2 Sheets—Sheet 1.

J. G. POWELL.

Escapement for Toy Watches.

No. 204,606. Patented June 4, 1878.

FIG. 1

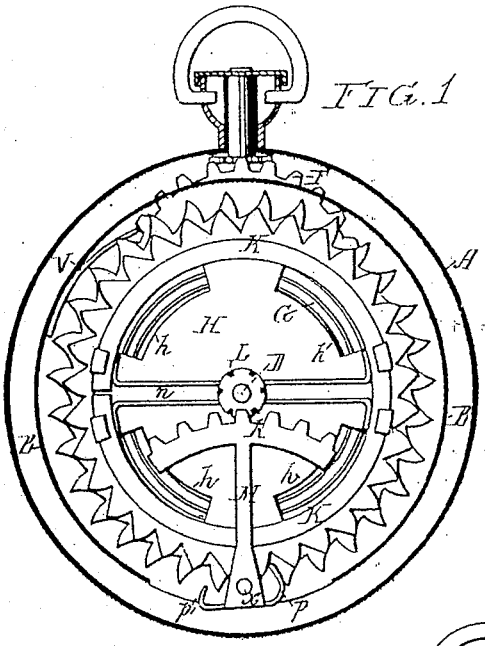


FIG. 4.

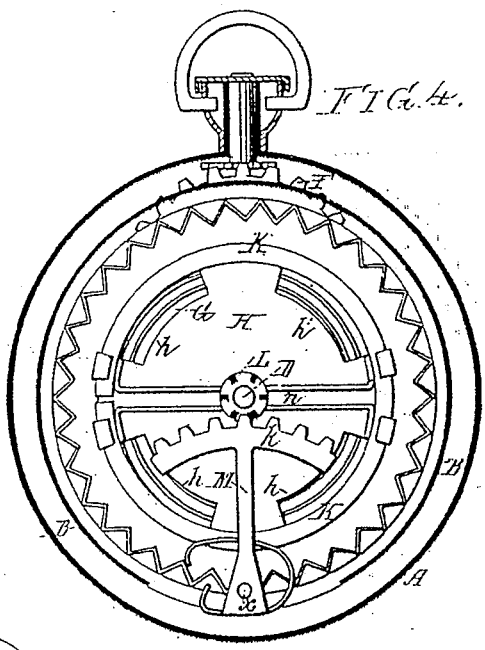


FIG. 2.

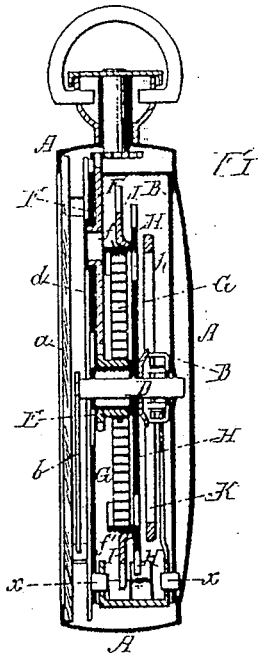


FIG. 3.

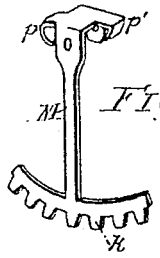


FIG. 6.

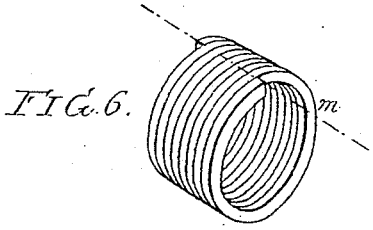


FIG. 7.

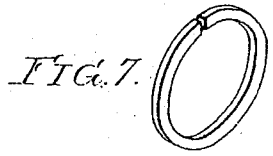
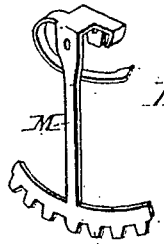


FIG. 5.



Witnesses
Henry Howson Jr.
Harry Smith

Inventor
John G. Powell
by his Attorneys
Howson and Son

2 Sheets—Sheet 2.

J. G. POWELL.

Escapement for Toy Watches.

