other end of such member; and lost motion means to gradually initiate the oscillatory movement of said member.

4. A variable mechanical movement comprising an oscillatory member provided with a way and a mobile weight in said way, said way being constructed with two limbs inclined downward toward the produced vertical plane of the axis of oscillation, said way being provided at one end with means to maintain the angle of repose of the weight throughout a greater arc at that end than at the other end during reciprocal oscillations of said member, so that the greater momentum will be acquired by the weight in gravitationally moving from one end of the oscillatory member than from the other end of such member; and lost motion means operable by the oscillatory member at the latter part of the upward movement of said angle of repose maintaining end of the member for the purpose of operating the operable lost motion means with a jerk.

5. A variable mechanical movement comprising an oscillatory member provided with a way and a mobile weight in said way, said way being constructed with two limbs inclined downward toward the produced vertical plane of the axis of oscillation, said way being provided at one end with means to maintain the angle of repose of the weight throughout a greater arc at that end than at the other end during reciprocal oscillations of said member, so that the greater momentum will be acquired by the weight in gravitationally moving from one end of the oscillatory member than from the other end of such member; lost motion means to gradually initiate the oscillatory movement of said member; and lost motion means operable by the oscillatory member at the latter part of the upward movement of said angle of repose maintaining end of the member for the purpose of operating the operable lost motion means with a jerk.

6. The combination with stops, and lost motion means, of an oscillatory member fulcrumed between its ends to oscillate between the stops and provided with a way for a mobile weight; said member being provided with two limbs converging toward a vertical plane produced from the axis of oscillation; a mobile weight in said way adapted to rest at either end of said member when such end is fully depressed, and adapted to move from such end when the same is elevated to a predetermined level, and to move over the adjacent limb and across said vertical plane and by reason of its momentum to act upon the opposite limb while such opposite limb is yet aslant up-

ward from such vertical plane for the purpose of operating the oscillatory member with a jerk and allowing the weight to come to rest at the farther end of the way.

7. The combination with a valve seat and a valve therefor, of an oscillatory member fulcrumed between its ends and provided with a way for a mobile weight; said member being provided with two limbs converging toward a vertical plane produced from the axis of oscillation and having a seat at each end for a weight; a weight in said way adapted to rest at either end of said member when such end is depressed and adapted to move from the depressed end when somewhat elevated and to move from its seat and down the adjacent limb while the same is aslant toward said vertical plane and to act upon the opposite limb to depress the same for the purpose of allowing the weight to come to rest at the farther end thereof; and means to maintain the weight in a state of repose at one end of the member through an arc of upward oscillation greater than that which is sufficient to overcome the angle of repose of the weight at the end opposite the valve.

8. The combination with a valve seat and a valve therefor, of an oscillatory member provided with a way for a mobile weight and having at one end a lost motion connection with said valve and a positive seat of repose for said weight and provided at the other end of the way with a less positive seat of repose for said weight; said oscillatory member being fulcrumed intermediate its ends and provided with limbs converging downwardly toward a vertical plane produced from the axis of oscillation; a mobile weight in said way adapted to remain at rest in one or the other seats of repose at the end of an oscillatory movement in one or the other direction; means to limit the amplitude of oscillation so that when the member oscillates from closed valve position, the mobile weight will be elevated to a sufficient height to cause the momentum of its descent along the then ascending limb of the way to be sufficiently great to suddenly operate the then descending limb to unseat the valve and to allow the weight to reach the other seat of repose.

9. The combination with a support; of an oscillatory member fulcrumed on the support and having a limited range of oscillation on a horizontal axis and provided with a way for a mobile weight; a mobile weight in said way adapted to move gravitationally from end to end of the way as said member is oscillated; said way being formed with limbs arranged in different angular relations to each other, the first and second of said limbs converging downward toward the produced vertical plane of said axis of oscillation, and the second and third limbs converging in a reverse direction to a line parallel to said axis and near one end of the way, to form a timed elevator for said mobile weight; and lost motion means to give sufficient initial oscillation to the oscillatory member in either direction to start the mobile weight from the rising toward the lowering end of said oscillatory member; said timed elevator being adapted to hold the weight in repose until it is elevated to a height sufficient to enable the weight to be returned with greater momentum toward the seat of slight repose than it travels from said seat toward the seat of greater repose.

10. The combination with a mobile weight, of an oscillatory member forming a way having two limbs in concave angular relation to each other and having seats for the weight at the ends of said way and provided at one of said seats with means to maintain an angle of repose for said weight for the purpose of elevating said weight through a considerable arc during an oscillatory movement in order that when the angle of repose of the weight is overcome, the impetus of descent of such weight will be considerable so as to exert considerable force to overcome resistance to descent of the opposite limb of the member.

11. The combination with a mobile weight, of an oscillatory member forming a way having two limbs in concave angular relation to each other and having seats for the weight at the ends of said way and provided at one of said seats with means to maintain an angle of repose for said weight for the purpose of elevating said weight through a considerable arc during an oscillatory movement in order that when the angle of repose of the weight is overcome, the impetus of descent of such weight will be considerable so as to exert considerable force to overcome resistance to descent of the opposite limb of the member, and lost motion means through which such force is applied to overcome the resistance.

12. The combination with a mobile weight, of an oscillatory member forming a way having two limbs in concave angular relation to each other and having seats for the weight at the ends of said way and provided at one of said seats with means to maintain an angle of repose for said weight for the purpose of elevating said weight through a considerable arc during an oscillatory movement in order that when the angle of repose of the weight is overcome, the impetus of descent of such weight will be considerable so as to exert considerable force to overcome resistance to descent of the opposite limb of the member, and means to initiate the oscillatory movement.

13. The combination with a mobile weight, of an oscillating member forming a way

having two limbs in concave angular relation to each other and having seats for the weight at the ends of said way and provided at one of said seats with means to maintain an angle of repose for said weight for the purpose of elevating said weight through a considerable arc during an oscillatory movement in order that when the angle of repose of the weight is overcome, the impetus of descent of such weight will be considerable so as to exert considerable force to overcome resistance to descent of the opposite limb of the member, lost motion means through which such force is applied to overcome the resistance, and lost motion means to initiate the oscillatory movement.

14. In combination, an oscillatory member bent to form the floor of a way having two limbs in concave angular relation to each other; cylindrical rods at the side of the way and bars at the end of the way; a ball in the way; lost motion means to initiate oscillation of the member; and lost motion means operable by the oscillatory member.

15. In combination, an oscillatory member bent to form the floor of a way having two limbs in concave angular relation to each other, cylindrical rods at the sides of the way and bars at the ends of the way; a ball in the way; lost motion means to initiate oscillation of the member; and valve means operable by the oscillatory member.

16. In combination, an oscillatory member bent to form the floor of a way having two limbs in concave angular relation to each other; a ball in the way; lost motion means to initiate oscillation of the member; and lost motion means operable by the oscillatory member.

17. In combination, an oscillatory member bent to form the floor of a way having two limbs in concave angular relation to each other; a ball in the way; and valve means operable by the oscillatory member.

18. In combination, an oscillatory member bent to form the floor of a way having two limbs in concave angular relation to each other; a ball in the way; lost motion means to initiate oscillation of the member; and adjustable stops to adjust the oscillatory movement of said member.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 29th day of April, 1918.

FRANK H. WALKER.

Witness:
JAMES R. TOWNSEND.