(No Model.) 2 Sheets—Sheet 1.

C. BICKFORD.

TIME PIECE.

No. 384,737. Patented June 19, 1888.

Fig. 4.

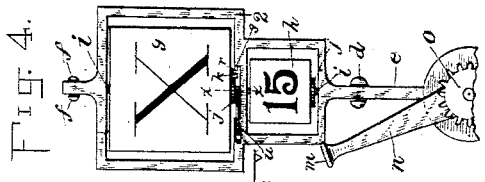


Fig. 3.

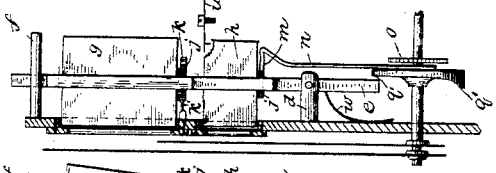


Fig. 2.

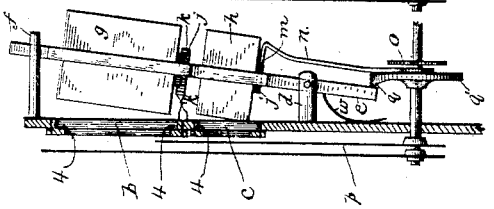


Fig. 7.

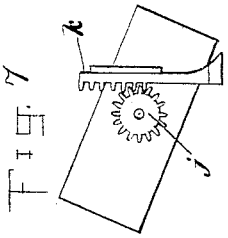


Fig. 6.

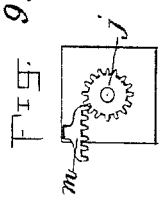


Fig. 8.

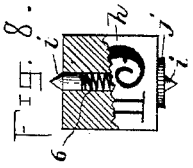
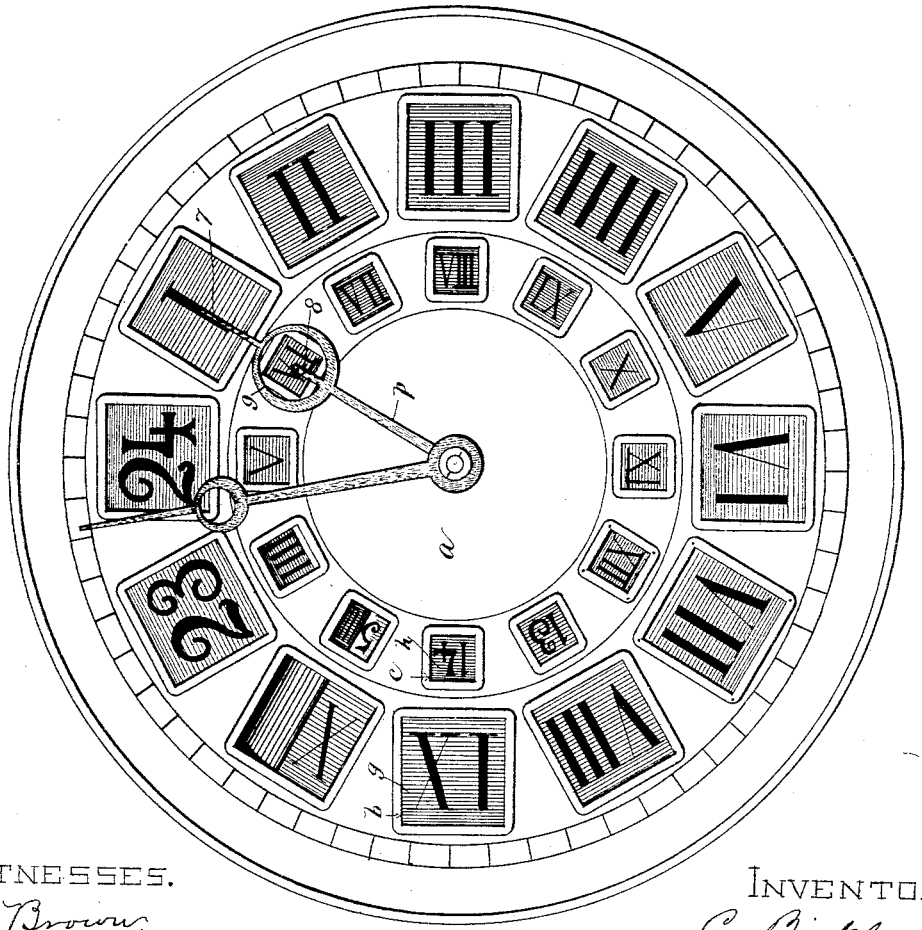


