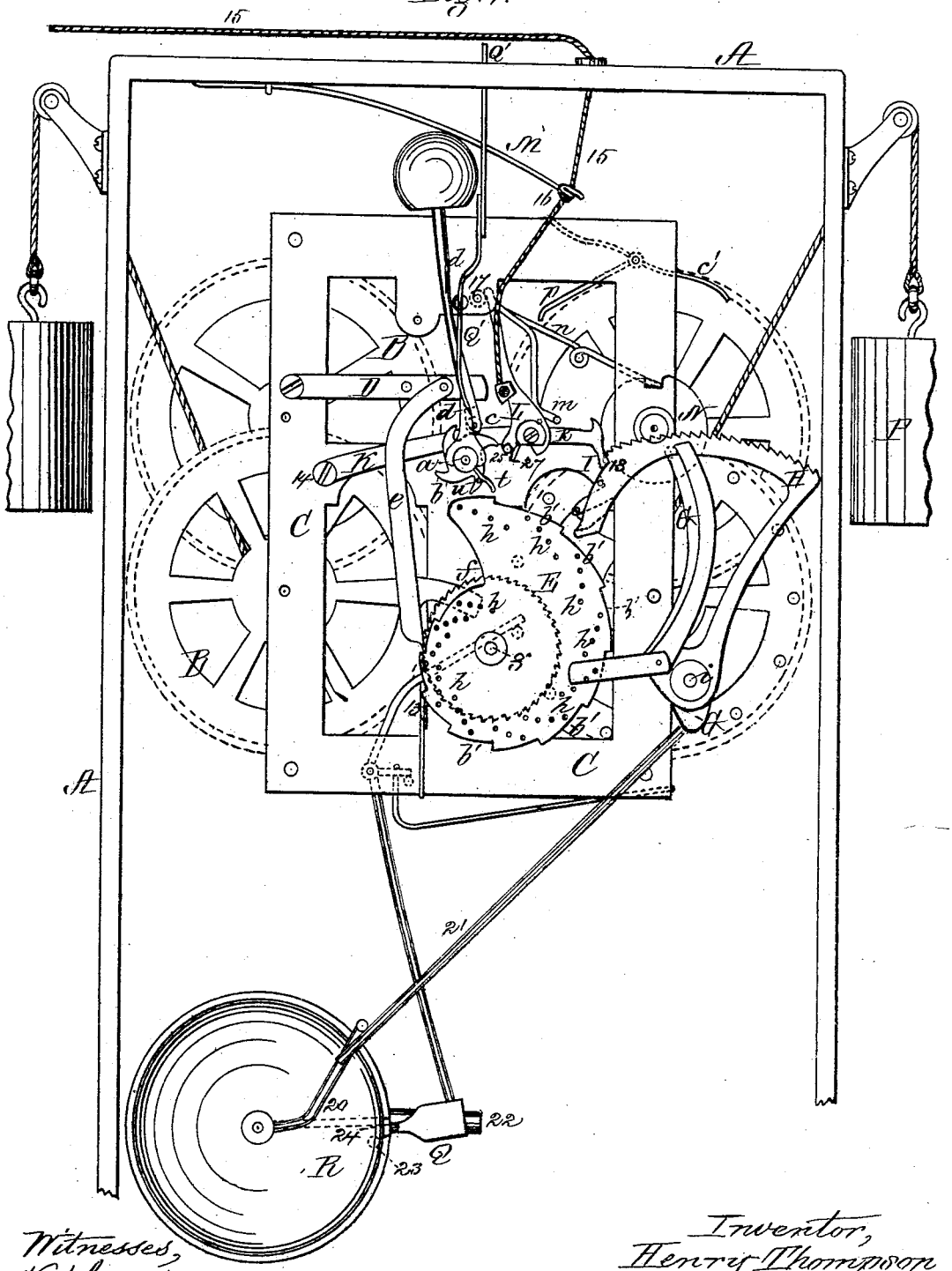
2 Sheets—Sheet 1

H. THOMPSON.

Repeating-Clocks.

No. 204,175. Patented May 28, 1878.

Fig. 1.



Witnesses,
W. J. Cambridge
J. E. Cambridge

Inventor,
Henry Thompson,
Per
Teschemacher & Stearns,
Attorneys.

2 Sheets—Sheet 2.

H. THOMPSON.

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No. 204,175. Patented May 28, 1878.

