

(No Model.)

3 Sheets—Sheet 1.

J. LINDAUER.

TIME PIECE MECHANISM.

No. 309,306.

Patented Dec. 16, 1884.

Fig. 1.

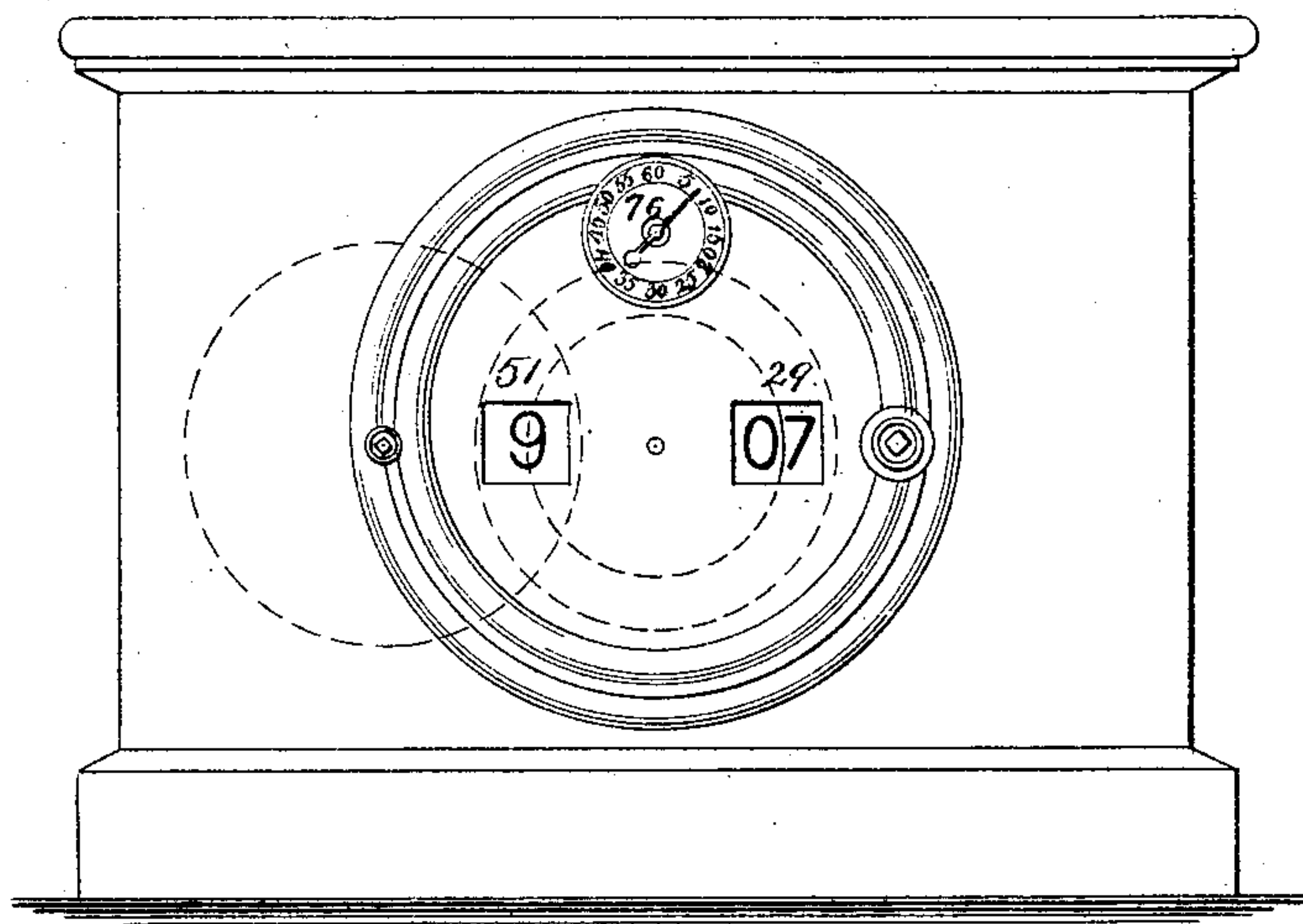
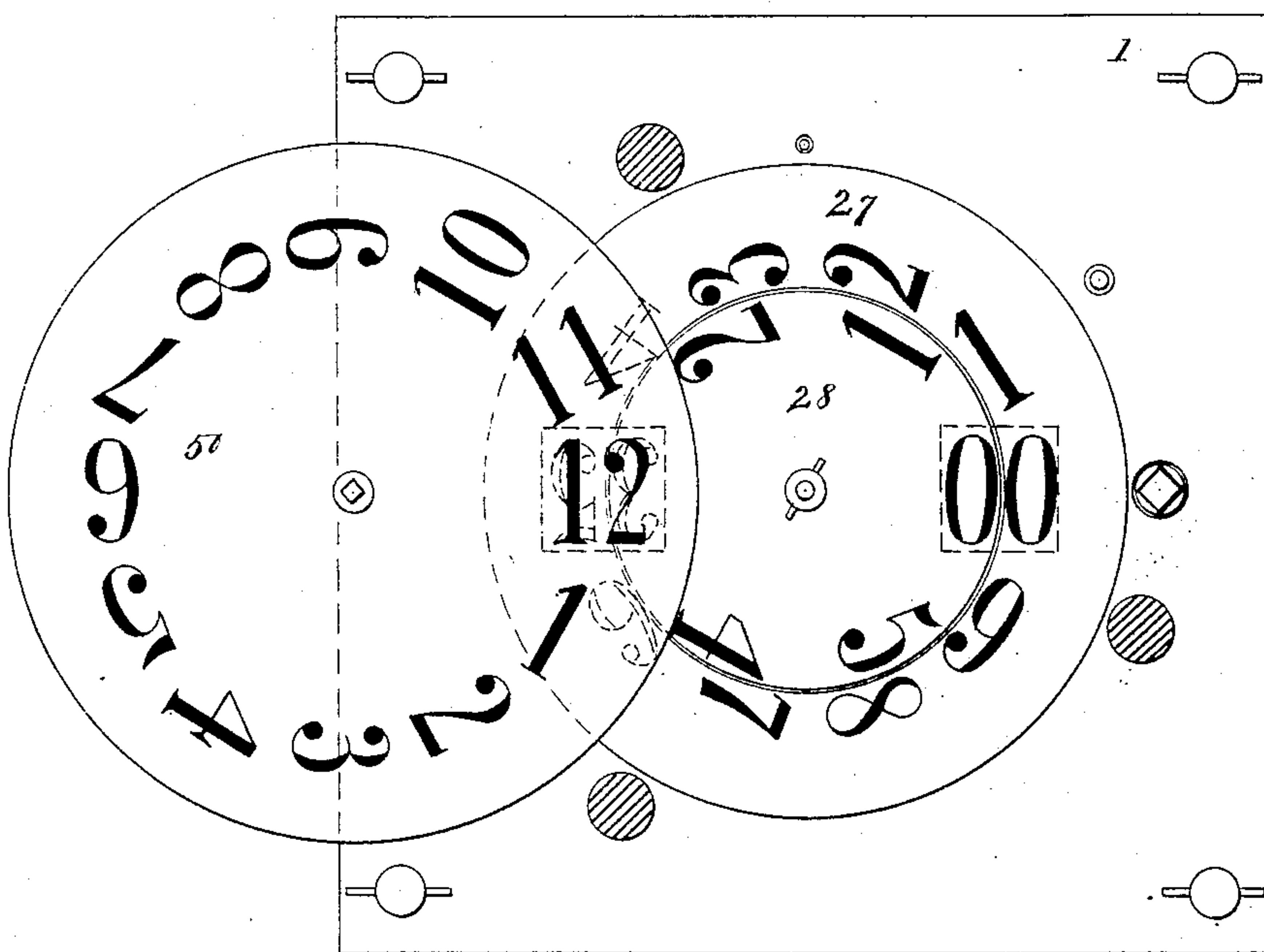


Fig. 2.



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Fig. 3.