Fig. 1.



WITNESSES.

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(No Model.) 2 Sheets—Sheet 2.

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TIME PIECE.

No. 384,737. Patented June 19, 1888.

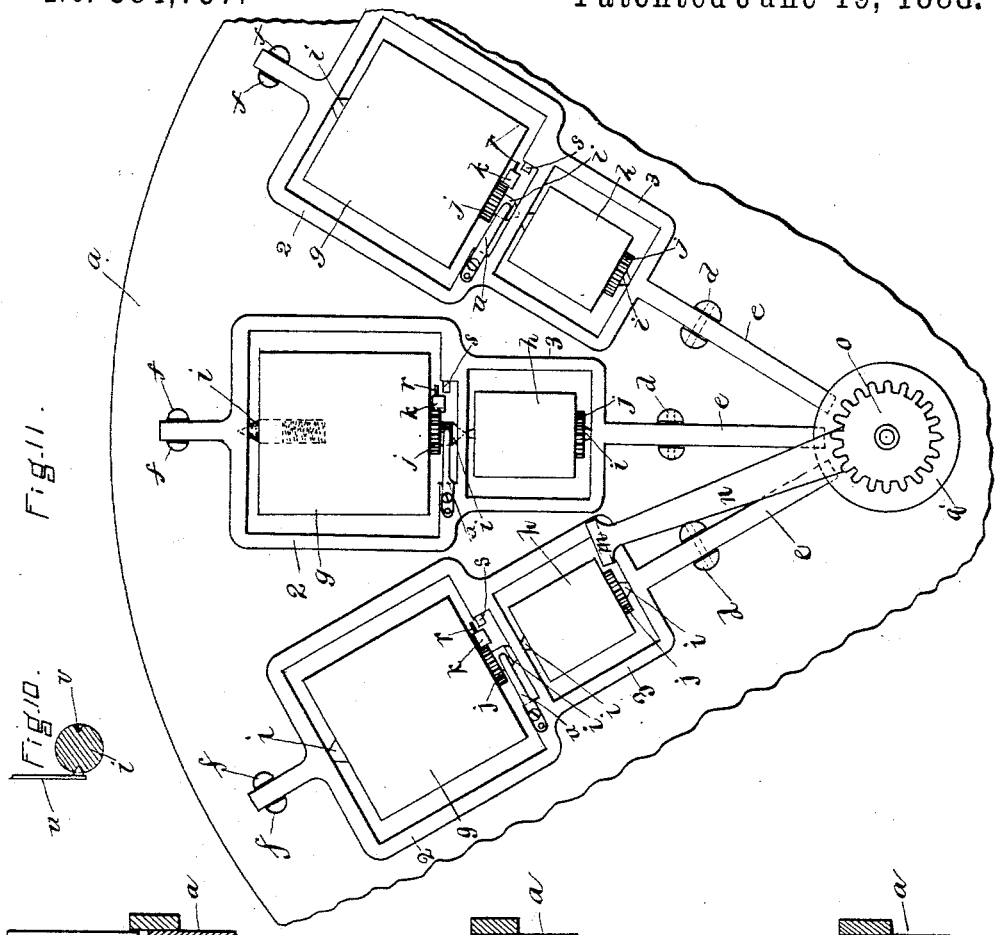

Fig. 11.

Fig. 10.