No. 204,606. Patented June 4, 1878.

FIG. 16.

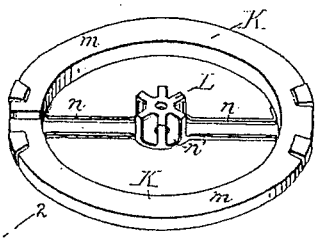


FIG. 8.

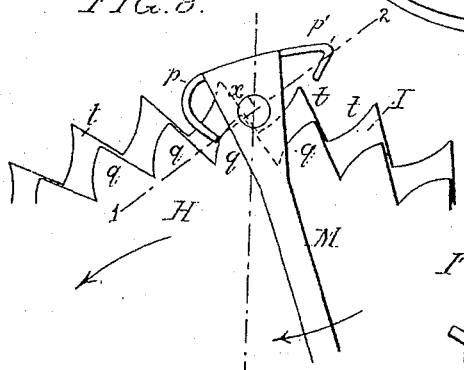


FIG. 9.

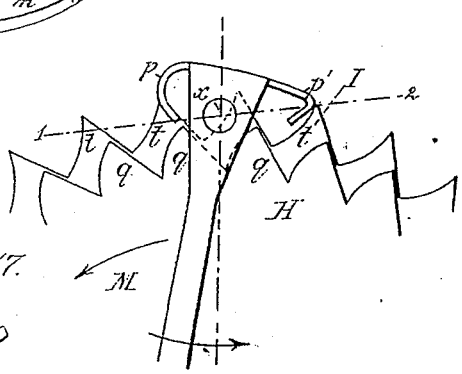


FIG. 17.

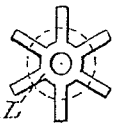


FIG. 13.

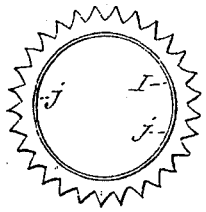


FIG. 18.

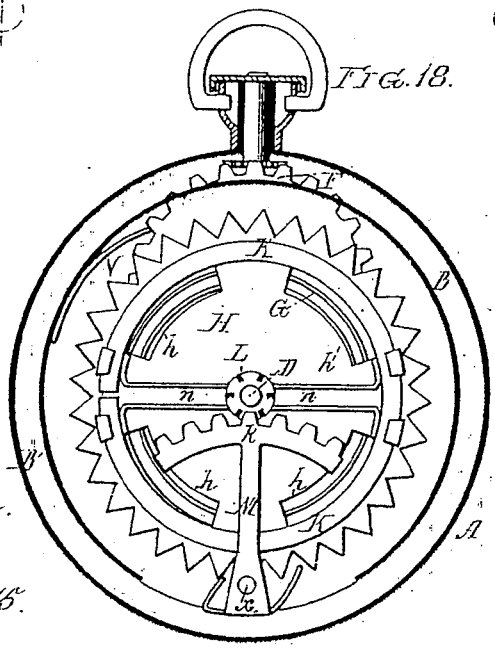


FIG. 10.

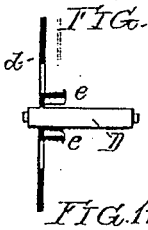


FIG. 12.

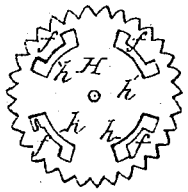


FIG. 11.

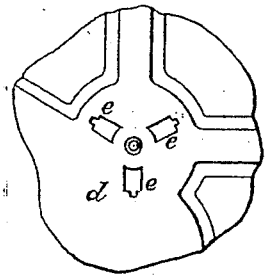


FIG. 14.

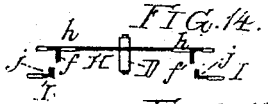
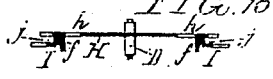


FIG. 15.



Witnesses
Henry Howson Jr.
Harry Smith

Inventor
John G. Powell
by his Attorneys
Howson and Son

UNITED STATES PATENT OFFICE.