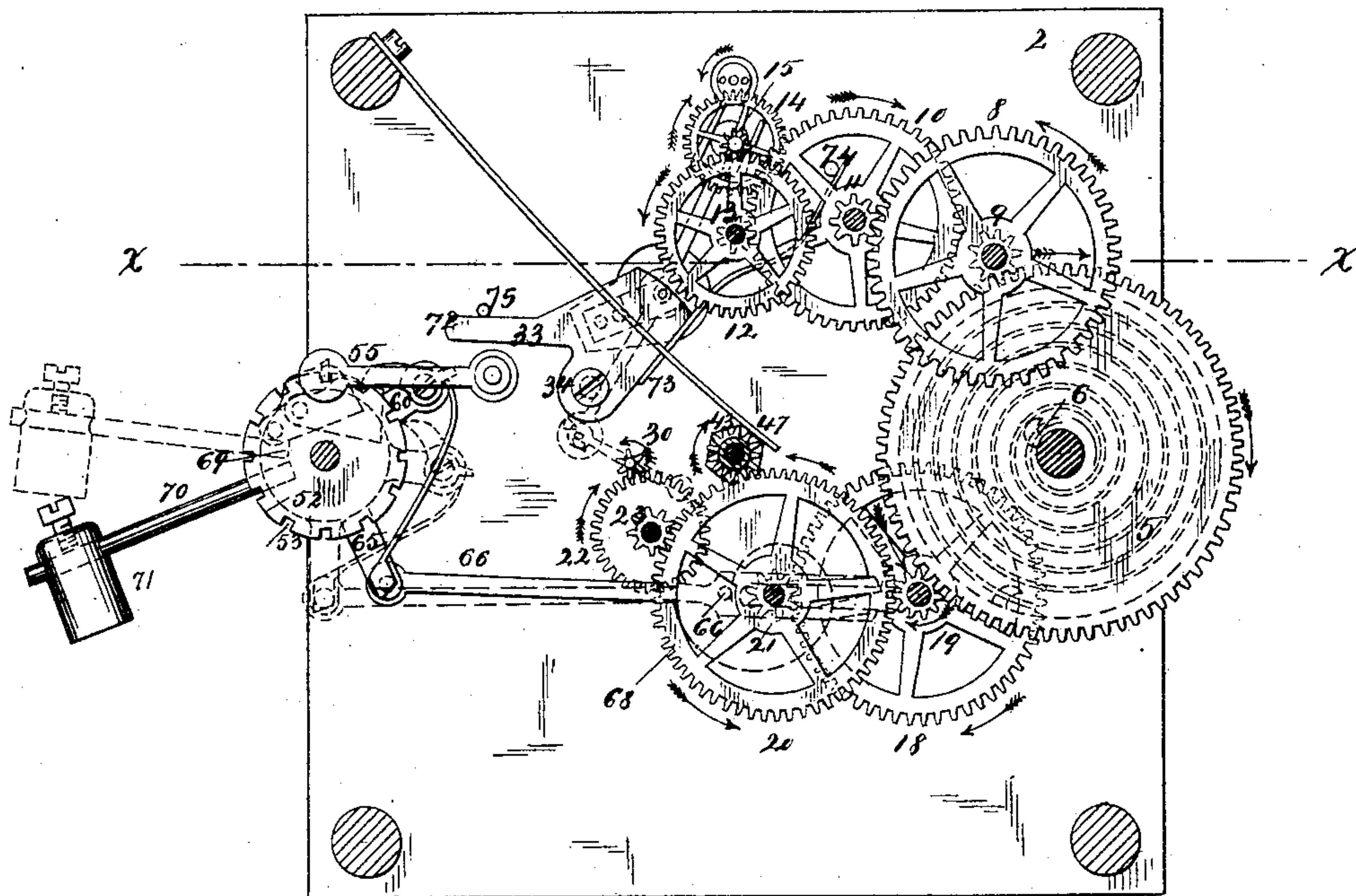


Fig. 4. X-X.

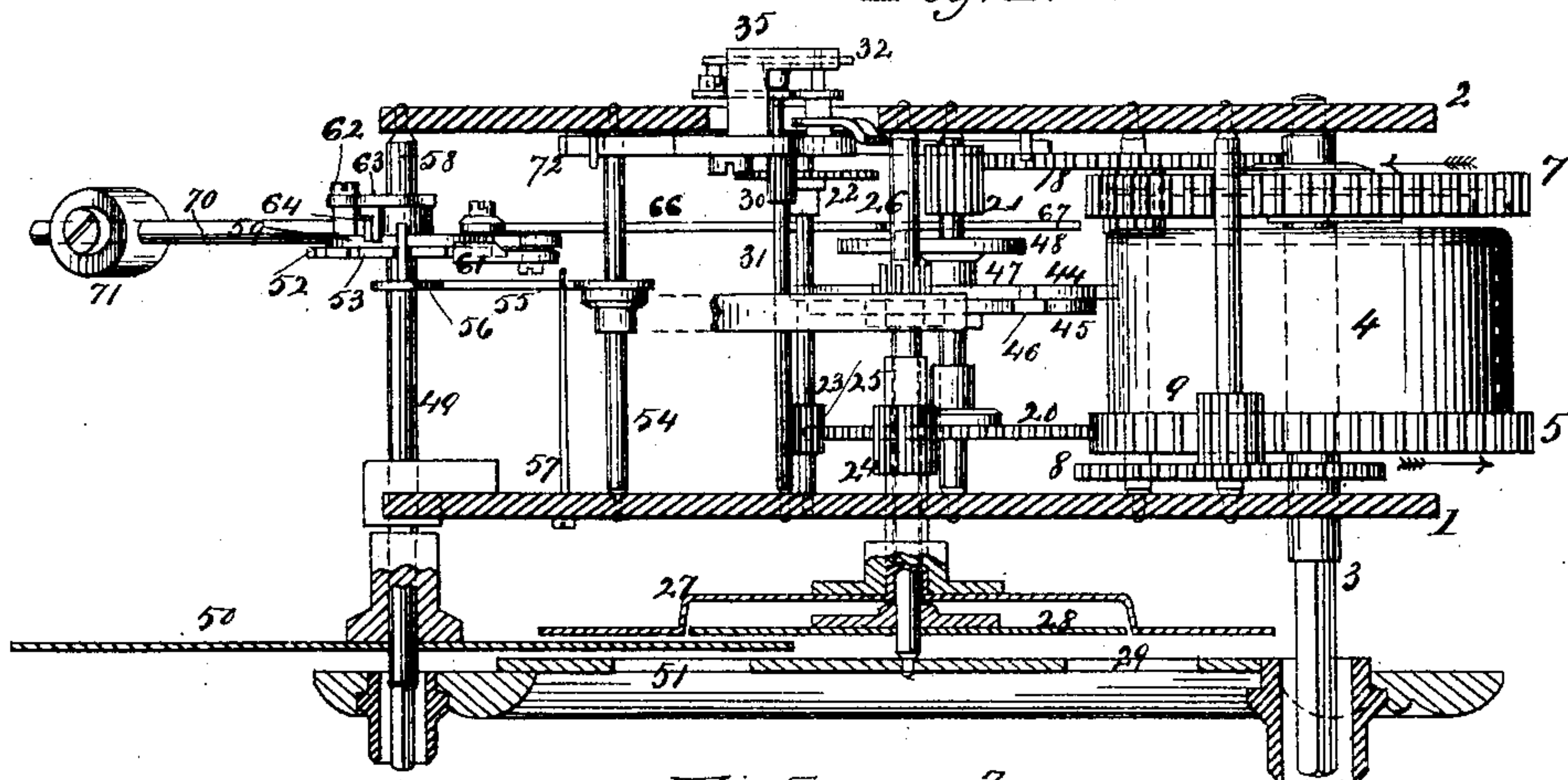
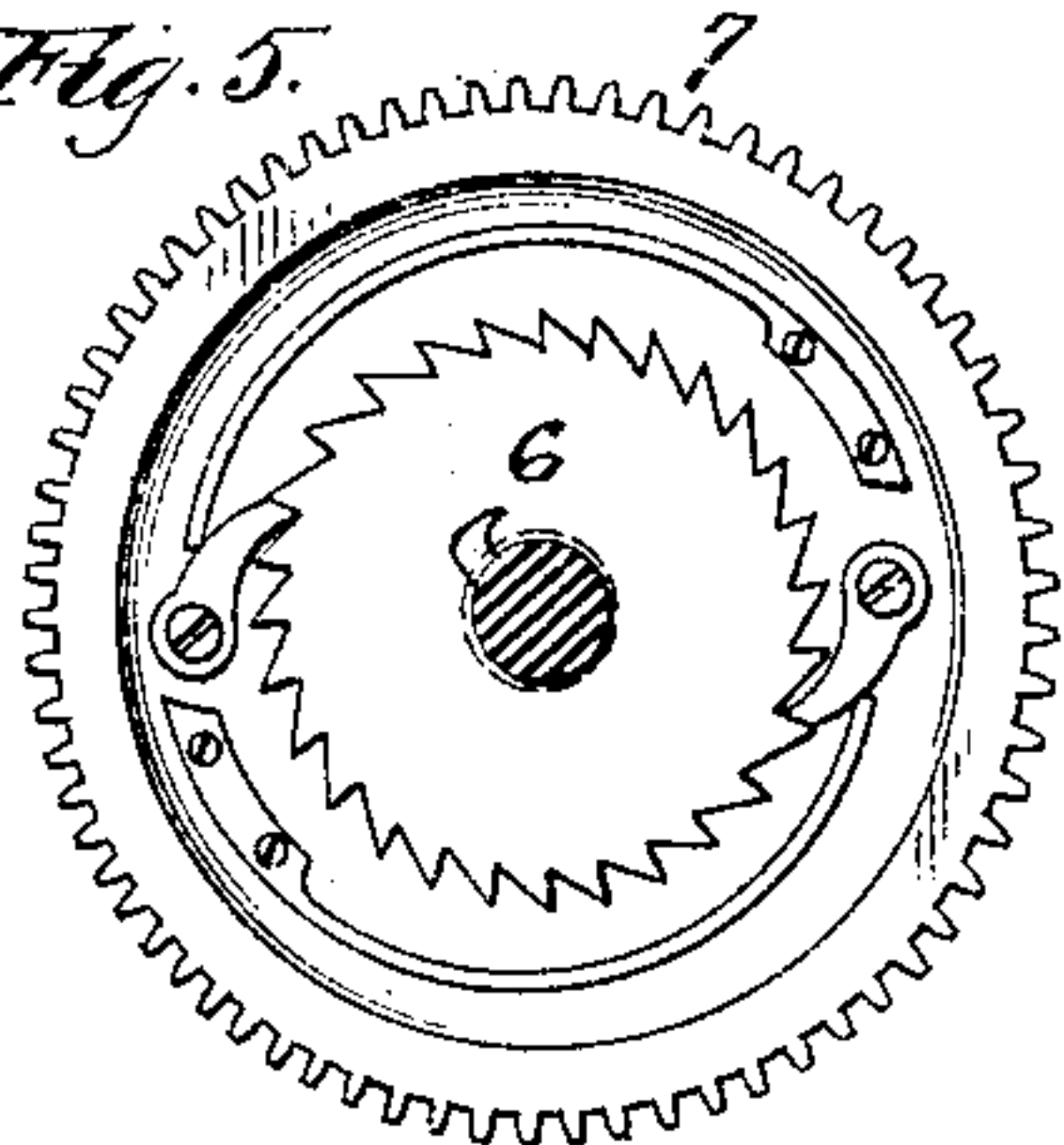