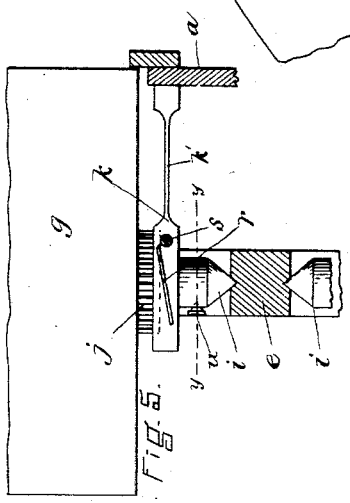

Fig. 8.

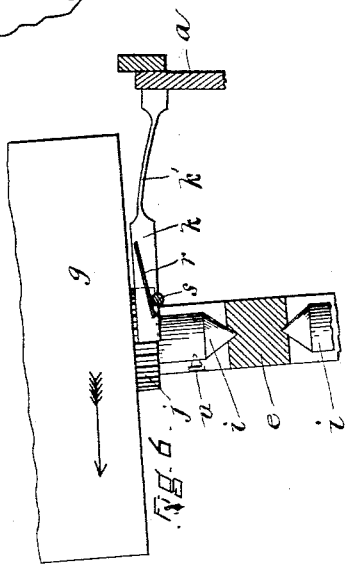

Fig. 9.

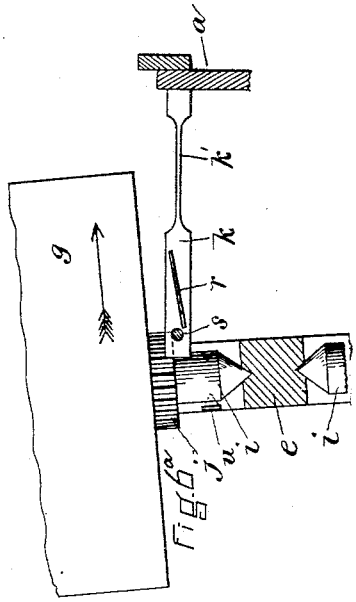

Fig. 9a.

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UNITED STATES PATENT OFFICE.

CHARLES BICKFORD, OF BOSTON, MASSACHUSETTS.

TIME-PIECE.

SPECIFICATION forming part of Letters Patent No. 384,737, dated June 19, 1888.

Application filed January 13, 1888. Serial No. 260,654. (No model.)

To all whom it may concern:

Be it known that I, CHARLES BICKFORD, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Time-Pieces, of which the following is a specification.

This invention has for its object to provide improved means whereby letters, figures, or symbols of a time-piece denoting the hours from one to twenty-four in each day in any standard-time division may be shown in the space usually alloted to twelve hours, and also to enable two different standards of time to be indicated simultaneously.

The invention consists of certain new and improved mechanism for presenting to the eye the figures which denote the hours from one to twenty-four through a circle of twelve openings in the dial-plate near its periphery and an inner circle of twelve openings concentric with the outer series through which the figures which denote the hours of Greenwich, local, or standard time of other divisions may be shown.

The invention also consists, in combination with a dial-plate having openings through which the hour-figures are shown, of an escutcheon or border around each opening, said escutcheon forming a seat for the figure-plate, while it also conceals the open space around said figure-plate and gives the dial the appearance of a compact face without openings, while it also lessens the liability of dust getting into the works of the clock.

The invention further consists of a series of radial levers operated by a cam attached to the hour-wheel pipe or thimble, each lever supporting one of each series of plates or blocks on which the hours are denoted, and when one of said levers is acted upon by the cam it moves the figure-plates which are supported in that lever away from their resting places on the back of the escutcheons, so that they may be turned over and display the figures required when the hour-hand shall again reach them, said levers returning them by the aid of a light spring to their seats on the back of the escutcheons, so that all openings in the dial are then closed.

The invention consists, furthermore, in having each figure plate or block supported in the levers on its own pivots, so that each series of figures has an independent mechanism by which they are reversed, thus making it possible to disconnect the revolving mechanism of one set of figure plates or blocks, leaving them to denote twelve-hour time, while the other set or series will denote the hours from one to twenty-four, all of which I will proceed to describe, claiming only such parts as I believe to be new and useful.