JOHN G. POWELL, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN ESCAPEMENTS FOR TOY WATCHES.

Specification forming part of Letters Patent No. **204,606**, dated June 4, 1878; application filed April 29, 1878.

To all whom it may concern:

Be it known that I, JOHN G. POWELL, of Philadelphia, Pennsylvania, have invented a new and useful Improvement in Escapement Motors for Toy Watches, &c., of which the following is a specification:

The main object of my invention is to so combine a duplex pallet-wheel in a toy watch, toy clock, time-keeper, or other motor with a pallet-lever that there shall be a more determinate and certain action of the escapement than when a single pallet-wheel is used.

My invention is also directed to improvements, fully described hereinafter, in toy watches.

In the accompanying drawing, Figure 1 is a sectional view of a toy watch with duplex pallet-wheel; Fig. 2, a transverse section of the same; Fig. 3, a perspective view of the pallet-lever for Figs. 1 and 2; Fig. 4, a sectional view of the watch, showing a modified duplex pallet-wheel; Fig. 5, a perspective view of the pallet-lever for Fig. 4; Figs. 6 and 7, perspective views showing the mode of making the rim of the balance-wheel; Figs. 8 and 9, diagrams illustrating the action of the escapement in Figs. 1 and 2; Figs. 10 and 11, detached views of parts of the toy watch; Figs. 12, 13, 14, and 15, views showing the mode which I prefer of making the duplex pallet-wheel; Figs. 16 and 17, views showing the mode of constructing the balance-wheel; and Fig. 18, a sectional view of a toy watch with single pallet-wheel.

In Figs. 1 and 2, A is the outer casing of the watch, and *a* the glass in front of the same, B being the inner casing; D, the central spindle, having its bearings in the opposite sides of the inner casing, and *b* the pointer secured to the spindle.

On the front *d* of the inner casing B is made an internal fixed journal for the pinion E by partially severing the metal at three points, (shown in Fig. 11,) so as to form three tongues, *e e e*, which are bent inward, and together form the desired journal, on which the pinion E revolves, the said pinion being retained in place by bending the ends of the tongues. This pinion gears into a wheel, F, which has a tubular projection made by forcing outward the central portion of the wheel, thus forming a journal, which has its bearing in the front *d* of the inner casing.

The wheel F gears into a pinion on the stem of the watch, as described in the Letters Patent No. 190,362, granted to me May 1, 1877. A spring-pawl, *v*, prevents the turning of the wheel F in the wrong direction.

One end of a coiled spring, G, is secured to the pinion E, the other end being attached to one of the projections *f* on a pallet-wheel, H, secured to the spindle D, and to this wheel is secured a second pallet-wheel, I, larger in diameter than but having the same number of teeth as the first wheel.

The method which I prefer to adopt in making this duplex pallet-wheel for toy watches will be best understood by reference to the detached views, Figs. 12, 13, 14, and 15.

The wheel H is struck out at one operation by a punch and die from a sheet of ordinary tinned plate, and four holes, *h*, of the shape shown in Fig. 12, are cut in the wheel, a lip, *f*, projecting into each hole.

The wheel I consists of a ring of tinned plate with teeth on the outer edge and a raised rib, *j*, on the inner edge.

The lips *f* of the wheel H are passed through the ring of the wheel I until the rib *j* of the latter is in contact with the wheel H. By applying heat to the two wheels a union will be effected through the medium of the tinned portions in contact with each other, and the duplex pallet-wheel will be complete, the projecting lips *f*, to one of which one end of the coiled spring is attached, as remarked, serving to confine the said coiled spring within proper limits.

It will be understood that other modes of making the duplex pallet-wheel may be adopted when it has to be applied to time-keepers; but I prefer the plan described above for toy watches on account of its economy.

K is the balance-wheel, hung loosely on the central spindle, and having a pinion, L, gearing into a toothed segment, *k*, on the pallet-lever M, which is of the form best observed in Fig. 3, and which is hung to two pins, *x x*, within the inner casing B of the watch, one projecting inwardly from one side and the

other from the opposite side of the said inner casing. The operation of this pallet-lever in connection with the duplex pallet-wheel will be explained hereinafter.