Fig. 5.



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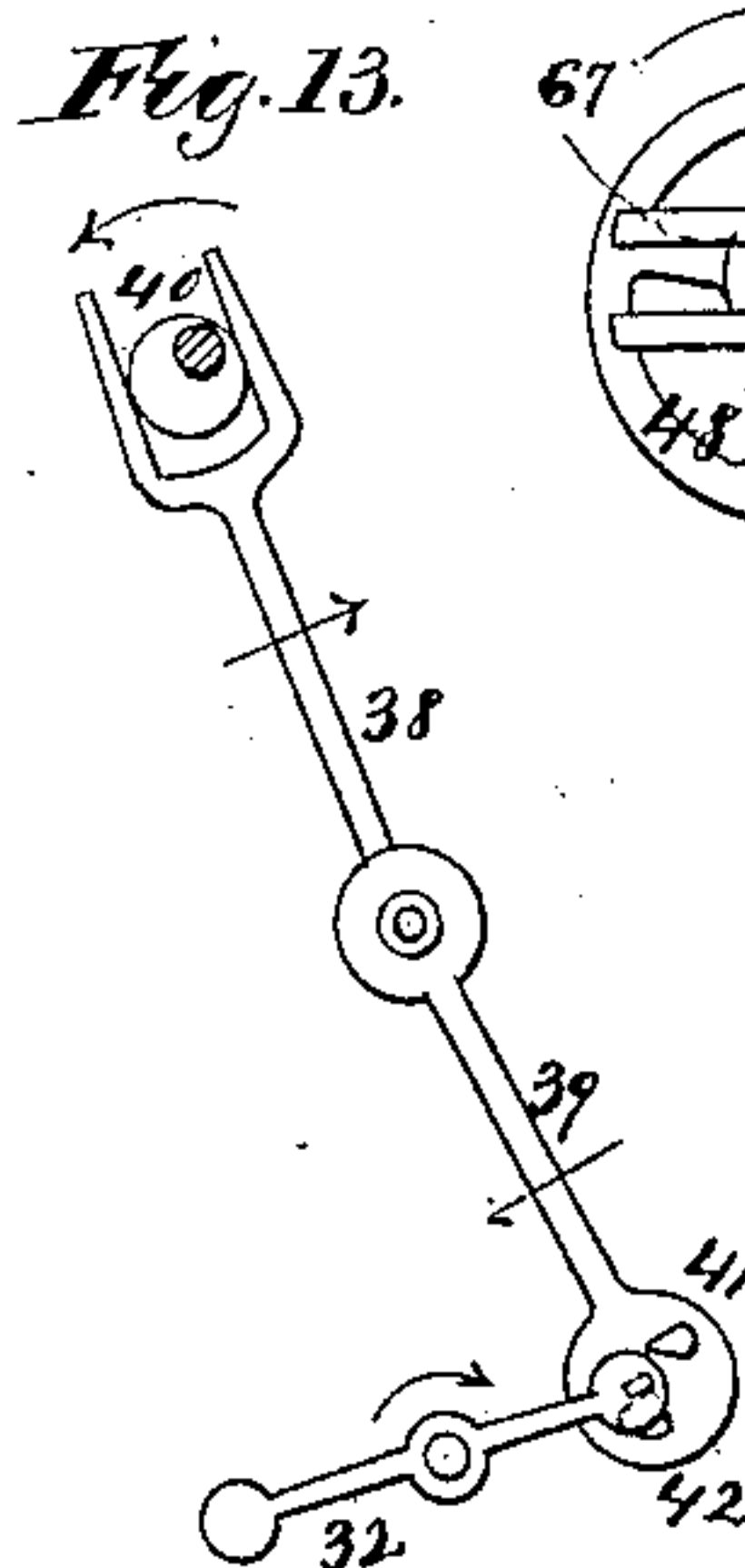
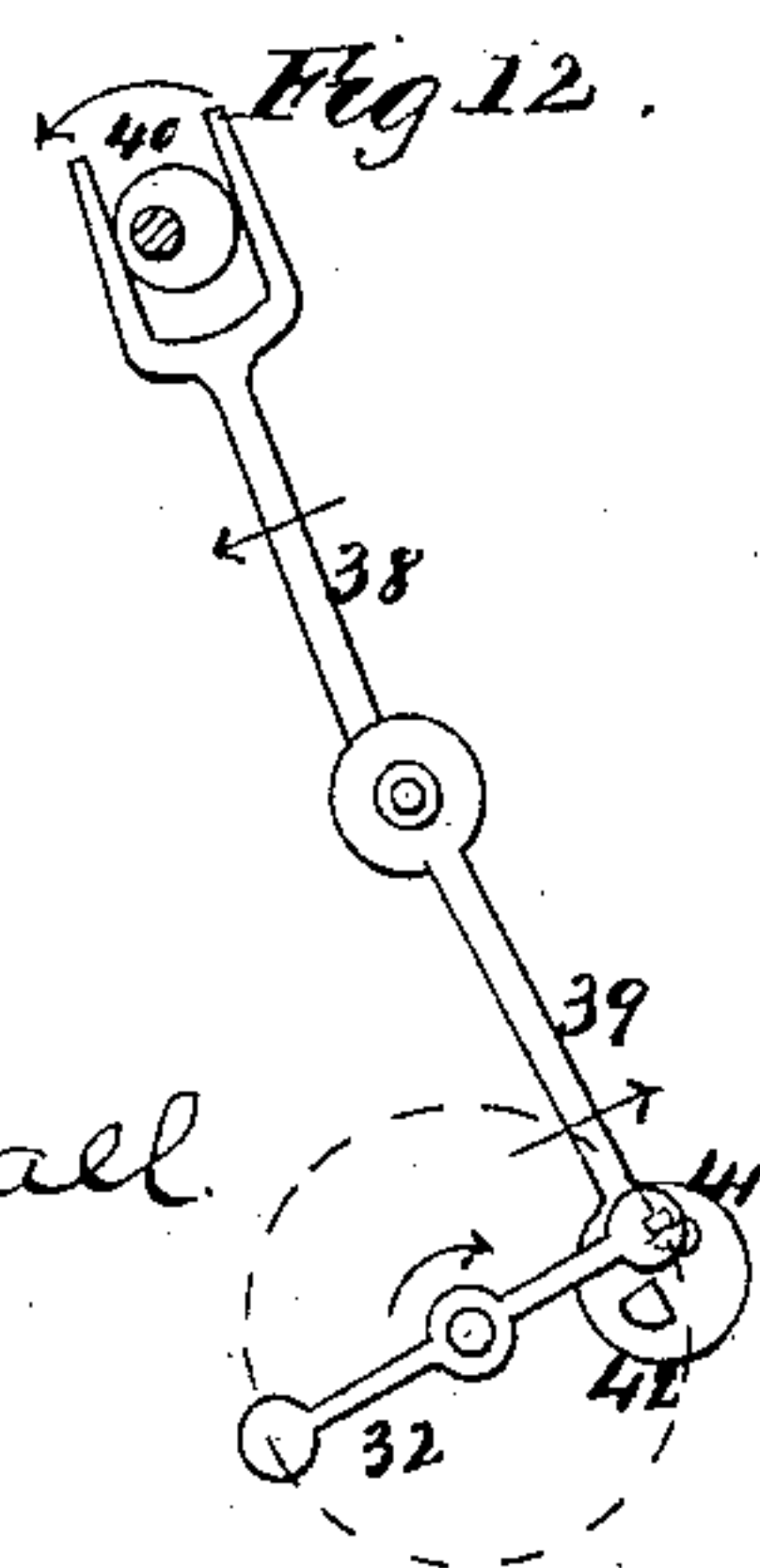
