

No. 699,387.

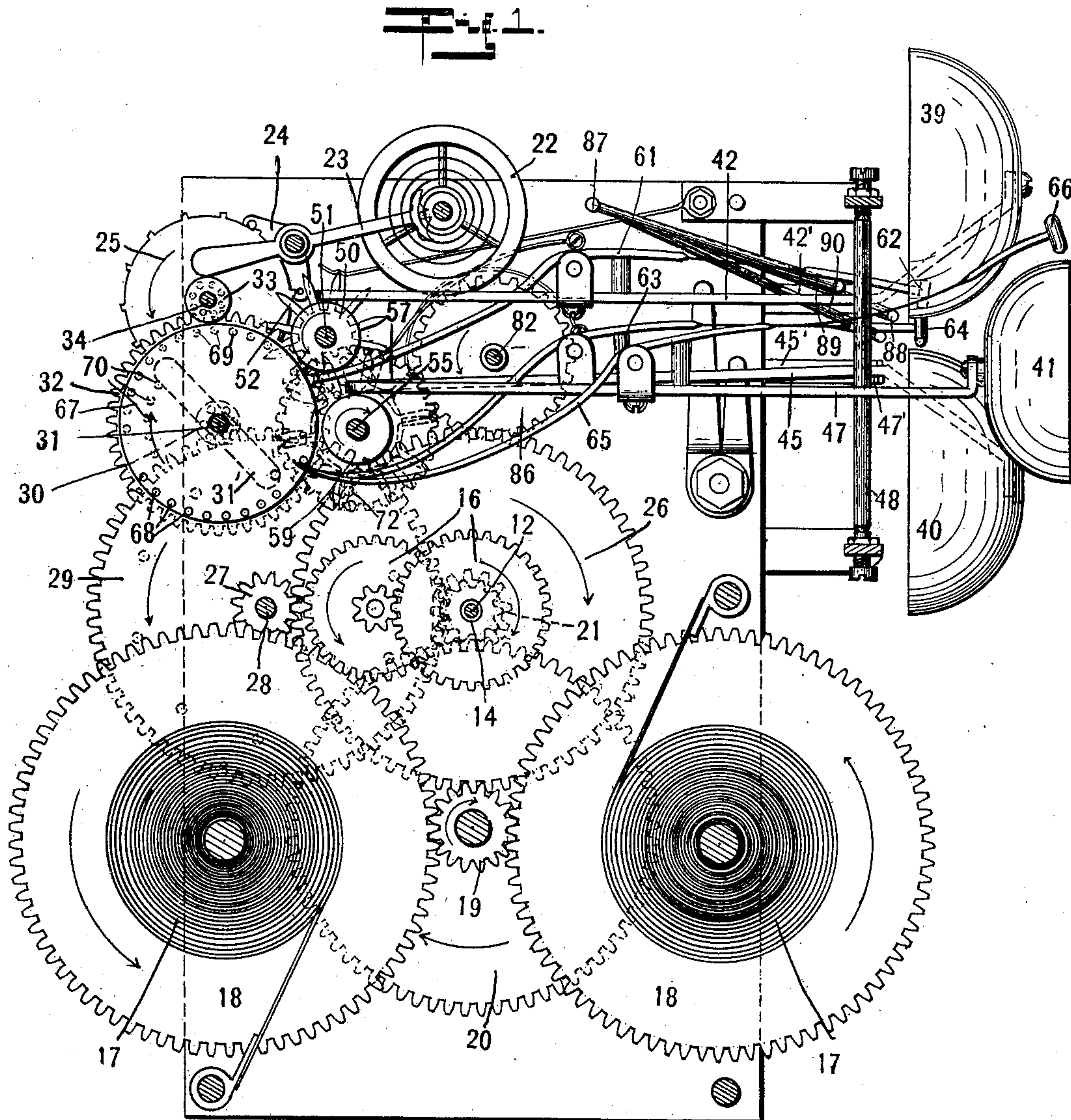
Patented May 6, 1902.

H. M. HUNT.
CLOCK STRIKING MECHANISM.

(Application filed Feb. 4, 1901.)

(No Model.)

6 Sheets—Sheet 1.



Witnesses
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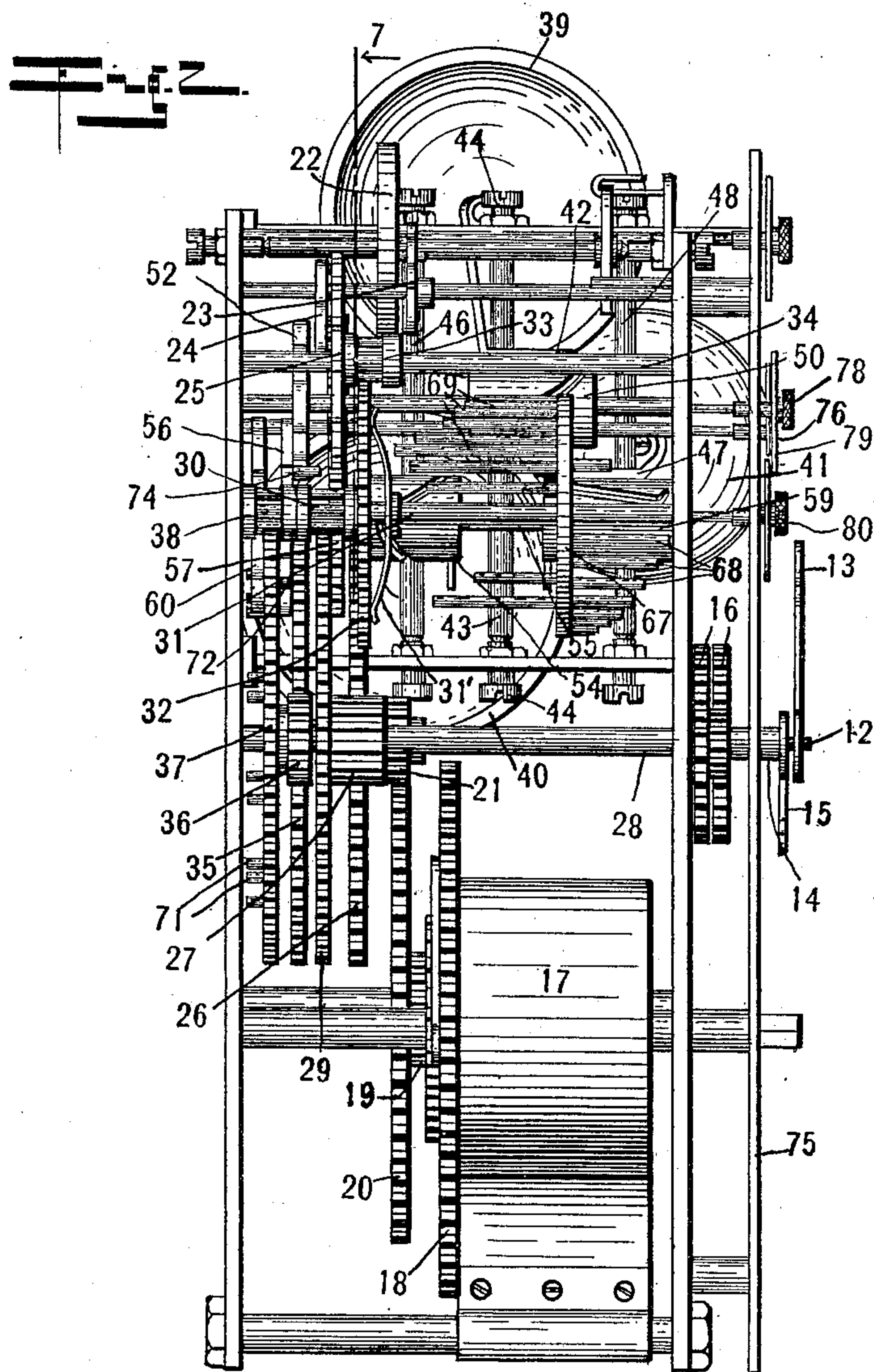
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6 Sheets—Sheet 2.