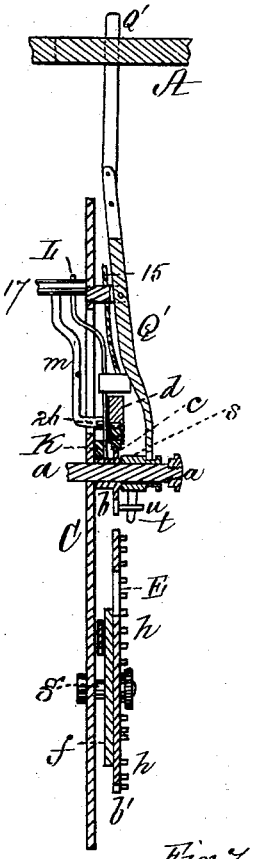


Fig. 3.

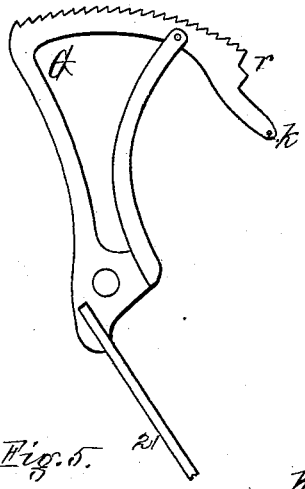


Fig. 4.

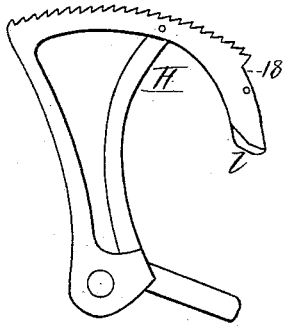


Fig. 5.

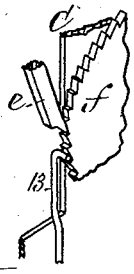


Fig. 6.

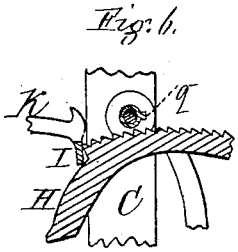


Fig. 7.

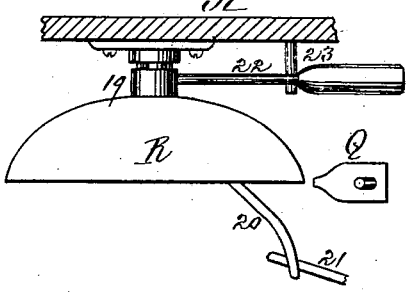


Fig. 8.

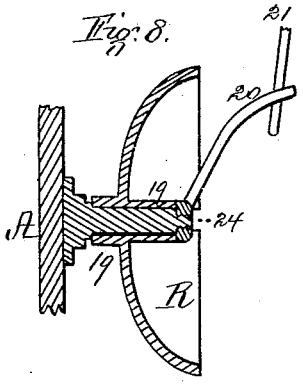


Fig. 9.

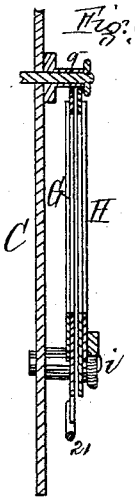
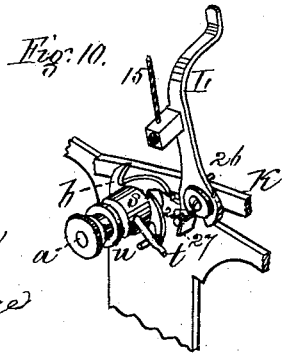


Fig. 10.



Witnesses,
W. J. Cambridge
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UNITED STATES PATENT OFFICE.

HENRY THOMPSON, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN REPEATING-CLOCKS.

Specification forming part of Letters Patent No. **204,175**, dated May 28, 1878; application filed March 16, 1878.

To all whom it may concern:

Be it known that I, HENRY THOMPSON, of Providence, in the county of Providence and State of Rhode Island, have invented certain Improvements in Repeating-Clocks, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a rear elevation of a clock having my repeating striking-movement applied thereto. Fig. 2 is a vertical section through a portion of the same; Figs. 3, 4, 5, 6, 7, 8, 9, and 10, details.

My invention relates to that class of clock-movements which are so constructed as to be capable of striking the time and repeating the same as often as desired, whereby a person, by means of a cord leading to the bed, may, without rising and striking a light, be made acquainted approximately with the time; and my invention consists in certain details of construction, as hereinafter set forth and specifically claimed.

To enable others skilled in the art to understand and use my invention, I will proceed to describe the manner in which I have carried it out.

