



# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN CLOCK-ESCAPEMENTS.

Specification forming part of Letters Patent No. 221,331, dated November 4, 1879; application filed May 2, 1879.

*To all whom it may concern:*

Be it known that I, CHARLES E. LORD, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Clock - Escapements, of which the following is a specification.

This escapement, although applicable to clocks of all sizes, is particularly adapted to tower-clocks. It is of that class known as "gravity-escapements," and one in which gravity not only gives the impulse to the pendulum, but also unlocks the escape-wheel.

The nature of this improvement and its advantages are below set forth.

In the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 is a side elevation of an escapement embodying my improvement, a spring and a little gear being shown, merely for the purpose of providing sufficient power to run the escapement for a short time. Fig. 2 is a front elevation of the escapement in the position assumed when the pendulum has swung to its extreme point at the left and is about to enter upon its return vibration to the right, (the direction indicated by the arrow.) Fig. 3 is a rear elevation of the same in exactly the same condition. In both Figs. 2 and 3 a part of the frame shown in Fig. 1 is removed the better to exhibit the escapement. Fig. 4 is a part elevation of the escape-wheel and some of its actuated connections. Fig. 5 is a detached view of the upper portion of one of the pallet-detents with one of the pallet-pins therein, the view being taken from the rear side.

A is the escape-wheel, fixed upon its arbor A'', which is actuated by the train of the clock, (not shown in the drawings,) but for which the gear *w* acts a substitute.

A fly-wheel, *x*, is fixed upon the arbor A'', and the escapement is supported in a frame, *y*, none of which parts, except the escape-wheel, are essential to the invention.

The escape-wheel A has six arms, whose ends are loaded or thickened alternately on the front and rear sides, although this is not absolutely necessary.

B B' are the wheel-detents, which lock the escape-wheel alternately. C C' are the pallets. D D' are the pallet-detents, to which the wheel-

detents B B' are firmly secured or made a part of. E E' are the lower extensions of the pallet-detents D D', being a part of or fastened to the same, and the latter, E', bending inward at nearly a right angle. *a a a* are the three lifting-pins projecting from the escape-wheel. *b b'* are the pallet-pin guards. *c c'* are the beat-pins. *d d'* are the pallet-pins. *f f'* are the cocks supporting the pivots *g g* of the pallet-detents, and also serving as banks for the wheel-detents. The pallets pivot at *h h*.

*k* is the pendulum, *l* the pendulum-rod, and *o o'* are the pallet-extensions, projecting inwardly from the pallets.

In the drawings, the escape-wheel A is turning toward the left, and is locked in the wheel-detent B' on the right-hand side. The pendulum has completed a vibration toward the left, and, we will suppose, has just entered upon its return—*i. e.*, is now moving toward the right. It strikes the beat-pin *c'*, and by it moves the pallet C' to the right and upward until the pallet-pin *d'*, releasing itself, allows the pallet-detent D' to fall, which by its weight alone raises the wheel-detent B', thus unlocking the escape-wheel. This pallet C' is now free, and will continue with the pendulum-rod (being raised thereby) to the end of its vibration toward the right, and will return with it in its vibration toward the left until its extension *o'* reaches the lowest of the lifting-pins *a* on the wheel, which will be when the pendulum-rod is hanging vertically or slightly to the left.

Furthermore, as soon as the escape-wheel is unlocked by the detent B', as above mentioned, it moves one-sixth of a revolution, when it is again locked by the detent B. The extension E having been moved outward toward the left from the center of the wheel by the highest lifting-pin *a*, the detent B, necessarily moving with it, is depressed, so as to encounter the thick end A' of the next spoke of the escape-wheel, and at the same time the pallet C is raised by the action of the same lifting-pin *a* upon its extension *o*, so as to carry the pallet-pin *d* over and allow it to catch into the pallet-detent D and hold it in position until released by the pendulum-rod, which will be

upon its return toward the left, just a little to the left of the central point, when it moves the pallet C, by means of its beat-pin *c*, toward the left until the pallet-pin *d* allows the pallet-detent D to fall. The upper lifting-pin, during the above-described operation, has passed a little beyond, to the left of the point of the extension E, on which it acts, so that the pallet-detent C is in a position to fall as soon as released by the pallet-pin *d*.

It will be seen that the above description takes the pendulum-rod at its highest point at the left and carries it once to its highest point to the right and return.

The pallet-extension *o'* of course performs an office upon the lowest lifting-pin similar to that performed by *o* upon the highest lifting-pin, said extension being bent at about a right angle, so as to reach the pin.

The guards *b b'* prevent the pallets from going so far as not to return in season to allow the pallet to catch the pallet-detents should the escape-wheel be moved with greater or less velocity. They are of great importance, as they effectually prevent tripping or allowing more than one arm of the escape-wheel to pass the detents at a time. They are not in action nor touched by the pallet-pins except in time of danger.

In this improvement there is a perfect uniformity in the labor of the pendulum, a perfect equalization of the friction. The friction of the pallet-pins is always the same, and cannot be affected by the greater or less force applied to the train.

The works may be freshly cleaned or be badly gummed up; the hands, as is often the case in tower-clocks, may be loaded with snow and ice; but the pendulum is not affected, as the whole force of locking is practically upon

the frame, not on any movable part of the clock.

The unlocking is purely by the power of gravity, and tripping is impossible, as proved by actual test.

Having thus fully described my improvement, what I claim, and desire to secure by Letters Patent, is—

1. The intermediate mechanism shown, lying between the pallets and the escape-wheel, and consisting of the pallet-detents D D' provided with the extensions E E' and guards *b b'*, and having the wheel-detents B B' attached to the same, arranged to operate substantially as described.

2. In combination with the escape-wheel, the pallet-detents D D', provided with the wheel-detents B B', arranged to lock alternately the escape-wheel by engaging the spokes thereof alternately, substantially as specified.

3. The pallet-detents D D', provided with the extensions E E', arranged to be actuated by the lifting-pins *a a a*, substantially as set forth.

4. The pallet-detents D D', provided with the guards *b b'*, in combination with locking or engaging pins or projections *d d'*, secured to the pallets for the purpose of preventing tripping, and substantially as described.

5. The combination, with the lifting-pins *a a a*, of the pallet-extensions *o o'* and the pallet-detent extensions E E', arranged substantially as described, and so that the same lifting-pin moves one of each of the said extensions, substantially as and for the purpose set forth.

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Witnesses:

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