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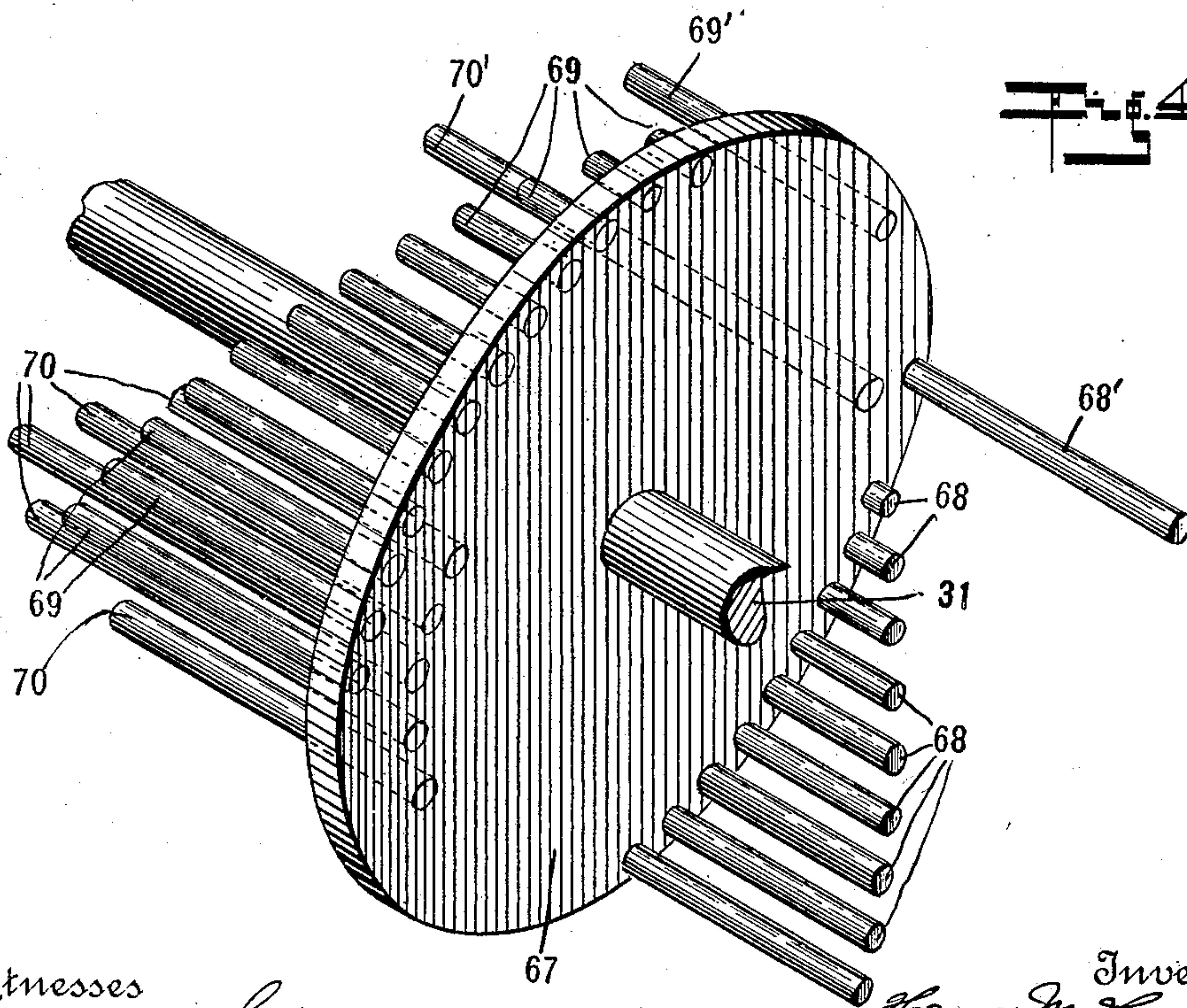
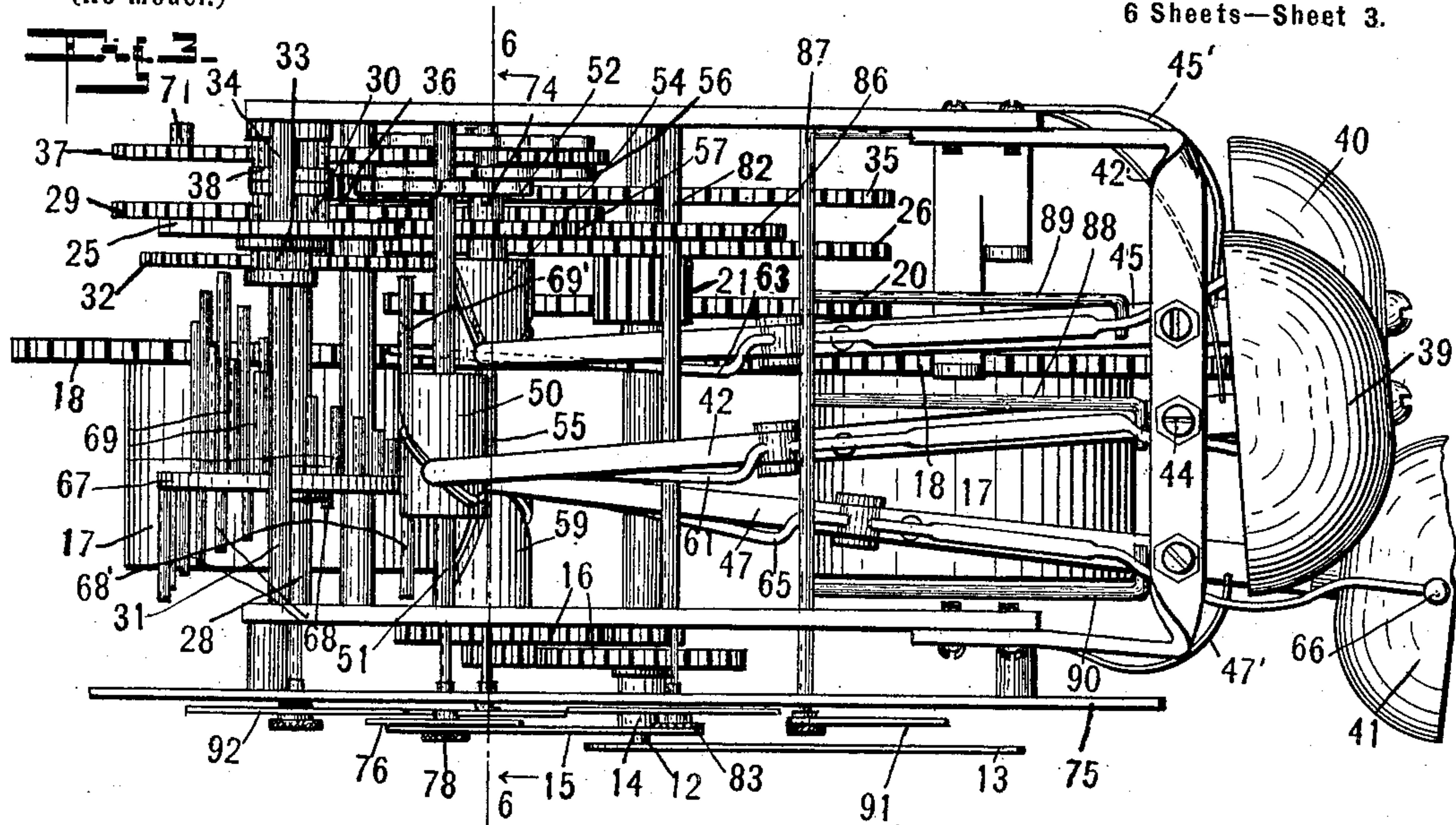
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6 Sheets—Sheet 3.