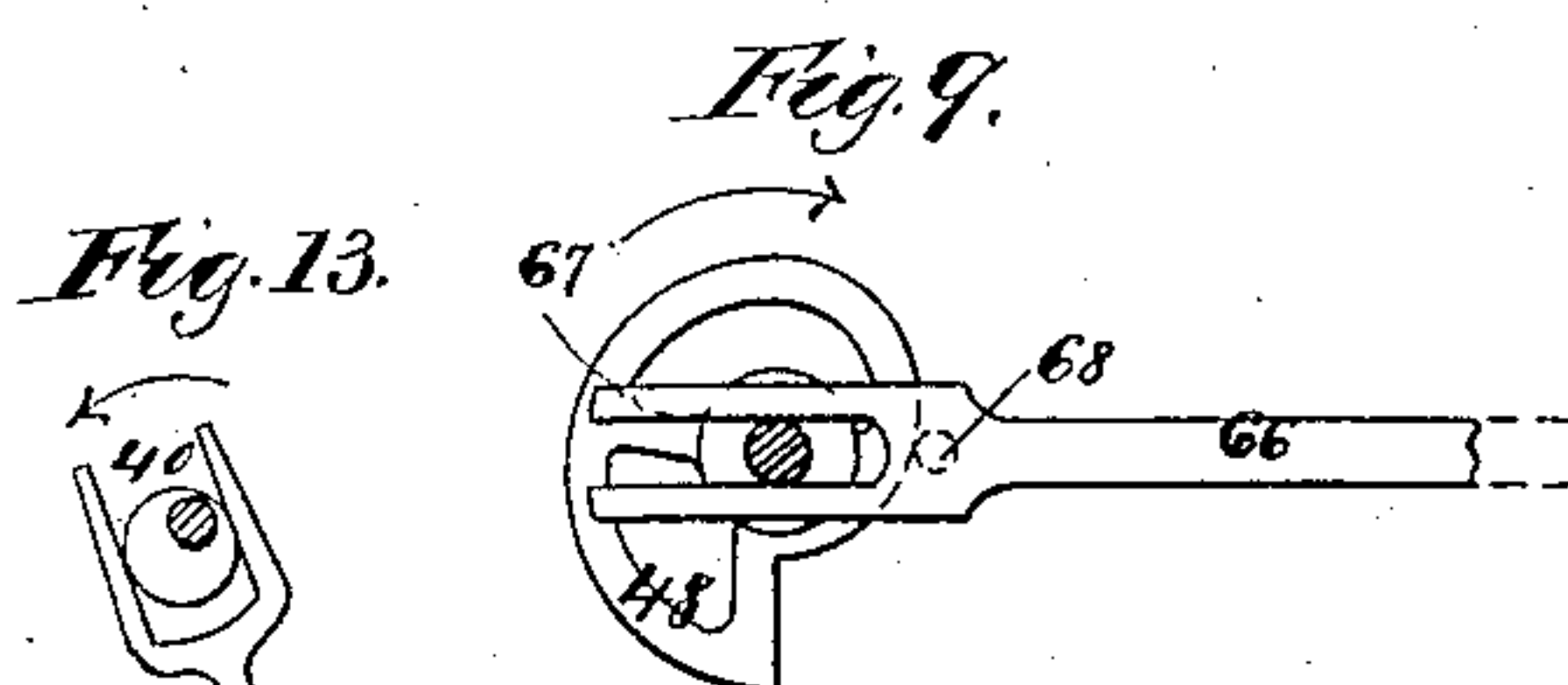
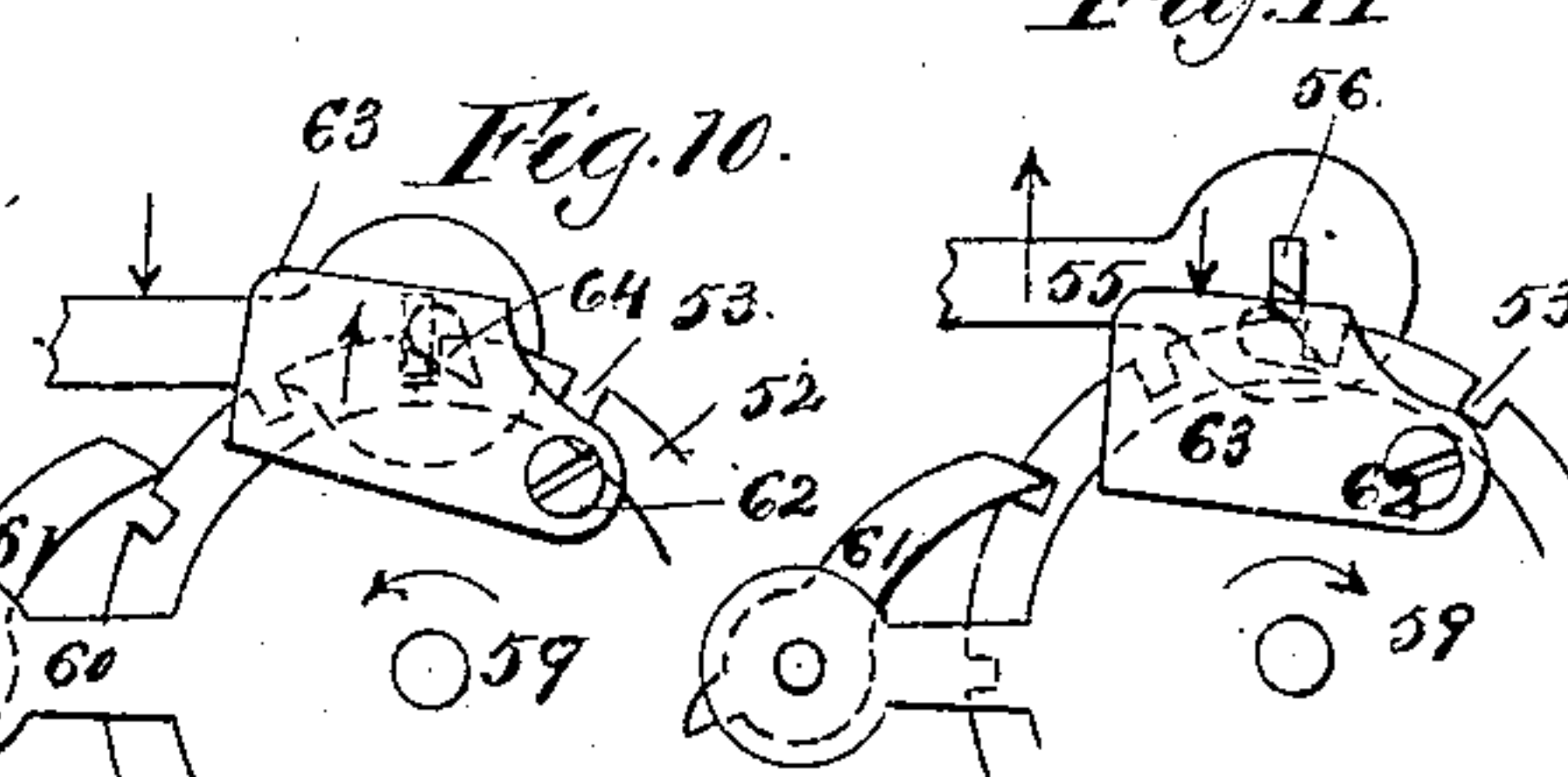
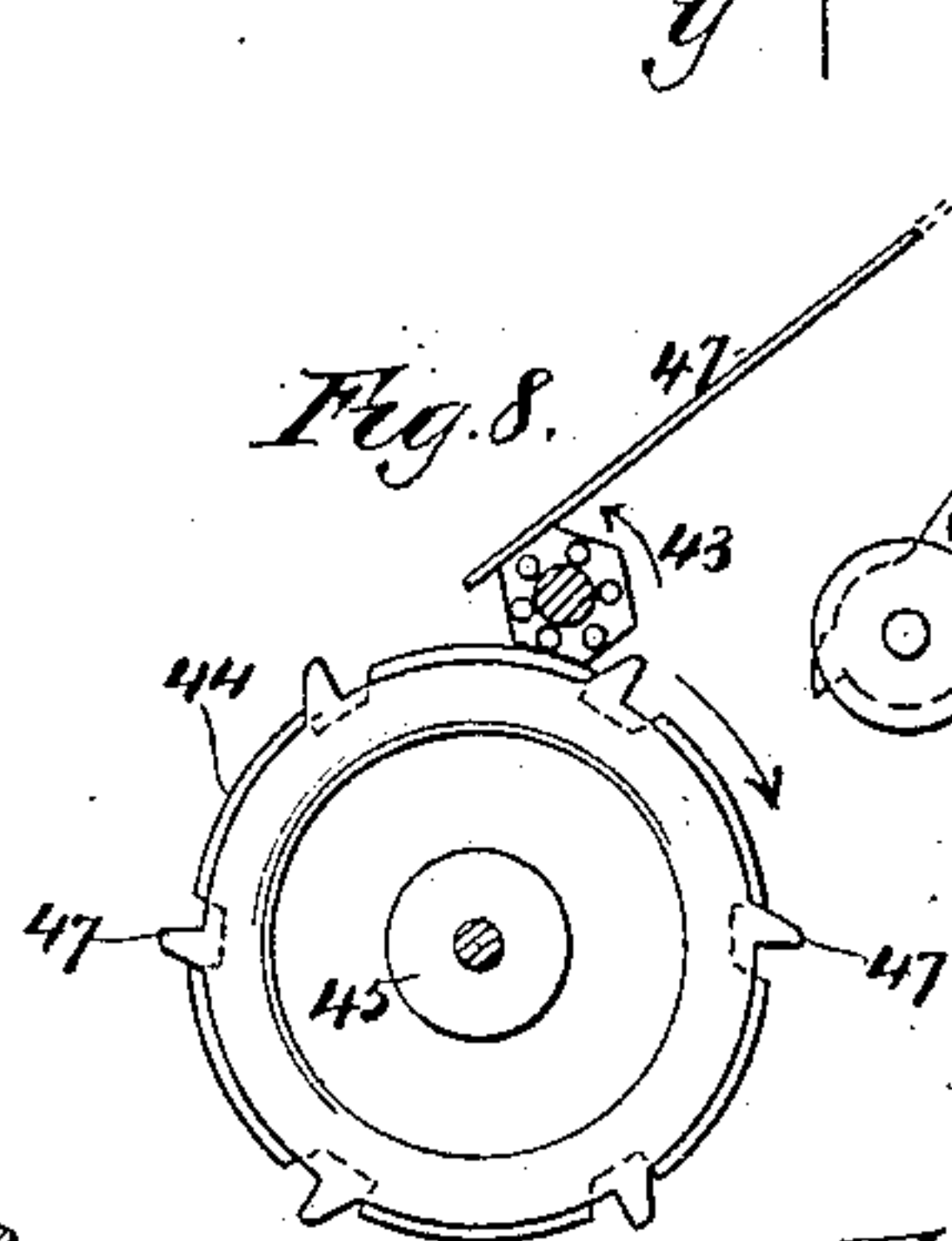