The mode of cheaply making the rim of the balance-wheel is shown in Figs. 6 and 7, and consists in first coiling a wire, *m*, round a mandrel of suitable diameter, and then severing the coil on the dotted line, Fig. 6, thereby separating it into as many rims as there are coils.

An enlarged view of the balance-wheel and mode of constructing the same is shown in Figs. 16 and 17.

A cross-bar, *n*, punched out of tinned plate, is clamped at its opposite ends to the rim *m*, the bar having a central dished hub, *n'*, to which is soldered the pinion L, the latter consisting, in the first instance, of a piece of thin sheet metal, of the form shown in Fig. 17, with a number of radial arms, which are bent at right angles to form the teeth, the latter fitting snugly into the dished hub to which they are soldered.

The action of the pallet-lever and duplex pallet-wheel may be best explained in connection with the diagrams, Figs. 8 and 9, Sheet 2, on reference to which it will be observed that the pallet-lever L has two pallets, *p* and *p'*, the former being acted upon by the teeth of the small pallet-wheel H, and the pallet *p'* by the teeth *t* of the larger pallet-wheel I. This arrangement enables me to employ such pallets *p* and *p'*, that both wheels shall act on the pallet-lever through a more determined leverage than can be attained by a single pallet-wheel. Thus, in Fig. 8, the duplex pallet-wheel being turned in the direction of its arrow by the spring, and a tooth, *q*, of the wheel H acting on the end of the pallet *p*, force will be exerted, through a leverage, to move the pallet-lever M in the direction of its arrow. In Fig. 9 the same lever is being moved in the contrary direction by a tooth, *t*, of the larger wheel I acting on the pallet *p'*, this movement being also effected through a leverage, owing to the relation of the center of the pivot-pin and of the pallet to the teeth of the wheel, this center being at a point between the bases of the teeth *q* of the wheel H and the points of the teeth of the wheel I. No such leverage can be obtained for the two movements by a single pallet-wheel. This leverage is of especial importance in toy watches, in making which, at the necessary cheap rate, perfect exactitude in workmanship cannot be attained; but the leverage exerted by the two pallet-wheels to vibrate the pallet-lever is such that the movement of the latter will be continued in spite of slight defects in the pallets or teeth.

The effect of the duplex pallet-wheel may still further be understood by comparing it with the plan shown in Fig. 18, in which a single pallet-wheel is used substantially in the manner described in the Letters Patent No. 171,851, granted to me January 4, 1876.

A duplex pallet-wheel may be made in the manner shown in Fig. 4, where an annular zigzag rib is secured to a plate or disk on the central spindle, the external projections formed by this rib being the teeth of the larger pallet-wheel, and the internal projections being the teeth of the smaller wheel. In using a duplex wheel of this kind the pallets of the pallet-lever must be arranged substantially in the manner shown in Fig. 5.

Although I have referred in the above description to the main feature of my invention, the duplex pallet-wheel, as applied to a toy watch, it may be used with advantage in connection with time-keepers, and may also constitute a motor or part of a motor for toys and other like purposes.

I claim as my invention—

1. In a toy watch, toy clock, time-keeper, or other motor, an escapement-motion consisting of two pallet-wheels, one of less diameter than the other, and a pallet-lever, one pallet of which is acted on by the teeth of one wheel and the other by the teeth of the other wheel, all substantially as set forth, for the purpose specified.

2. The combination of the duplex pallet-wheel and the pallet-lever with the inner case B of the toy watch, toy clock, or other motor, and the pivot-pins *x x* for the said lever, the said pins projecting inward from opposite sides of the case, all substantially as set forth.

3. The within-described duplex pallet-wheel, consisting of the wheel H, with its bent lips *f* and the toothed ring I, the two being secured together, all substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN G. POWELL.

Witnesses:

HARRY A. CRAWFORD,

HARRY SMITH.