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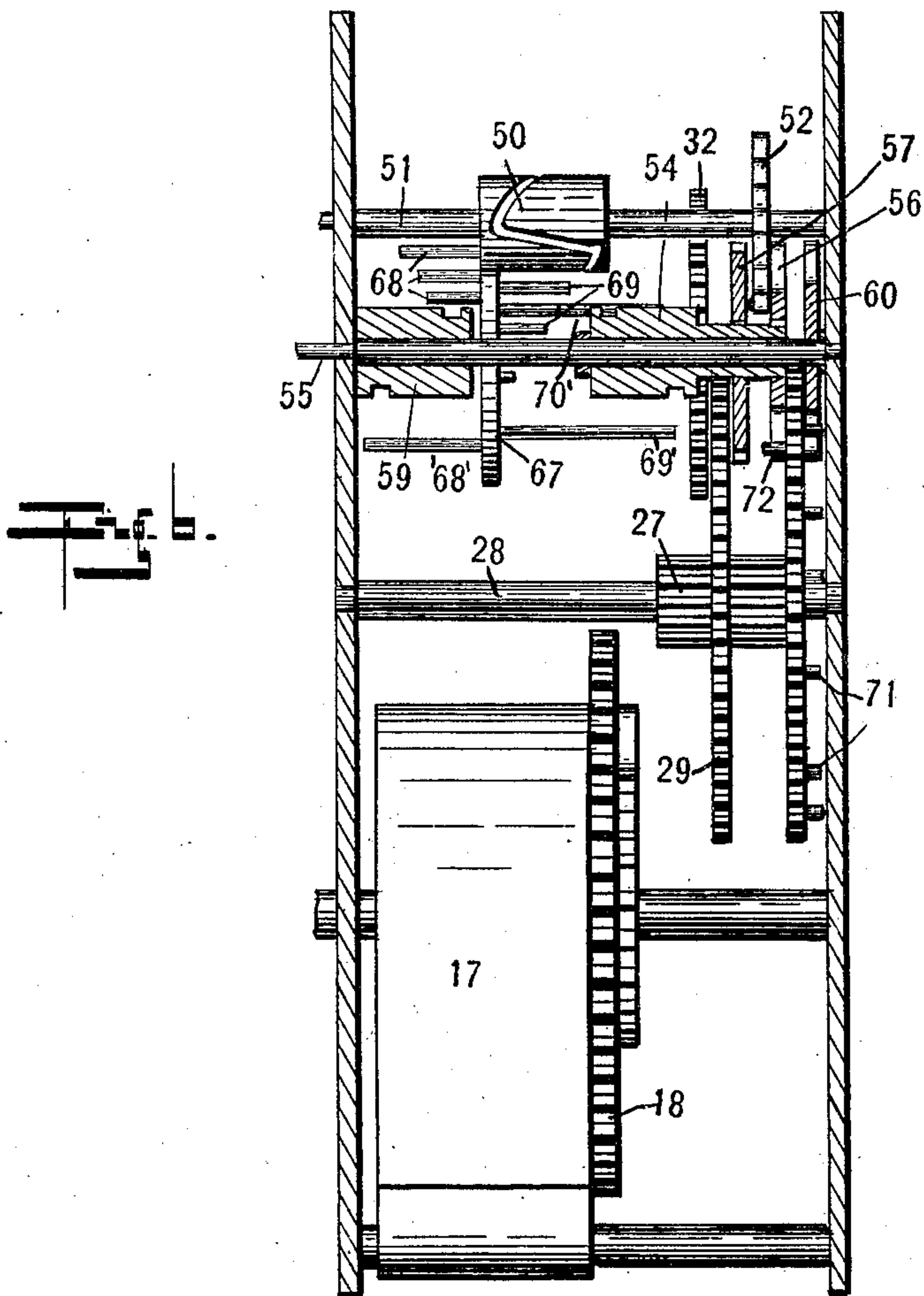
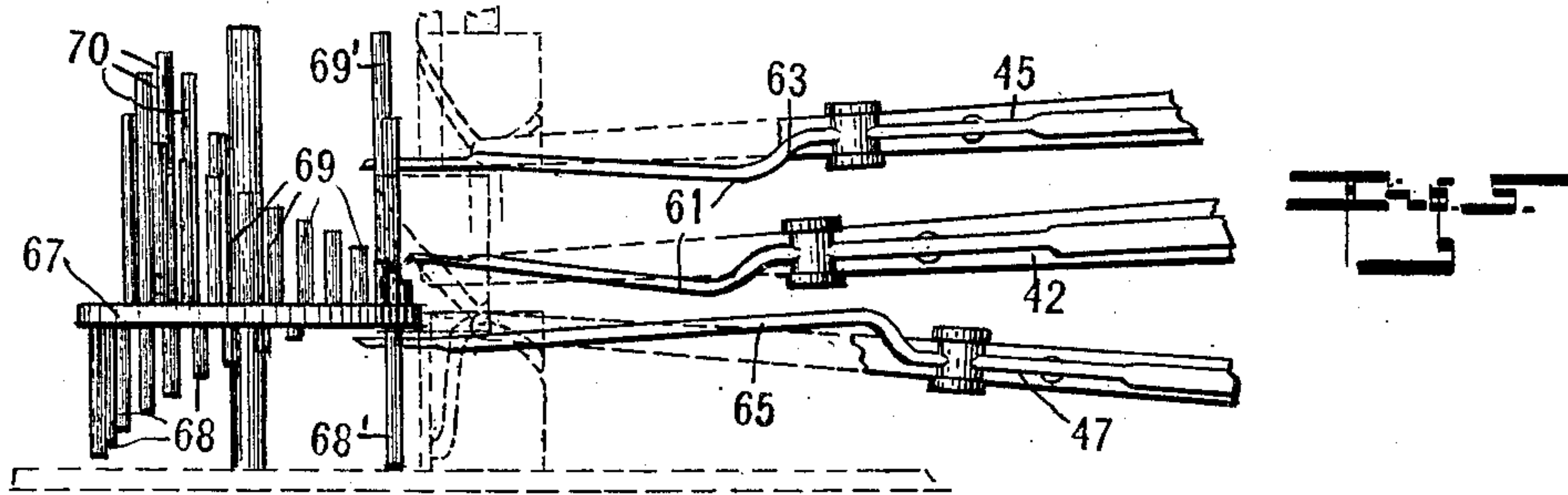
Patented May 6, 1902.