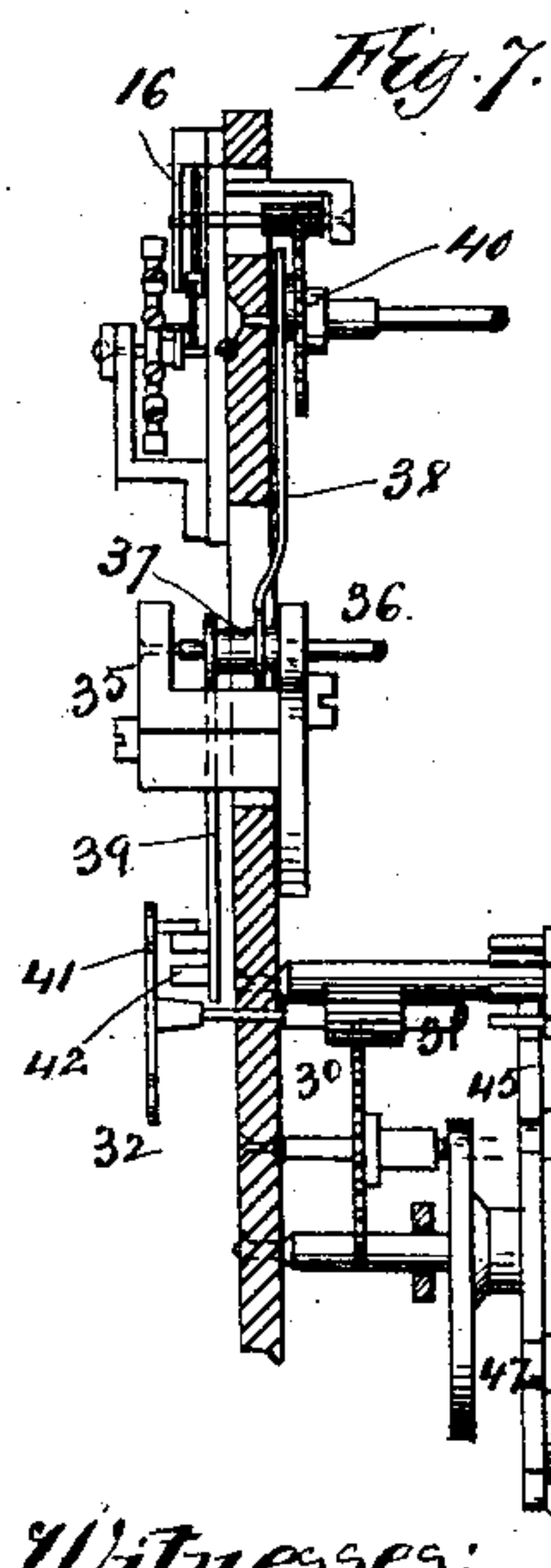
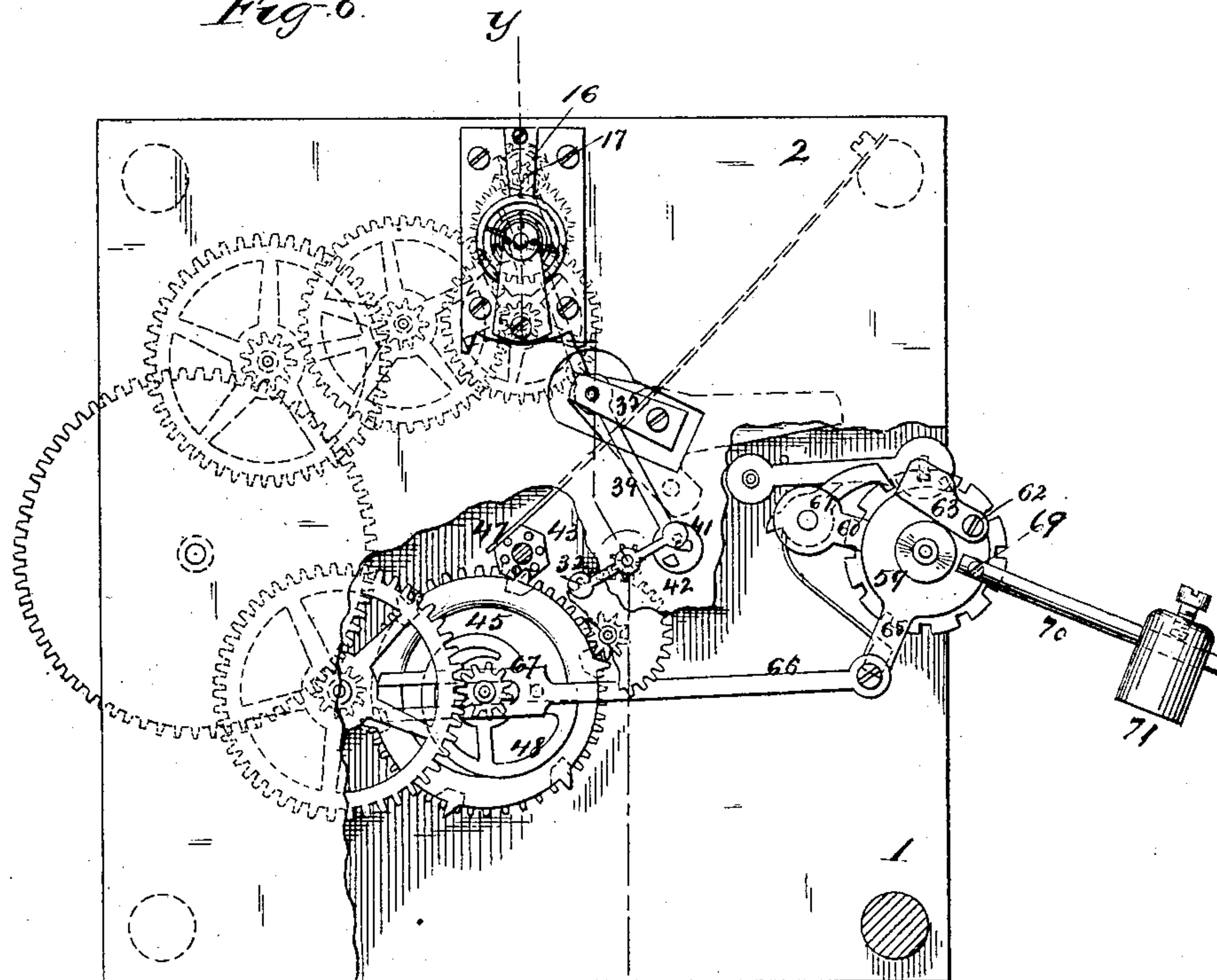
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Fig. 6.