In the said drawings, A represents a clock-case, within which is secured the movement B, provided with a going-train on one side and a striking-train on the other. The arbor *a* of the minute-hand extends out beyond the rear plate C of the frame of the movement, and on this extension is secured a four-branch cam-wheel, *b*, upon the edge of which rests a grooved friction-wheel, *c*, secured to the lower end of an arm, *d*, secured to the free end of a weighted lever, D, pivoted to the plate C, and to this lever D is pivoted the upper end of a bent pawl, *e*, which engages with a ratchet-wheel, *f*, (having forty-eight teeth,) secured to the inner face of a graduated snail-wheel, E, which, with the ratchet-wheel *f*, revolves on a stud, *g*, projecting out from the plate C. This snail-wheel is provided with twelve steps, *b'*, (one for each hour,) and from the outer face of this snail project forty-eight pins, *h*, divided into twelve series of four pins each, for every hour or step, one pin for each quarter-hour, these pins being arranged in independent eccentric rows.

As the cam-wheel *b* revolves each branch raises the weighted lever D, and with it the pawl *e*, and as soon as the point of the branch passes from under the friction-wheel *c* the lever drops and causes the pawl *e* to move the ratchet-wheel *f* and the snail E a distance equal to that between two teeth of the ratchet-wheel, this movement taking place at the expiration of every quarter of an hour, a spring-pawl, 13, being employed to hold the ratchet-wheel after each movement.

On a stud, *i*, projecting from the plate C, are pivoted two segmental racks, G H, provided with ratchet-shaped teeth, the lower ends of these racks being so weighted as to cause them, when not held back, (by a click or retainer, to be hereinafter described,) to swing over toward the snail E, a pin, *k*, on the rack G resting upon one of the steps of the snail, and a projection, *l*, on the other rack, H, resting on one of the pins *h* of the snail. The racks are held back in the position seen in Fig. 1 by a click or retainer, I, on the end of a long curved lever, K, pivoted at 14 to the plate C. To the lever K is pivoted a weighted bent arm, L, to which is attached a cord, 15, which is led up through a spring-guide, M, and an opening in the top of the case, to any desired point within reach of the person who desires to know the time.

The cord is knotted at 16, immediately below the eye of the guide M, so that when there is no tension on the cord it will be slack between the eye of the guide and the point where it is attached to the bent arm L, so as to allow the latter to be kept by its own weight in the position seen in Fig. 1, with its upper end resting against a suitable stop, and when the cord is released, after being pulled to raise the lever K and retainer I, it is returned to its original position by the spring of the guide M.

When the lever K is raised by the cord the racks G H fall forward as far as allowed by the snail and its pins, the distance varying with the position of the snail. For instance, if the hour-hand points to four, the pin *k* on the rack G will fall against the fourth step of the snail, and if the minute-hand is at any point

between thirty and forty-five minutes past the hour, the projection *l* will fall against the third stop-pin *h* of the series belonging to the fourth step of the snail.

The lever K in its ascent comes into contact with and raises a bent arm, *m*, secured to a rocker-shaft, 17, which carries another arm, *n*, the bent end of which is, by this movement, raised out of a notch in a disk, N, on one of the arbors on the striking-train.

When the cord is pulled to raise the lever K, the upper end of the bent arm L is drawn forward into a position to intercept an arm, *p*, on the shaft of the fan or fly *c'* of the striking-train, which is thus prevented from rotating (after being released by the withdrawal of the arm *n* from the notch in the disk N) until the cord is slackened and the bent arm L falls back out of the path of the arm *p*, when the striking-train will commence to be revolved by its weight P, the retainer I resting on the teeth of the rack.

The arbor of the wheel over the striking-wheel projects out beyond the plate C, and carries a single-toothed pinion or gathering-pallet, *q*, Fig. 6, which, as it revolves, takes up the teeth of the racks one after the other, the retainer I catching and holding the teeth as the pallet *q* gathers them up, a blow being struck by the hammer Q on the gong-bell R at each revolution of the gathering-pallet *q*, the hammer being operated by the pins on the striking-wheel in the ordinary manner.

The bell R is provided with a hub, 19, which fits over and is free to turn upon a stud projecting from the clock-case A, and to the front portion of this hub is secured a bent arm, 20, which is struck by a long bent arm, 21, secured to the lower end of the rack G, in order to partially rotate the bell on its stud, for a purpose hereinafter to be described.

To the rear end of the hub, which extends back of the bell, is secured a weighted arm, 22, which rests on a stop, 23, as seen in Fig. 7, whereby the bell is held in this position, except when moved by the arm 21, the weighted arm serving to return the bell to the position seen in Fig. 7 when the arm 21 is withdrawn from the arm 20.