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(Application filed Feb. 4, 1901.)

(No Model.)

6 Sheets—Sheet 4.



Witnesses

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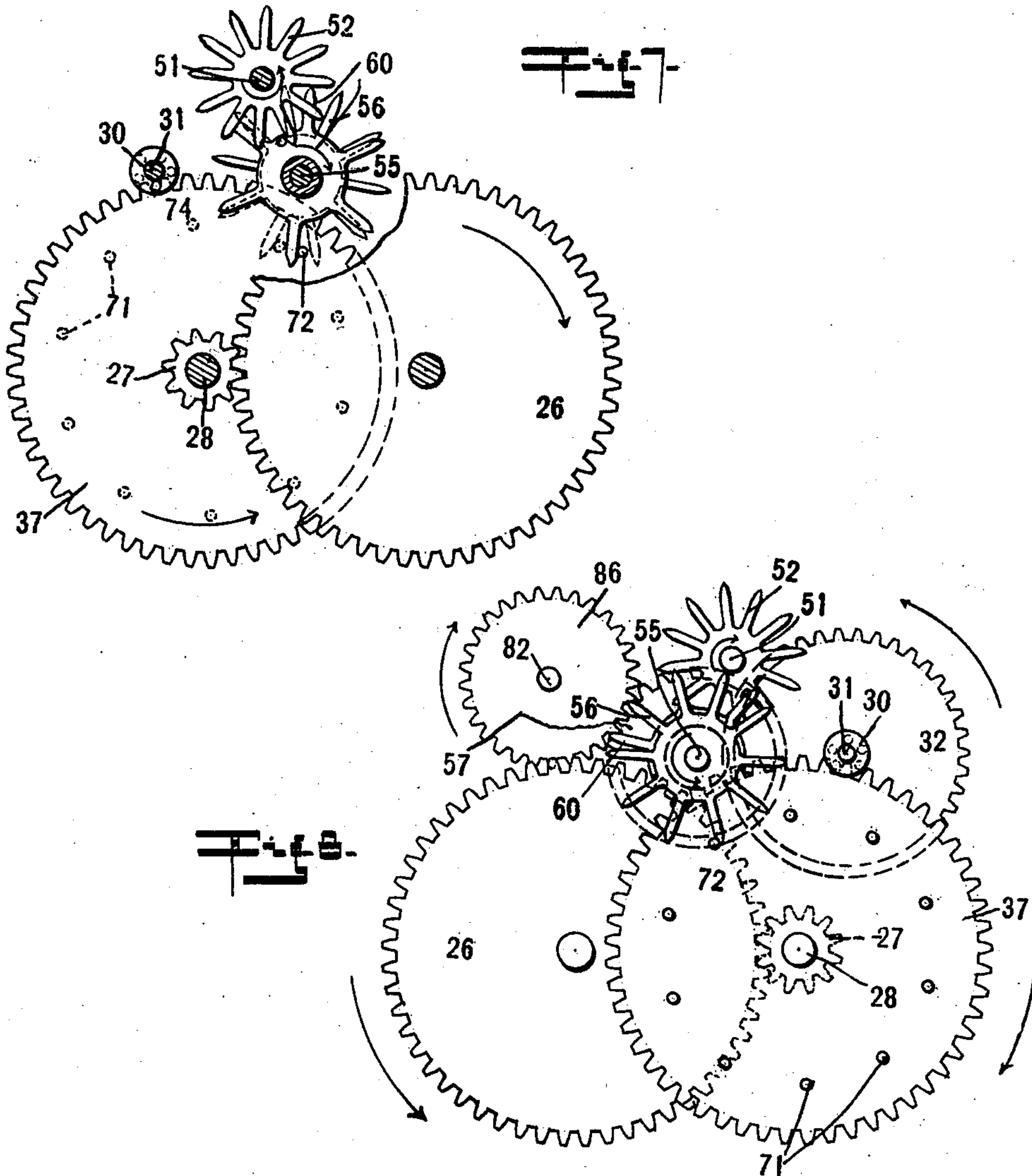
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(Application filed Feb. 4, 1901.)

(No Model.)

6 Sheets—Sheet 5.



Witnesses

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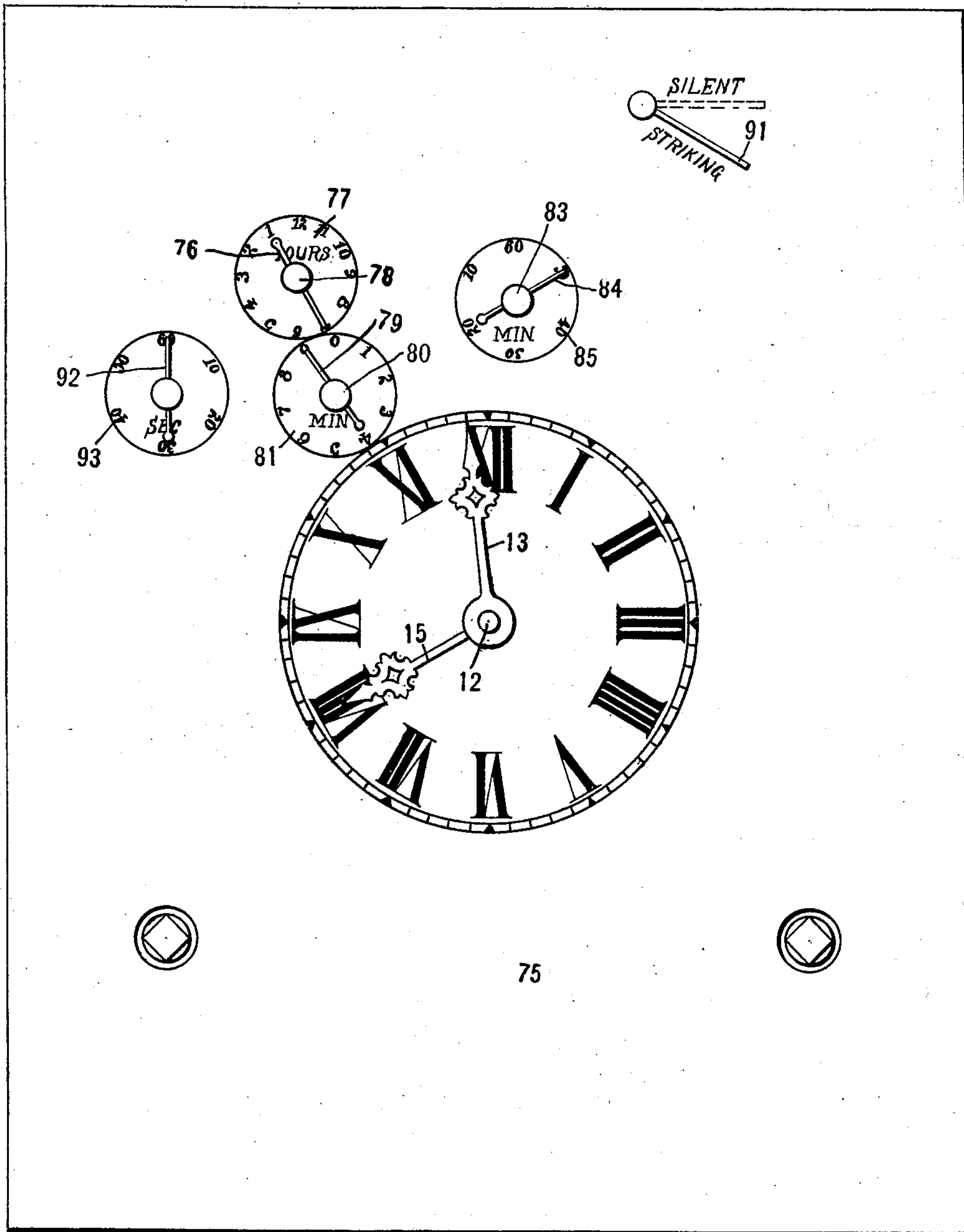
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6 Sheets—Sheet 6.