Figure 1 of the accompanying drawings, which form a part of this specification, represents the face of the dial with all the figure-plates resting on the escutcheon, except one in each series, they being partially reversed. The hour-hand pointing to I in the outer circle shows Eastern standard time, while the finger in the ring or opening of the hour-hand pointing on VI of the inner circle denotes Greenwich time. Fig. 2 is a section showing one of the levers being acted upon by the cam, and the plates or blocks having on their surfaces the figures which denote the hours are being reversed by their respective mechanisms. Fig. 3 is a similar section showing the lever and blocks in their normal position. Fig. 4 is a back view of one of the levers with the figure-plates in a state of rest. Fig. 9 shows one of the inner circle of figure-blocks with the cog-wheel and segment by which it is turned over. Fig. 7 shows one of the outer series of figure plates or blocks, with the rack and pinion by which it is reversed. Fig. 5 represent a section on line $x\,x$, Fig. 4, showing the lever in its normal position. Figs. 6 and 6^a represent similar sections showing the lever displaced. Fig. 8 represents one of the figure-blocks with a section broken to show a pivot with a spring back of it, so that the block can be snapped into its place in the lever and be easily taken out and given another place in the circle if the owner desires his clock to show standard time of some other division or local time. Fig. 10 represents a section on line $y\,y$, Fig. 5. Fig. 11 represents a rear view of a portion of the dial and a portion of the radial levers and blocks.

The same letters of reference indicate the same parts in all the figures.

In the drawings, a represents a dial having two concentric series of openings, one series consisting of twelve outer openings, b, and the other of twelve inner openings, c. The open-

ings may be made of any desired form, and those of the outer series are preferably larger than those of the inner series, as shown, for the sake of symmetry. At the inner side of the dial and supported by lugs or standards *d*, preferably attached to the dial, are twelve radial rods or levers, *e*, each of which is pivoted to a standard, *d*, at a point near its inner end, its outer end being adapted to move toward and from the dial between parallel guide rods or pins *f f*, which prevent lateral displacement of said rods or levers and keep them in their proper relative positions.

Each lever *e* is enlarged to form two frames or openings, 2 3, in which are pivoted blocks or character-holders *g h*, formed, respectively, to fit the corresponding openings, *b* and *c*, of the dial, said openings and blocks being so arranged that the two blocks of each lever, when in their normal positions, coincide with two of the dial-openings and are visible through the same. Said openings are provided at the inner side of the dial with seats 4 4, as shown in Fig. 2, in which seats the blocks *g h* fit closely when in their operative positions, as shown in Fig. 3, so that the front of the dial is given a solid appearance without orifices, and dust is excluded from the clock-movement. Said seats are preferably formed by attaching escutcheons to the outer side of the dial, as shown.

Each block has two or more characters painted, printed, or otherwise made distinct upon it. The number of characters on each block will depend on the extent of each hourly partial rotation given the block by the mechanism hereinafter described. If the blocks are to be given a half-rotation at each movement, each block will have two characters at opposite sides. The block standing in the one o'clock position will have on one side the character "1" and on the opposite side characters indicating "13," while the next block will have "2" on one side and "14" on the other, and so on to the last, which will have "12" on one side and "24" on the other. I prefer to rotate the outer blocks a half-turn at each operation and the inner blocks a quarter-turn, it being preferable to make the outer blocks oblong in cross-section and the inner blocks cubical. The inner blocks should therefore each have duplicate characters on its opposite sides.