As soon as the last tooth on the left-hand side of the rack H has been carried by the action of the gathering-pallet *q* beyond the retainer I, the latter drops down into a deep notch, 18, of the rack H, and the lever K drops down out of contact with the bent arm *m*, which, being no longer supported thereby, allows the arm *n* to enter the notch in the disk N, and thus arrest the motion of the striking mechanism.

In Fig. 1 the snail is in the position which it occupies when the time indicated on the dial by the hands is 2 hours and 45 minutes; and on releasing the racks G H by pulling the cord 15, they simultaneously fall forward, which causes the pin *k* of the rack G to come into contact with and rest upon the second step of the snail, corresponding to the hour (2) marked by the hour-hand, the projection *l* on the rack H coming into contact with and resting upon the fourth pin *h* of the series of four, corresponding to the hour of the step of the snail on which the pin *k* of the rack G is resting.

The rack G is now in such a position that as soon as the pallet *q* has gathered two of its teeth, and the hammer has consequently struck two blows, the lower end of the arm 21 is brought into contact with the arm 20 of the bell, and as the next tooth of this rack is gathered by the pallet the bell is moved by the arm 21 sufficiently to bring a notch, 24, in the edge of the bell opposite to the point of the hammer, which, on the next stroke, enters the notch and fails to sound the bell, which thus produces an interval after the hammer has struck the number of blows denoting the hour.

The quarter-hours are now struck on the bell in the following manner: As before stated, both racks G H are moved by the pallet *q'* simultaneously, and the position of the front rack H (as determined by the fourth pin of the series on which it fell) is such that immediately after the interval succeeding the striking of the hour the retainer I will lie in the third small notch from the left hand of the rack, and it will require three revolutions of the gathering-pallet (during which the hammer strikes three blows) to bring the rack H into a position to allow the retainer to drop into the notch 18, which, as before explained, causes the arrest of the striking mechanism. During the time the pallet is taking up the teeth of the outer rack H, after the interval succeeding the striking of the hour, one tooth of the inner rack G is taken up and let go at each revolution of the pallet, which causes the arm 21 to turn the bell on its stud just previous to the stroke of the hammer sufficiently to move the notch above the path of the hammer, which is thus enabled to strike a blow thereon, as desired, the shoulder *r* at the left hand of the rack G coming in contact with the retainer I immediately after each time it is released by the pallet.

From the foregoing it will be seen that whenever the cord 15 is pulled the hour and also the last quarter passed by the minute-hand will be struck, and may be repeated as often as desired until the weight or spring runs down, and by assuming the time to be half-way between the quarter-hour struck and the next succeeding quarter, the time indicated by the bell can never vary more than seven and a half minutes from the correct time.

It is evident, however, that by employing a cam-wheel, *b*, having a different number of branches, and arranging the other mechanism to correspond, the intervals of time between the hours indicated by the striking of the bell may be varied as desired.

A clock thus constructed will be found a great convenience to many persons, as it can be placed in a room adjoining the bed-room or other locality within sound of the bell, and

the striking-cord led to the bed, and the necessity of rising in the night and striking a light to ascertain the time can thus be entirely avoided.

I will now describe the manner in which the striking mechanism is liberated when the minute-hand points to twelve on the dial, in order that the hours may be struck automatically, as in an ordinary clock.

On the arbor *a* of the minute-hand, outside the cam-wheel *b*, is fitted a sleeve, *s*, which is free to turn upon the arbor *a*, and is also capable of a longitudinal movement thereon, this latter movement being effected by a shipper-lever, Q′, the lower end of which is bifurcated, and fits into an annular groove in the sleeve, the upper end of the lever extending outside of the top of the clock-case, so as to be accessible to the hand.

From the sleeve *s* projects a bent pin, *t*, which lies in the path of a pin, *u*, projecting from the cam *b*, and thus, as the cam is rotated by the arbor of the minute-hand, the sleeve *s* is caused to revolve with it, and the position of the pin *u* on the cam *b* is such that just before the hour the pin *t* (if the sleeve *s* has been previously moved in by the lever Q′ into the position seen in Fig. 2) will be brought into contact with a pin, 25, projecting from the heel of the bent arm L, which is thus vibrated on its pivot until a pin, 26, projecting from its rear side, comes into contact with the lever K, which is then raised by the continued movement of the pin *t* until the striking mechanism is released, and the instant the hour-hand marks twelve the pin *t* passes out of contact with the arm 25, when the arm L will fall back out of the path of the arm P, and the striking mechanism will be set in motion, as before described, the snail E having been moved by the revolution of the cam *b* through the connections previously referred to in the proper position to cause the required number of blows to be struck on the bell.