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UNITED STATES PATENT OFFICE.

HENRY M. HUNT, OF INDIANAPOLIS, INDIANA.

CLOCK STRIKING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 699,387, dated May 6, 1902.

Application filed February 4, 1901. Serial No. 45,811. (No model.)

To all whom it may concern:

Be it known that I, HENRY M. HUNT, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented a new and useful Striking-Clock, of which the following is a specification.

My invention relates to an improvement in clocks in which the time is indicated by an audible signal.

The object of my present invention is to provide mechanism by means of which the exact time may be indicated by an audible signal, said mechanism being driven by the same motor which drives the time-train.

The accompanying drawings illustrate my invention.

Figure 1 is a front elevation of my improved mechanism, the face-plate being omitted. Fig. 2 is a side elevation. Fig. 3 is a top plan. Fig. 4 is a perspective of the striking-wheel. Fig. 5 is a plan of the striking-wheel and bell-hammers with the positioning-cams indicated in dotted lines. Fig. 6 is a section on line 6 6 of Fig. 3. Fig. 7 is a section on line 7 of Fig. 2 of the cam-operating star-wheels and immediately adjacent parts. Fig. 8 is a rear elevation of the parts shown in Fig. 7. Fig. 9 is a face view of the clock.

In the drawings, 12 indicates the center arbor, to the outer end of which is secured the minute-hand 13. Revolvably mounted on arbor 12 is a sleeve 14, Figs. 2 and 3, to which is secured the hour-hand 15, said sleeve being driven from the arbor 12 by the usual dial-train of gears 16, Fig. 1. Arbor 12 may be driven by any suitable motor, in the present case said motor consisting of a pair of mainsprings 17, Fig. 1, each of which is connected to a gear 18, both of which gears mesh with a pinion 19, which carries a gear 20, said gear meshing with a pinion 21, mounted upon arbor 12, so as to have a frictional engagement therewith. The movement of the arbor 12 is controlled in the usual manner by the balance-wheel 22, Fig. 1, lever 23, pallet 24, and escape-wheel 25, said escape-wheel being geared to arbor 12 by the usual time-train, consisting of a gear 26, secured to pinion 21, Figs. 1 and 3; a pinion 27, Fig. 1, carried by an arbor 28 and meshing with gear 26; a gear

29, secured to arbor 28 and meshing with a pinion 30, revolvably mounted upon an arbor 31, a gear 32, secured to pinion 30 and meshing with a pinion 33, secured to arbor 34 of the escape-wheel 25. Secured to arbor 31 is a friction-spring 31', Fig. 2, which engages gear 32 in the usual well-known manner, so as to form a frictional driving connection between said gear and arbor.

If desired, the striking mechanism now to be described might be driven directly and positively from the time-train; but for obvious reasons relating to convenience of setting I have provided an independent train of gears, which, however, are connected to the same motor. The gears of this train are in many cases the same size as the gears of the time-train. (See Figs. 2 and 3.)

Mounted upon arbor 12 immediately to the rear of gear 26 is a gear 35, the same size as gear 26 and having a frictional driving connection with the arbor 12. Meshing with gear 35 is a pinion 36, of the same size as pinion 27. Pinion 36 is mounted upon arbor 28, and secured to said pinion is a gear 37, which meshes with a pinion 38, secured to arbor 31. It will be noticed that by this means arbor 31 may be rotated independently of the escape-wheel and motor. This construction makes possible the setting of the striking mechanism and the several dial-pointers without interfering with the time-train.

It is my intention to provide mechanism by means of which each minute of the day may be indicated audibly by its own distinctive signal, the hour being first designated by a proper number of strokes upon a bell, the ten-minute interval following the hour being indicated by the proper number of strokes, and the number of minutes passed in the ten-minute interval indicated being indicated by a proper number of strokes. In other words, the nomenclature used will be that commonly known as "railroad time," in which the time is described by a statement of the hour, the number of ten-minute intervals following the hour, and the minutes in the ten-minute interval named, thus the time indicated in Fig. 9 being "7.59." The signals may be struck upon a single bell, if desired; but I prefer to provide three bells of different sounds—the

hour-bell 39, Fig. 1, the ten-minute bell 40, and the minute-bell 41. Bell 39 is carried upon the outer end of a lever 42, which is pivotally supported upon an arbor 43, Fig. 2, supported between suitable adjusting-screws 44, mounted upon the frame. Bell 40 is carried upon the outer end of a lever 45, similar to lever 42, and supported upon an arbor 46, Fig. 2, similar to arbor 43. Bell 41 is carried upon the outer end of a lever 47, which is mounted upon an arbor 48, Figs. 1 and 2, similar to arbor 43. The inner end of lever 42 is provided with a depending end adapted to be engaged by a cam 50, which is carried by an arbor 51. Secured to arbor 51 is a star-wheel 52, Figs. 1 and 3, by which the arbor 51 and cam 50 may be intermittently rotated, the arrangement being such that a rotation of cam 50 will cause lever 42 to be swung about its axis. Similarly the inner end of lever 45 engages a cam 54, which is sleeved upon an arbor 55. Secured to cam 54 is a star-wheel 56, Figs. 2, 6, and 8, and a gear 57. The inner end of lever 47 engages a cam 59, which is secured to arbor 55. Secured to arbor 55 is a star-wheel 60. Pivoted upon lever 42 is a hammer-lever 61, which at its outer end carries a hammer 62, adapted to strike bell 39. Pivoted upon lever 45 is a hammer-lever 63, which carries upon its outer end a hammer 64, adapted to strike bell 40, and pivoted upon lever 47 is a hammer-lever 65, which carries at its outer end a hammer 66, adapted to strike bell 41. The several hammer-levers are all operated by a single element 67, which I term the "striking-wheel," which is secured to arbor 31. Projecting from one face of disk 67 is a series of nine pins 68, said pins projecting from the face of wheel 67 parallel to the axis and being graduated in length in regular sequence. These pins 68 are for the purpose of operating the hammer of the minute-bell 41, and the inner end of hammer-lever 65 is therefore extended beneath the cam 59, so as to project into the cylinder of movement of said pins, as clearly shown in Figs. 1 and 5. Projecting from the opposite face of wheel 67 is a series of twelve pins 69, which are graduated in length in regular sequence, as clearly shown in Figs. 2, 4, and 5. The pins 69 are for the purpose of operating the hammer which strikes the hour, and the inner end of the lever 61 is therefore extended, so as to pass beneath cam 50 and project into the cylinder of movement of pins 69. Projecting also from the same face of the wheel 67, but arranged in an arc of shorter radius than the arc of arrangement of pins 69, is a series of five pins 70, the shortest one of which is longer than the longest pin 69. The lengths of these pins are varied, no two being the same length, and, if desired, may be arranged in regular sequence. In the present case I have shown the middle one the longer and the shorter pins arranged alternately upon each side of said middle pin. Pins 70 are for the purpose of operating the

hammer which strikes the ten-minute intervals, and lever 63 is therefore passed beneath cam 54, so as to project into the cylinder of movement of said pins.