Each block has two trunnions, *i i*, which are journaled in bearings in the lever *e*. On one trunnion of each block is a pinion, *j*, the pinions of the outer blocks, *g*, being engaged by racks *k*, attached to the dial, while the pinions of the inner blocks, *h*, are engaged successively by a rack-segment, *m*, on an arm or lever, *n*, which is attached to the sleeve of the hour-wheel *o* and revolves at the same rate as the hour-hand *p*, so that its segment *m* at a given hour will engage the pinion of one of the inner blocks, *h*, and give the latter a partial rotation, and at the next hour will engage the pinion of the next block *h*, and so on.

q represents a cam or protuberance on a disk, *q'*, affixed to the sleeve of the hour-hand and rotating with the latter and with the arm *n*. Said cam at each hour comes in contact with the inner end of one of the levers *e* and swings said lever inwardly away from the dial, as shown in Fig. 2. This movement of the lever *e* causes a partial rotation of the outer block, *g*, therein by the engagement of the pinion *j* of said block with the accompanying rack, *k*. The shank *k'* of each rack *k* is made thin and flexible, and the back of the rack has an inclined rib, *r*, which is acted on by a stud, *s*, affixed to the lever *e*. When the rack is in its normal position, the upper portions of its teeth are in engagement with the lower portions of the teeth of the pinion *j*, and the higher forward end of the rib *r* is in position to engage the pin *s*, as shown in Fig. 5. When the movement of the lever *e* away from the dial commences, the pin *s* comes in contact with the under side of the rib *r* and raises said rib and the rack *k*, as shown in Fig. 6, the rack remaining in engagement with the pinion. This displacement of the rack gives it a tendency to spring downward, so that when the pin *s* passes off from the rear end of the rib the rack thus released springs downwardly, so that its rear end is just below the pin, as shown in Fig. 6[a]; hence said pin during the return movement of the lever *e* bears on the upper side of the rib *r* and forces the rack away from its pinion, thus preventing the rack from rotating the block backwardly. Just as the lever *e* reaches its operative position the pin *s* passes off from the forward end of the rib *r*, and the displaced rack, again released, springs back to its normal position in engagement with the pinion and is ready to rotate the latter at the next movement of the lever *e* away from the dial.

The block *g* is held in the position to which it is thus moved by a spring-latch, *u*, on the lever *e*, which engages with an orifice, *v*, in one of the trunnions *i* and holds the block with sufficient firmness to prevent accidental rotation. When the cam *q* passes away from the lever *e*, the latter is returned to its normal position by a spring, *w*, attached to the lever near its inner end and bearing on the inner side of the dial, the displaced rack *k* springing back to its normal position during the return.

It will be seen that the two blocks *g h* are rotated simultaneously, or practically so, the inner block, *h*, being rotated by the revolving arm *n* and its segment *m*, while the outer block is being rotated by the swinging movement of the lever *e* and the engagement of its pinion with the rack *k*. The arm *n* is resilient so that it yields to the inward swinging movement of the lever *e*, as shown in Fig. 2.

The blocks *g h* may be made readily detachable from the levers *e*, so that differently-inscribed blocks can be used interchangeably in the same levers. To this end one of the trunnions *i* may be made capable of sliding into

the block and supported by a spring, 6, Fig. 8, so that the block can be easily inserted in and removed from its recess or frame in the lever *e*. The described means for rotating the blocks *g h* are arranged so that each block will be turned after the hour-hand has passed it, and thus be set to display the hour which the hour-hand should indicate when it next reaches the same block.

It will be seen that the independent adjustability of the blocks enables one series to be adjusted to denote the hours from one to twenty-four in each day in any standard-time division, while the other may be adjusted to denote the hours in any other standard-time division or the time at Greenwich. The lever *n* may be moved so that it will not act on the pinions of the inner blocks, said blocks being thus caused to constantly show the same series of numerals, as from "1" to "12," the clock being thus enabled to show both twenty-four-hour time and the ordinary twelve-hour time.

The hour-hand has two pointers, 7 8, one being the outer end of the hand, as usual, and co-operating with the outer series of blocks, while the other is located in the ring or opening 9 and co-operates with the inner series of blocks, as shown in Fig. 1.