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UNITED STATES PATENT OFFICE.

JOSEPH LINDAUER, OF NEW YORK, N. Y., ASSIGNOR TO TIFFANY & CO.,
OF SAME PLACE.

TIME-PIECE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 309,306, dated December 16, 1884.

Application filed January 25, 1884. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH LINDAUER, of the city, county, and State of New York, have invented certain new and useful Improvements in Time-Pieces, of which the following is a specification.

My improvements relate to a new method of indicating time. Heretofore it has been universally indicated by means of a dial or face plate with figures representing the hours placed radially thereon, and a hand or hands for pointing to such figures. Nearly always, when written or printed, the time is expressed in figures in one line—as seen, for instance, in railroad and steamboat time-tables, in the newspaper advertisements, &c. A time-piece, to express the hours and minutes on its dial or face plate, so that it can be read the same way, is the result of my invention. To effect this, mechanism has been devised by me, and placed in combination with a dial or face plate containing, instead of a circle of figures with hands or pointers, as before referred to, a series of openings, in which the hours and minutes are at proper intervals exposed to view. The new division of time into hour-belts over the country can by my invention be efficiently registered, and the change easily computed when passing from one belt to another. In case such computation and division of time is made universal—that is, extended around the world, doing away with the a. m. and p. m. distinction—my invention would be equally applicable to such system, as it will only be necessary to continue to expose the hours in one of the dial-openings up to 24, instead of stopping at 12. Thus, for illustration, half-past ten o'clock p. m. would be indicated 22.30, (twenty-two o'clock and thirty minutes.)

I will now proceed to describe a mechanism by which I have worked out the continuous indication of time by hours and minutes on a dial or face plate without the aid of figures permanently attached thereto, and hands or pointers in connection therewith.

In the drawings, Figure 1 is a dial or face plate, to be used in connection with the operative mechanism of a time-piece, exposing thereon the correct time in hours and minutes by figures. Fig. 2 is a front view showing one

arrangement of disks for carrying out my invention, each containing a series of figures thereon, in this particular instance, for indicating hours from 1 up to 12, and minutes from 1 up to 59, inclusive. Fig. 3 is a view of the interior mechanism of a time-piece employed for operating these disks, constructed according to my invention, the front pillar-plate and said disks being removed. Fig. 4 is a horizontal cross-section of said mechanism, taken in the line *xx* of Fig. 1. Fig. 5 is a detached view of the ratchet-wheel mechanism for the mainspring. Fig. 6 is a rear view of the whole mechanism of the time-piece, a part of the rear pillar-plate being shown broken away to exhibit some of the more novel elements comprised within my invention. The older and well-known elements, such as the trains of wheels, escapement, &c., are represented by dotted lines. Fig. 7 is a vertical cross-section taken through the line *yy* of Fig. 6. Figs. 8 to 13, inclusive, are detached views of some of the novel elements comprised within my invention.

Old elements, such as mainspring, the train controlled by the escapement, &c., will not be described with unnecessary detail, as such are well known in the art, and can be modified or rearranged without affecting the character or nature of my invention.

1 is the front pillar-plate. 2 is the rear pillar-plate. 3 is the arbor, upon which the mainspring is placed, pivoted in the rear pillar-plate, its front end extending through the front pillar-plate and the dial or face plate, for convenience in winding. 4 is a mainspring-barrel having the outer end of the spring connected to its inner periphery. 5 is the great-wheel rigidly attached to the end of this barrel, but moving freely on the arbor 3. The other end of the mainspring is connected to this arbor by the hook 6. Another great-wheel, 7, turns with the arbor 3 in the running down of the time-piece, but does not turn with it in the winding up by reason of its pawls acting on a ratchet-wheel, which is rigidly connected to such arbor. (See Fig. 5.)