For the sake of convenience it is desirable that a striking-signal be given preliminary to the beginning of indication of each minute of time, although this is by no means necessary. For such purpose, however, I secure to wheel 67 three pins 68', 69', and 70'. Pin 68' projects from the same side as pins 68 and is a trifle longer than the longest of said pins. Pins 69' and 70' project from the same face as pins 69 and 70, and pin 69' is of the same length as the longest pin 69, while pin 70' is a trifle longer than the longest pin 70. Pins 68', 69', and 70' are so arranged upon wheel 67 that they will be brought simultaneously or nearly simultaneously into engagement with their respective hammer-levers 65, 61, and 63, so that a striking-signal which is a compound of a simultaneous striking of all three of the bells 39, 40, and 41 may be had. Pins 68, 69, and 70 are so arranged upon the wheel 67 that the entire group of pins 69 will pass the hammer-lever 61, cooperating therewith, before the first one of pins 70 comes into engagement with the hammer-lever 63, and the entire group of pins 70 will pass hammer-lever 63 before the first one of pins 68 comes into engagement with hammer-lever 65. The relation of gearing is such that arbor 31 is given a complete revolution once each minute, and the arrangement of pins upon wheel 67 is therefore such that each minute the hammer-lever 61 will be operated, so as to strike bell 39 to indicate the hour. Hammer-lever 63 will then be operated so as to strike bell 40 to indicate the number of ten-minute intervals past the hour, and hammer-lever 65 will then be operated so as to strike bell 41, so as to indicate the number of minutes past in the ten-minute interval indicated. The number of strokes which any one of the hammers will deliver to its bell depends upon the number of pins carried by wheel 67 which engage said lever, and this number of pins is automatically controlled by the position of cams 50, 54, and 59, said cams controlling the position of the levers 42, 45, and 47, respectively, and the consequent position of the inner ends of the hammer-levers 61, 63, and 65, respectively, with relation to the wheel 67. Levers 42, 45, and 47 are urged in one direction so as to be held into contact with their respective cams by springs 42', 45', and 47'. Hammer-lever 65 must have its inner end shifted with relation to pin 68 once each minute, and for this purpose gear 37 is provided upon one face (see Figs. 2 and 8) with a series of ten short projecting pins 71, which are arranged to be brought into engagement successively with the teeth of star-wheel 60. Star-wheel 60 being composed of ten equally-spaced fingers, a complete revolution of gear 37 causes a complete revolution of cam 59, said revolu-

tion taking place in each ten minutes. At the tenth minute lever 47 is thrown by its cam sufficiently far from wheel 67 to cause hammer-lever 65 to entirely avoid all of the pins 68. During the succeeding ten minutes cam 59 is advanced step by step, so as to shift hammer-lever 65 successively toward wheel 67 into successive engagement with an increasing number of pins 68. Hammer-lever 63, which strikes bell 40 to indicate the ten-minute periods in the hour, must be shifted at least five times during the hour, as no signal is given upon this bell during the first ten-minute period. It is somewhat easier, however, to shift this lever six times for each hour, the first shift not being sufficient to bring the lever into position to be engaged by the longest one of the pins 70. It is apparent, therefore, that cam 54 should be shifted once for each revolution of cam 59, and as convenience makes it possible to place cams 59 and 54 upon the same arbor cam 54 must be advanced by some other means than cam 59 or its operating parts. For this purpose gear 37 is provided upon the face opposite pins 71 with a single pin 72, (see Figs. 6 and 7,) which is adapted to be brought into engagement with any one of the six teeth on the star-wheel 56, which is secured to cam 54. By this means cam 54 is advanced one-sixth of a revolution for each revolution of cam 59, and hence is given a complete revolution once each hour. Cam 50, which controls the position of hammer-lever 61, must be moved one step in each hour and given a complete revolution each twelve hours. For this purpose a star-wheel 52 is secured to the arbor 51 of said cam 50, in position where any one of the twelve fingers of said star-wheel may be engaged by a pin 74, which is carried by the star-wheel 56, the arrangement being such that for each revolution of star-wheel 56 and the attached cam 54 star-wheel 52, with its attached cam 50, will be given one-twelfth of a revolution.

Arbor 51 is extended through the face-plate 75 and a hand 76 placed thereon to traverse a dial 77, having numerals from "1" to "12" placed thereon. The outer end of arbor 51 is provided with a thumb-nut 78, by means of which the arbor may be rotated so as to make possible a proper adjustment of cam 50. Arbor 55 is also extended through the face-plate 75 and provided with a hand 79 and a thumb-nut 80, hand 79 traversing a dial 81, having numerals from "0" to "9." Cam 54 is loosely sleeved upon arbor 55, Figs. 1 and 3, and for the purpose of adjusting said cam I provide an arbor 82, Fig. 3, which is extended through the face-plate 75 and provided with a thumb-nut 83 and a hand 84, Fig. 9, which traverses a dial 85, marked with numerals from "10" to "60." Secured to arbor 82 is a gear 86, Figs. 3 and 8, which meshes with gear 57, secured to cam 54.

The face of the clock is provided with the usual dial, which is traversed by hands 13

and 15, said dial being provided, as usual, with Roman numerals from "1" to "12."

It is sometimes desirable to prevent the operation of the several hammers, and for this purpose I provide a rock-shaft 87, provided with arms 88, 89, and 90, the outer ends of which are arranged beneath the ends of hammer-levers 61, 63, and 65, respectively. Rock-shaft 87 is extended through the face 75 and provided with a hand 91, which may be thrown toward the words "Striking" or "Silent" marked upon the face, the arrangement being such that when thrown toward the word "Silent" arms 88, 89, and 90 will lift the hammer-levers and throw their inner ends out of the paths of movement of the pins 69', 70', and 68', respectively.