I am aware that dials with openings, through which characters are displayed on movable blocks, disks, or plates, are not new. I am also aware that a time-piece has been shown and described in which characters are placed on blocks affixed to radial rods or shafts and displayed through openings in the dial, said rods and blocks being partially rotated at regular intervals, as shown in patent to Etheridge, No. 319,804. I do not therefore claim, broadly, the perforated dial and the rotary blocks or character-holders displayed through the openings of the dial and rotated by the mechanism of the time-piece. I am not aware, however, that the rotary blocks have ever been supported by arms or levers which are movable toward and from the dial, so that the blocks when in place rest in seats in the dial and are moved back from the dial to be adjusted. I am also the first, so far as I am aware, to use two concentric series of openings, and in connection therewith two series of blocks arranged as shown, the blocks of each series being independently adjustable, so that the two series of blocks are capable of simultaneously indicating time according to different standards. I do not limit myself, however, in all cases to the employment of the two series of blocks, as the swinging levers and means for oscillating them may be used with one series of blocks. The blocks or character-holders may be of any desired shape. In some cases it may be desirable to make them spherical. The openings in the dial should of course be conformed to the shape of the character-holders.

I claim—

1. The combination of a dial having openings arranged concentrically, a series of levers arranged radially at the inner side of the dial and pivoted to swing from and toward the dial, means for oscillating said levers successively at predetermined intervals, and rotary blocks or character-holders supported by said levers and rotated by the movement of the levers away from the dial, substantially as set forth.

2. The combination of a dial having openings arranged concentrically, a series of oscillatory levers which are oscillated at regular intervals, as described, a series of rotatable blocks or character-holders supported by said levers and partially rotated by the inward movement of the levers, and locking devices, substantially as described, whereby said blocks are locked to the levers after each partial rotation, as set forth.

3. The combination of a dial having openings concentrically arranged and formed with seats at the rear side of the dial, a series of pivoted levers radially arranged at the inner side of the dial, and a series of rotatable blocks or character-holders supported by said levers and formed to fit said seats when the levers are in their normal positions, as set forth.

4. The combination of a dial having concentrically-arranged openings, a series of radial levers pivoted to supports at the inner side of the dial, a series of rotary blocks journaled in said levers and provided with pinions, the flexibly-supported racks engaged with said pinions, whereby the blocks are rotated when the levers are moved away from the dial, and the inclined ribs on the racks, and the studs or pins on the levers co-operating with said ribs, whereby the racks are prevented from rotating the blocks backwardly, as set forth.

5. The combination of a dial having concentrically-arranged openings, a series of radial levers arranged at the inner side of the dial and pivoted near their inner ends to fixed supports, rotary blocks supported by said levers, a cam impelled by the time-movement and arranged to bear successively against the inner ends of said levers and force the blocks away from the dial, means, as described, whereby the blocks are rotated while being moved by said cam, and springs whereby the levers are forced toward the dial when released by the cam, as set forth.

6. The combination of a dial having two concentric series of openings, one within the other, a series of pivoted levers radially arranged within the dial, two series of rotary blocks supported by said levers, and means, substantially as described, for rotating said blocks simultaneously at predetermined periods, as set forth.

7. The combination of a dial having two concentric series of openings, a series of radial levers pivoted to fixed supports at the rear of the dial, two series of rotary blocks supported by said levers, an arm having a gear-segment revolved by the time mechanism and arranged to successively engage pinions on the blocks of the inner series, a cam also rotated by the time mechanism and arranged to successively

swing said levers inwardly from the dial, racks secured to a fixed support and engaged with pinions on the blocks of the outer series, whereby said blocks are rotated when the levers are moved inwardly, devices for disengaging said racks from the block-pinions during the return movement of the levers, and springs to return the levers to their normal positions after they are released by the cam, as set forth.

8. The combination, with a dial having openings concentrically arranged, of a series of radially-arranged pivoted levers and blocks or character-holders detachably secured to said levers, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 7th day of January, A. D. 1888.

CHARLES BICKFORD.

Witnesses:
C. F. BROWN,
A. D. HARRISON.