The object of the great-wheel 5 is to move the train of wheels which is controlled by the scape-wheel, and by means of which the min-

ute let-off is directly, and the hour let-off indirectly, timed. The great-wheel 7 moves a train of wheels which furnishes the power to move the figure-disks at the change of the minutes and hours, as the same are continuously and timely let off through the time-train of wheels and its escapement above referred to.

The time-train of wheels controlled by the escapement is constituted as follows: 8 is the first wheel, its pinion 9 gearing with the great-wheel 5. 10 is the second wheel, its pinion 11 gearing with wheel 8. 12 is the third wheel, its pinion 13 gearing with wheel 10. 14 is the fourth wheel, its pinion 15 gearing with wheel 12. The escape-wheel 16 has on its arbor a pinion, 17, which gears with the fourth wheel, 14. The kind of escapement here used does not require any description in detail. Its form and kind can be varied for different styles or sizes of time-pieces embodying my invention.

The train of wheels which furnishes the power to turn the minute and hour disks is constituted as follows: 18 is the first wheel, its pinion 19 gearing with the great-wheel 7. 20 is the second wheel, its pinion 21 gearing with wheel 18. 22 is the third wheel, its pinion 23 gearing with wheel 20. To the second wheel, 20, is geared a pinion, 24, rigidly fixed on a sleeve, 25. This sleeve and pinion work loosely on a shaft, 26, such shaft having one end pivoted in the rear pillar-plate and the other extending through the front pillar-plate, so as to obtain its other bearing in the dial or face plate. The sleeve 25 extends through the front pillar-plate, and has attached to it between such plate and the dial-plate the disk 27. On the outer edge of its surface facing the dial-plate are placed at equal distances the units of the minutes in the hour—namely, 1 to 9, inclusive—with a zero (0) to aid in indicating the minutes above nine in connection with another disk, hereinafter explained. On the shaft 26, upon which this sleeve 25 and disk 27 have free motion, and between such disk and the dial-plate is rigidly attached another, but smaller, disk, 28, placed within a dished portion of the disk 27, and so that the exterior surfaces of the two disks shall be flush with each other. Upon the outer edge of this disk 28 and facing the dial-plate are placed at equal distances the figures 1 2 3 4 5 0, so as to obtain the tens of units of the minutes up to the even hour. From the last minute of the hour (59) we go for the time to the hour-disk, which will be presently described, the disks 27 and 28 then each exhibiting zero, thus 0 0. 29 is an opening in the dial-plate, which brings into view simply those portions of the surfaces of the two referred-to disks, containing the units and tens of units of the minutes indicated by the run of the time-piece.

I will now proceed to explain how these minute-disks are operated to properly determine the fraction of the hour. To the third wheel, 22, is geared a pinion, 30. The shaft

31, carrying the pinion 30, extends through the rear pillar-plate. To such end of the shaft is attached a let-off bar, 32. The bar makes but half a revolution at the end of every minute by reason of its being controlled by the time-train of wheels. This periodic semi-rotation of the let-off bar is accomplished by means of a mechanism operating between the time-train and the train giving power to operate the figure-disks. There is an opening made in the rear pillar-plate above the let-off bar and about midway between it and the rear pivot of the fourth wheel, 14, of the time-train. 33 is a small block hinged at 34 on the inner side of the rear pillar-plate. 35 is a cock or bridge attached to this hinged block, so as to project through the said opening and to hold pivoted between it and the block an axle, 36. This axle carries an enlargement or spool, 37, to which is rigidly attached a bar consisting of two arms, 38 and 39, one, 38, extending upward inside of the pillar-plate bifurcated at its end, so as to grasp a cam, 40, rigidly attached to the arbor of the fourth wheel, 14, between such wheel and the pillar-plate, and the other, 39, extending downward on the outside of the pillar-plate, having at its end a circular enlargement carrying two short pins, 41 and 42, projecting horizontally outward and obliquely arranged with reference to each other, so that one shall be a little higher than the other. This bar, consisting of two arms, 38 and 39, is shown in Figs. 12 and 13, in the extreme right and left position assumed by it through the throw of the cam 40 on the arbor of wheel 14, that shown in Fig. 12 being the throw of the bar by the eccentric 40 to the extreme left having reference to the lower arm, 39, and so as to arrest the let-off bar 32 after its complete let-off, in order to indicate the next minute. The let-off bar is now shown with one of its ends resting on a pin, 41, Figs. 7 and 12, at the commencement of the minute, and as the cam 40 moves in the direction of the arrow, the arm 39 moves off to the right, and between the thirtieth and forty-fifth second the end of the let-off bar drops from off the pin 41 onto the pin 42, thus performing the partial let-off. The cam 40 has now assumed the position shown in Fig. 13, and the arm 39 moves to the left during the remainder of the minute, (fifteen seconds,) which causes the pin 42 to move away from the end of the let-off bar 32, so that a projecting stud on the end of the let-off bar can now pass freely between the pins 41 42, allowing the bar to turn, so as to bring its other end up to be arrested by the pin 41, which is now placed in its path, thus causing the complete let-off and the turning of the minute-dial to the next minute to be indicated. Thus is the connection made between the time-train and the minute and hour disk train, and the minutes expressed consecutively.

The operation of the complete let-off of the arm 32 is as follows: The pinion 30 on the arbor of the let-off arm 32 is turned by the third

wheel, 22, of the train driving the disks. On the arbor of the third wheel is the pinion 23, which is turned by the second wheel, 20. The second-wheel, 20, also turns at same time the pinion 24, as before stated, a sufficient distance to change the unit of the number of minutes. The pinion 21 on the arbor of the second wheel, 20, is turned by the first wheel, 18. The great-wheel 7 drives the pinion 19, which latter is situated on arbor of first wheel, 18, as hereinbefore explained.

The tens of minutes are changed as follows: The shaft 26 has a small hexagonal-sided block, 43, rigidly fixed onto it about midway between the pillar-plates. Upon one face thereof are placed six pins at equal distances from each other, virtually forming a six-leaf pinion. Upon the arbor of the second wheel, 20, underneath this pinion, are two disks, 44 and 45, rigidly connected to each other and to the arbor. The periphery of disk 44 is immediately underneath the block 43, and has at six equal intervals depressions 46, so deep and wide that when a depression coincides with a side of the block 43, the block can be turned on the periphery of the disk 44 within such depression. On the disk 45, at equal distances from each other, are six projections or teeth, 46, for gearing with the leaves of the block 43, one of each of such teeth 47 being opposite to one of the depressions 46, so that it will act on one of the leaves of block 43 and give the said block one turn, while one of its sides coincides with and is within one of such depressions 46. This being at the sixth of the hour (every ten minutes) permits the shaft 26 to be turned sufficiently to exhibit a figure representing the tens of minutes in the opening 29 of the dial or face plate. The last movement after the five will be 0, or a space merely, because of the exhibition of the full hour at that interval. As soon as the block 43 is so turned on its edge, the fixed disks 44 and 45 move away, and its adjacent hexagonal edge rides on the smooth periphery left between each two depressions 46 of disk 44 (see Fig. 8) until another sixth of the periphery is moved along and it reaches the next depression 46, representing ten minutes, or the sixth of an hour, when the same operation of the partial rotation of block 43 is repeated. The hexagonal block 43 is retained in fixed position against such periphery by the gentle action of a spring, 47, the freed end of which rests against one of its edges, the other end of the spring being affixed to the upper left-hand pillar. As this shaft 26 makes a whole revolution once an hour, I place on it between these fixed disks 44 45 and the rear pillar-plate, a snail, 48, by which will be let off the hour mechanism at each completion of the hour by the units and tens of units of minute-dials through the shaft 26 and sleeve 25.