The operation is as follows: The striking-wheel 67 is continuously advanced, said wheel being in direct frictional driving connection with the time-train and making a complete rotation once each minute, the arbor 31 thereof being, if desired, extended through the face and provided with a hand 92, which traverses a "seconds-dial" 93. Once each minute, therefore, pins 68', 69', and 70' come substantially simultaneously into engagement with their respective hammer-levers 65, 61, and 63 and swing said levers about their pivots, so that when released a substantially simultaneous striking of the three bells will be produced, thus giving what I choose to term a "counting-signal," this signal being given irrespective of the positions of the cams and consequent lateral positions of the inner ends of the hammer-levers. For the sake of illustration the several parts are shown in position to indicate the time "7.59," as indicated by the dials in Fig. 9. At this time lever 42 has been moved by its cam 50 until the inner end of hammer-lever 61 lies a sufficient distance from wheel 67 to be missed by the first five of pins 69 and be engaged by the succeeding seven of said pins, so that as wheel 67 is rotated hammer-lever 61 will be given seven impulses, so as to strike bell 39 seven times. Lever 45 lies at one extreme of cam 54, with hammer-lever 63 at its nearest point to wheel 67, so that it lies in the path of movement of all five of pins 70. The first of said pins comes into engagement with hammer-lever 63 immediately after the last pin 69 has passed hammer-lever 61, thus operating hammer-lever 63 five times, so as to strike bell 40 five times. Lever 47 lies at one extreme of cam 59, so that the inner end of hammer-lever 65 lies at its closest point to wheel 67, and thereby in position to be engaged by all of said pins 68, the first of said pins coming into engagement with hammer-lever 65 immediately after the last pin 70 has passed hammer-lever 63, and thus causing hammer 66 to strike bell 41 nine times. The actual time is thus indicated by the strokes "7, 5, 9" in succession, each series of strokes being upon a different bell and being slightly separated one from the other. Soon after this

signal has been completed pins 68', 69', and 70' come again into simultaneous engagement with the several hammer-levers. At the same time gear 37 has been rotated, so as to bring
 5 one of pins 71 in engagement with the star-wheel 60, so as to rotate arbor 55 one-tenth of a revolution, turning cam 59 through the same angle and allowing lever 47 to be swung immediately to the opposite end of cam 59, so
 10 as to throw hammer-lever 65 to the farthest point from wheel 67, and thereby be entirely out of the path of movement of all the pins 68. At the same time pin 72 has been brought into engagement with star-wheel 56, so as to
 15 advance said wheel and cam 54, attached thereto, one-sixth of a revolution, said movement allowing lever 45 to be forced to the opposite extreme of cam 54, so as to throw hammer-lever 63 out of the path of movement of
 20 the pins 70.

It is to be noticed that the wheel 67 is in direct connection with the time-train and is continuously rotated. It will be further noticed that the hammer-levers are carried upon
 25 swinging levers, and the positions of the inner ends of said hammer-levers are determined by the swinging movement of their supporting-levers, said swinging movement being accomplished by means of the respective cams,
 30 which cams are intermittently rotated by the time-train. The action of the swinging levers which support the hammer-levers is such as to require but little power, so that very little resistance is offered to the motor
 35 and there is no probability of any cramping action due to the shifting of positions of the hammer-levers with relation to the striking-wheel.

It will be readily understood that, if desired, means for throwing the hammer-levers
 40 into or out of operative position with respect to the striking-wheel may be introduced, so that levers may be thrown out of or into striking position from a distant point. Such an
 45 arrangement may involve the well-known use of an electromagnet coöperating with an armature carried by the rock-shaft 87.

By the mechanism described a correct time-signal is given for each revolution of the
 50 striking-wheel, so that there need be no introduction of any means for preventing the operation of the striking-wheel upon the hammer-levers because of an incorrect relative position, which would result in the indication
 55 of incorrect or only approximate time, the mechanism being always in position to indicate the correct time within the range of the smallest division of time commonly used.

I claim as my invention—

60 1. In a striking-clock, the combination with a revoluble striking-wheel, and means for rotating said wheel once during each period of time indicated, of a graduated series of pins carried by said striking-wheel, a lever, a
 65 hammer-lever pivotally mounted upon said lever and arranged to be engaged by said

pins, a bell, and means for swinging said lever so as to shift the hammer-lever to vary the number of pins engaging said hammer-lever.

2. In a striking-clock, the combination with a revoluble striking-wheel, of a graduated series of pins carried by said striking-wheel, a lever, a hammer-lever pivotally mounted upon said lever and arranged to be engaged
 75 by said pins, a bell, means for swinging said lever so as to shift the hammer-lever to vary the number of pins engaging the hammer-lever, and means for carrying said pins past the hammer-lever once each period of time
 80 to be indicated.

3. In a striking-clock, the combination with a revoluble striking-wheel, and means for rotating said wheel once during each period of time indicated, of a graduated series of pins
 85 carried by said striking-wheel, a lever, a bell mounted upon said lever, a hammer-lever pivoted upon said lever and arranged to be engaged by said pins, and means for swinging said lever so as to shift the hammer-lever
 90 to vary the number of pins engaging said hammer-lever.

4. In a striking-clock, the combination with a revoluble striking-wheel, and means for rotating said wheel once each minute, of a series of twelve graduated hour-pins carried by
 95 said wheel, a series of five graduated ten-minute pins carried by said wheel, a series of nine graduated minute-pins carried by said wheel, three levers, three bells, a hammer-lever pivotally mounted upon the first of said levers and adapted to be engaged by the hour-pins, means for swinging said first lever so as to vary the number of hour-pins engaging its hammer-lever, a hammer-lever pivoted upon
 105 the second lever and adapted to be engaged by the ten-minute pins, means for swinging said second lever so as to vary the number of pins engaging its hammer-lever, a hammer-lever pivoted upon the third lever and adapted to be engaged by the minute-pins, and means for swinging said third lever to vary the number of pins engaging its hammer-lever.

5. In a striking-clock, the combination with a revoluble striking-wheel, and means for rotating said wheel once each minute, of a series of twelve graduated hour-pins carried by said striking-wheel, a series of five graduated ten-minute pins carried by said wheel, a series of nine graduated minute-pins carried by said
 120 wheel, three levers, three bells, one carried by each of said levers, a hammer-lever pivotally mounted upon the first of said levers and adapted to be engaged by the hour-pins, means for swinging said first lever so as to vary the number of hour-pins engaging its hammer-lever, a hammer-lever pivoted upon the second lever and adapted to be engaged by the ten-minute pins, means for swinging said second lever so as to vary the number of
 130 pins engaging its hammer-lever, a hammer-lever pivoted upon the third lever and adapted

ed to be engaged by the minute-pins, and means for swinging said third lever to vary the number of pins engaging its hammer-lever.

6. In a striking-clock, the combination with
5 a revoluble striking-wheel, and means for rotating said wheel once each minute, of a series of twelve graduated hour-pins carried by said wheel, a series of five graduated ten-minute pins carried by said wheel, a series of
10 nine graduated minute-pins carried by said wheel, a lever, a hammer-lever pivoted upon said lever and arranged to be engaged by the minute-pins, a cam arranged to engage the said lever, means for moving said cam so as
15 to swing said lever through its range of movement once in each ten minutes, a second lever, a hammer-lever carried by said second lever and arranged to be engaged by the ten-minute pins, a cam, means for advancing said
20 cam step by step through the range of its movement once each hour, a third lever, a hammer-lever carried thereby and arranged to be engaged by the hour-pins, a cam engaging said third lever, means for advancing said
25 cam step by step once each hour so as to swing said third lever through its range of movement once in twelve hours, and three bells arranged to cooperate with the hammer-levers.