If the cord 15 should be pulled after the arm L has been moved sufficiently by the pin *t* to intercept the arm *p*, and the pin *t* was allowed to remain in this position, it is evident that on the release of the cord the pin 25 on the arm L would drop down onto the pin *t*, which would prevent the upper end of the arm L from falling back out of the path of the arm *p*, and consequently the clock would not repeat if the cord was pulled just before the hour.

To overcome this difficulty, the arm L is provided with a lip, 27, located immediately beneath and on one side of the pin 25, this lip catching under the point of the pin *t*, so that when the arm L is raised by pulling the cord 15 the pin *t* will be carried up out of the way, where it is held by the friction of the sleeve *s* on the arbor *a*, and consequently, when the cord is released, the arm L will be free to fall back out of the path of the arm *p*, and thus allow the striking mechanism to be set in motion.

When the clock has been made to repeat just before the hour, the ordinary striking of the hour does not take place when the minute-hand reaches twelve, as the pin *t* has been raised out of the way of the pin 25, as before stated, and disengaged therefrom, and the striking does not take place until the pin *t* has been again brought around by the revolution of the cam *b*.

When it is desired to have the clock remain silent, except when the cord 15 is pulled, the sleeve *s* is moved by the shipper-lever Q′ longitudinally on the arbor *a* away from the cam *b*, which carries the pin *t* back into such a position that as it is carried around by the pin *u* of the cam *b* it will not come into contact with the pin 25, and consequently the striking mechanism will not be released by the revolution of the cam.

The projection *l* on the rear side of the rack H is wedge-shaped, as seen in Fig. 4, in order that it may pass under the pin *h* of the step of the snail E, corresponding to one o'clock, the distance which the snail is moved during the contact of the projection *l* with the pin *h* being less than that between two contiguous pins *h*, this movement of the snail taking place against the resistance produced by the pressure of the spring-pawl 13 on the inclined tooth of the ratchet-wheel *f*, with which it may be in contact, as seen in Fig. 5, this spring-pawl 13 serving to return the snail to its original position after the projection *l* has passed the pin *h*. This passage of the projection *l* under this particular pin *h*, just referred to, would take place if the projection *l* on the rack H should happen to be below this pin *h*, as would occur if the cord was pulled an instant before one o'clock, and the movement of the snail at one o'clock should take place before the gathering-pallet *q* has drawn back the rack H sufficiently to cause the projection *l* to pass the pin *h*.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The snail-wheel E, with its steps *b′* and pins *h*, rotated by mechanism connected with the arbor of the minute-hand, in combination with the racks G H, gathering-pallet *q*, retainer I, a mechanism for striking the hours and parts thereof, and a mechanism operated by a cord, 15, or its equivalent, for raising the retainer and setting in motion the striking-train, substantially as and for the purpose set forth.

2. The cam-wheel *b* on the arbor of the minute-hand, in combination with the weighted lever D, with its pawl *e*, the ratchet-wheel *f*, and the snail-wheel E, operating substantially in the manner and for the purpose described.

3. The pins *h*, in combination with and projecting from the snail-wheel E, provided with graduated steps *b′*, substantially as and for the purpose set forth.

4. The arm L, pivoted to the lever K, and operated by the cord 15, in combination with a mechanism for liberating the striking-train, and the arm *p* on the shaft of the fly *c′*, oper-

ating substantially in the manner and for the purpose set forth.

5. The spring-guide M, in combination with the pivoted arm L and cord 15, substantially as and for the purpose described.

6. The rack G, with its arm 21, operated by the gathering-pallet *q*, in combination with the movable bell R, with its notch 24, and the hammer Q and its operative mechanism, substantially as and for the purpose set forth.

7. The notched bell R, made movable around its center, in combination with a mechanism for returning it to its original position after being turned by the arm 21 of the rack G, substantially as described.

8. The sleeve *s*, with its pin *t*, arranged to rotate and slide upon the arbor *a* of the minute-hand, in combination with the shipper-lever Q′, cam *b*, and its pin *u*, the arm L, with its pin 25, and a mechanism for liberating the racks G H and setting in motion the striking-train, substantially as set forth.

9. The lip 27, projecting from the arm L, in combination with the pin 25 and the pin *t* on the sleeve *s*, operating substantially in the manner and for the purpose described.

10. The rack H, with its wedge-shaped projection *l*, in combination with the snail-wheel E, with its pins, the ratchet-wheel *f*, and spring-pawl 13, constructed and operating substantially in the manner and for the purpose set forth.

Witness my hand this 7th day of March, A. D. 1878.

HENRY THOMPSON.

In presence of—

CHARLES E. BARRETT,

JAMES BAILEY.