The mechanism controlling the hour-dial is as follows: At the left end of the pillar-plates is a shaft, 49, one end being pivoted in the rear pillar-plate and the other end passing through

the front pillar-plate, and having keyed thereto between the front pillar-plate and the dial or face plate a disk, 50, on which are placed the hours consecutively in a circle from one upward. An opening, 51, is made in the dial-plate, so that the hour indicated by the operation of the trains may be observed. 52 is a disk on this shaft 49, containing in its periphery as many notches 53 as there are hours represented on the hour-disk, such number being twelve in the time-piece herein described. 54 is a shaft pivoted in the pillar-plates, containing an arm, 55, which has a pin, 56, projecting out horizontally from its free end, which drops into one of these notches 53, to keep in a fixed position the hour-disk, except while the disk is being moved to exhibit the next succeeding hour, when it is elevated out of such notch in manner as hereinafter explained. A spring, 57, impinging upon the top of this arm 55, extends horizontally out from the inner face of the front pillar-plate and serves to give the required gentle pressure on the arm 55, so that its pin 56 will always drop promptly into a notch at the proper instant and remain there until removed therefrom. On the shaft 49, between this notched disk 52 and the rear pillar-plate, is a hollow arbor, 58, carrying a disk, 59, which latter abuts close up against the notched disk 52. At 60 on disk 59 is a short projecting arm, carrying a pawl, 61, having a spring connected to such arm, and impinging on the back of such pawl in the usual manner, which pawl will at the proper interval of time take into one of the notches of disk 52 and carry forward such disk the distance of one notch—that is, until the pin 56 of arm 55, which has in meantime been withdrawn from the notched wheel, again engages with the next adjoining notch in it. In order to withdraw the pin 56 from out of the notch, there is hinged at 62 a loose block, 63, carrying a pin, 64, which projects toward and overlaps the pin 56 up to the side of the notched disk 52. The pin 62 rides on the periphery of disk 59, which periphery is nearly flush with the bottom portions of the notches of disk 52. At a projection, 65, on disk 59 is hinged an arm, 66, bifurcated at its other end, 67, so as to embrace the arbor of the second wheel, 20, between the snail 48 and the rear pillar-plate. Contact between this arm 66 and the periphery of the snail is made by means of the pin 68. At 69 on disk 56 is riveted an arm, 70, carrying a weight, 71, serving from its position to keep the pin 68 in close contact with the snail, and so that as the snail rotates, bringing its greater diameter out in the direction of the hour-disk mechanism, the arm 66 will be moved in same direction, carrying up the weight 71, also the pin 64, which is beveled, Figs. 10 and 11, so that as it approaches the reduced end of pin 56 projecting over periphery of disk 59, which is correspondingly beveled, it will ride up over and take a position on the other side of such pin 56, and so position itself that its lower or knife

edge will at the proper instant of time raise up pin 56 out of the notch it rests in, and during this movement the pawl 61 is brought into position, in order to be ready to drop into one of the notches of disk 52, for the purpose of carrying forward the disk 52 and relocking it in position to show the next succeeding hour.

The operation is as follows: The snail 48 having pressed outward the arm 66, and such arm having rotated the disk 59 in direction shown by arrow in Fig. 10, the weight will be gradually raised, and the pin 64 be caused to assume a position on inner side of the pin 56, ready to elevate the latter by passing under it. The pawl 61 will also by this movement have been withdrawn from its notch and positioned so as to drop into the next succeeding notch, as before stated. As soon as the pin 68 drops off the largest diameter of snail 48 the weight 71 will be caused to rotate the disk 59, (in direction of arrow on Fig. 11,) and the pin 64 will at same time elevate the locking-pin 56 out of its notch, and allow the pawl 61 to drop into the notch on disk 59, which it is positioned a little in advance of at that instant, and thereby rotate the disk 52 the distance of one notch, at which point the locking-pin 56 will arrest and lock it by dropping into the first notch rotated to a position underneath it. Such rotation will bring up to and expose in the opening 51 on the dial or face-plate the next consecutive hour-number of the disk-plate, which latter is rotated by the shaft 49, as before stated.

Fig. 10 represents the position of the parts last described just before the pin 64 has passed to the inner side of locking-pin 56, and just before the end of pawl 61 has reached its position opposite the appropriate notch to engage with, when pin 56 is elevated and disengaged from its notch.

Fig. 11 shows the pin 64 as having just disengaged the pin 56 from the notch, while the pawl 61 has dropped into the notch it has been rotated opposite to, which movements are practically simultaneous, to secure the rotation of the disk 52, so that the locking-pin 56 (the pin 64 having now passed away from its under side) shall take into the next succeeding notch, the pawl 61 carrying the disk 52 along until it is arrested and the hour-disk securely locked, the change of the hour being thereby indicated. The block 33 is pivoted to the pillar-plate 34, so that by depressing its rear arm, 72, it will draw to one side the arm 39, and permit one end of the let-off bar 32 to pass between the pins 41 and 42, so as to change the figures representing the minutes and hours in the dial-openings. The block 33 is, after such movement, returned to its normal position by the flat spring 73, one end of which is attached at its rear portion, and the other end presses against a pin, 74, on the inner face of the rear pillar-plate. The tension put on the spring by depressing the arm 72 will automatically bring the block 33 into its normal position again on releasing such arm, a stud, 75, acting

as a limit to the upward movement of arm 72. The fractions of a minute, or the seconds, may be indicated by a second-hand, 76, which is placed on the end of the arbor of the fourth wheel, 14, of the time-train projecting through to the front of the dial or face plate.

My improvements are equally applicable to a movement in which it is desired to embody a striking mechanism or chimes mechanism, or both, as such features can be readily added thereto by means of appropriate trains of wheels in manner well known to those skilled in the art.

I claim—

1. The combination, with a mainspring or its equivalent, of two trains of wheels, one train controlled by the escapement and the other train for driving the minute and hour disks, with an intermediate minute let-off bar, and vibrating cam-bar between said trains for letting off the last-named train at the proper intervals to drive around the minute and hour disks.

2. The combination, with the mainspring or its equivalent, of two trains of wheels, an intermediate minute let-off bar connecting such trains, minute let-off disks, hour let-off disk, and mechanism connected with and controlling the let-off of said disks.

3. The combination, with the mainspring or its equivalent, of two trains of wheels, an intermediate minute let-off bar connecting such trains, minute let-off disks, hour let-off disk, mechanism connected with and controlling the let-off of said disks, and a dial or face plate in which are openings to expose at the proper interval of time figures indicating each minute of the hour and the full hour.

4. The arrangement of the arms 38 and 39 between the arbor of the fourth or last wheel of the time-train and the let-off bar, the arm 38 being constructed with a bifurcated end to grasp and be operated by a cam on such arbor, and the arm 39 constructed with two pins, 41 and 42, on which the let-off bar acts to let off intermittently the train driving the minute-disks, and thereby turn the said disks, so as to exhibit the number of minutes during the hour the time-piece has run.

5. The arrangement of the arms 38 and 39 between the arbor of the fourth or last wheel of the time-train and the let-off bar, the arm 38 being constructed with a bifurcated end to grasp and be operated by a cam on such arbor, and the arm 39, constructed with two pins, 41 and 42, on which the let-off bar acts to let off intermittently the train driving the minute-disks, and thereby turn the said disks so as to exhibit the number of minutes the time-piece has run, in combination with a hinged block supporting the arms 38 and 39, by which the driving-train can be let off and the minute-disks rotated at will.

6. The construction and arrangement on the driving-train of two disks, 44 and 45, in combination with a hexagonal-sided pinion, 43, and a disk indicating the tens of minutes in

the hour, and a snail operating against a bar, 66, which is connected to the hour-disk mechanism.

7. The hour-disk mechanism, consisting of
5 a disk, 52, rigidly connected to the hour-disk shaft, having as many slots in its periphery as there are hours on the hour-disk, an arm, 55, and its pin 56, for locking disk 44 in fixed position, and a disk, 59, to which is attached the
10 pawl 61, the hinged block 63, carrying a pin, 64, for releasing arm 55 from disk 44, and the

weight 71, which disk is connected to the train driving the minute-disks by a bar, 66, which latter is bifurcated at its end and caused to impinge against the periphery of the snail by 15 means of a pin, 68.

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