7. In a striking-clock, the combination with
30 a revoluble striking-wheel, and means for rotating said wheel once each minute, of a series of twelve graduated hour-pins carried by said wheel, a series of five graduated ten-minute pins carried by said wheel, a series of nine
35 graduated minute-pins carried by said wheel, a swinging lever, a hammer-lever carried by said lever, a rotatable cam engaging said first lever, means for advancing said cam step by
40 step once each minute, a second lever, a hammer-lever carried thereby and arranged to be engaged by the ten-minute pins, a cam engaging said second lever, a six-point star-wheel connected to said cam, means for ad-
45 vancing said star-wheel intermittently one-sixth of a revolution each ten minutes, a third lever, a hammer-lever carried thereby in position to be engaged by the hour-pins, a cam arranged to engage said third lever, a twelve-
50 point star-wheel connected to said cam, means carried by said six-point star-wheel for advancing the twelve-point star-wheel once each revolution, and three bells arranged to cooperate with the hammer-levers.

8. In a striking-clock, the combination with
55 a revoluble striking-wheel, and means for rotating said wheel once each minute, of a series of twelve graduated hour-pins carried by said wheel, a series of five graduated ten-minute pins carried by said wheel, a series of
60 nine graduated minute-pins carried by said wheel, three hammer-levers and cooperating bells, said hammer-levers being arranged to be engaged respectively by the hour-pins, ten-minute pins, and minute-pins in succession,
65 means for changing the relative position of the minute-pins and cooperating hammer-le-

ver once each minute, means for changing the relative position of the ten-minute pins and cooperating hammer-lever five times each
70 hour, and means for changing the relative position of the hour-pins and cooperating hammer-lever once each hour.

9. In a striking-clock, the combination with
75 a revoluble striking-wheel, of a series of twelve graduated hour-pins carried by said wheel, a series of five graduated ten-minute pins carried by said wheel, a series of nine graduated minute-pins carried by said wheel, three hammer-levers and cooperating bells, said ham-
80 mer-levers being arranged to be engaged respectively by the hour-pins, ten-minute pins, and minute-pins in succession, means for carrying said pins past their respective hammer-levers once each minute, means for changing
85 the relative position of the minute-pins and cooperating hammer-lever once each minute, means for changing the relative position of the ten-minute pins and cooperating hammer-lever five times each hour, and means for
90 changing the relative position of the hour-pins and cooperating hammer-lever once each hour.

10. In a striking-clock, the combination with
95 a revoluble striking-wheel, of a driving-wheel 37 geared therewith, a series of twelve graduated hour-pins carried by said striking-wheel, a series of five graduated ten-minute pins carried by said striking-wheel, a series of
100 nine graduated minute-pins carried by said striking-wheel, three hammer-levers and cooperating bells, said hammer-levers being arranged to be engaged respectively by the hour-pins, ten-minute pins, and minute-pins in
105 succession, a cam for shifting the first hammer-lever with relation to the minute-pins, a star-wheel secured to said cam, means carried by the driving-wheel 37 for engaging said star-wheel to advance said cam one step each
110 minute, a second cam sleeved upon the arbor of the first cam and arranged to shift the position of the second hammer-lever with relation to the ten-minute pins, a star-wheel carried by said second cam, means carried by gear 37
115 for advancing said second cam one step each ten minutes, a third cam arranged to shift the third hammer-lever with relation to the hour-pins, a star-wheel secured thereto, and means carried by the second star-wheel for engaging
120 the third star-wheel and advancing said third star-wheel one step each hour.

11. In a striking-clock, the combination with
125 a revoluble striking-wheel, of a series of twelve graduated hour-pins carried by said wheel, a series of five graduated ten-minute pins carried by said wheel, a series of nine graduated minute-pins carried by said wheel, three levers, three bells, a hammer-lever pivoted upon the first of said levers, and adapted to be engaged by the hour-pins, means for
130 swinging said first lever so as to vary the number of hour-pins engaging its hammer-lever, a hammer-lever pivoted upon the second lever and adapted to be engaged by the ten-

minute pins, means for swinging said second lever so as to vary the number of pins engaging its hammer-lever, a hammer-lever pivoted upon the third lever and adapted to be engaged by the minute-pins, means for swinging said third lever to vary the number of pins engaging its hammer-lever, and means for carrying the three series of pins past their respective hammer-levers once each minute.

10 12. In a striking-clock, the combination with a revoluble striking-wheel, of a series of twelve graduated hour-pins carried by said wheel, a series of five graduated ten-minute pins carried by said wheel, a series of nine graduated minute-pins carried by said wheel, 15 a lever, a hammer-lever pivoted upon said lever and arranged to be engaged by the minute-pins, a cam arranged to engage the said lever, means for moving said cam so as to swing said lever through its range of movement once each ten minutes, a second lever, 20 a hammer-lever carried by said second lever and arranged to be engaged by the ten-minute pins, a second cam, means for advancing said second cam step by step through the range of its movement once each hour, a third 25 lever, a hammer-lever carried thereby and arranged to be engaged by the hour-pins, a third cam engaging said third lever, means for advancing said third cam step by step once each hour so as to swing said third lever through its range of movement once in twelve hours, three bells arranged to cooperate with the hammer-levers, and means for rotating 30 the striking-wheel so as to carry the three series of pins past their respective hammer-levers once each minute.

13. In a striking-clock, the combination with a revoluble striking-wheel, of a series of 40 twelve graduated hour-pins carried by said wheel, a series of five graduated ten-minute pins carried by said wheel, a series of nine graduated minute-pins carried by said wheel, three hammer-levers and cooperating bells, 45 said hammer-levers being arranged to be engaged respectively by the hour-pins, ten-minute pins, and minute-pins in succession, means for changing the relative position of the minute-pins and cooperating hammer-lever once each minute, means for changing 50 the relative position of the ten-minute pins and cooperating hammer-lever five times each hour, means for changing the relative position of the hour-pins and cooperating hammer-lever once each hour, and means for rotating said wheel so as to carry the three series of pins past their respective hammer-levers once each minute.

14. In a striking-clock, the combination with 60 a revoluble striking-wheel, and means for rotating said wheel once each minute, of a series of twelve graduated hour-pins carried by said wheel, a series of five graduated ten-minute pins carried by said wheel, a series of 65 nine graduated minute-pins carried by said wheel, three levers, three bells, a hammer-

lever pivotally mounted upon the first of said levers and adapted to be engaged by the hour-pins, means for swinging said first lever so as to vary the number of hour-pins engaging 70 its hammer-lever, a hammer-lever pivoted upon the second lever and adapted to be engaged by the ten-minute pins, means for swinging said second lever so as to vary the number of pins engaging its hammer-lever, a 75 hammer-lever pivoted upon the third lever and adapted to be engaged by the minute-pins, means for swinging said third lever to vary the number of pins engaging its hammer-lever, and three pins carried by the 80 striking-wheel in position to engage the three hammer-levers substantially simultaneously in all positions of said levers.

15. In a striking-clock, the combination with a revoluble striking-wheel, and means for rotating said wheel once each minute, of a series of twelve graduated hour-pins carried by said wheel, a series of five graduated ten-minute pins carried by said wheel, a series of nine graduated minute-pins carried by said 90 wheel, a lever, a hammer-lever pivoted upon said lever and arranged to be engaged by the minute-pins, a cam arranged to engage the said lever, means for moving said cam so as to swing said lever through its range of 95 movement once in each ten minutes, a second lever, a hammer-lever carried by said second lever and arranged to be engaged by the ten-minute pins, a second cam, means for advancing said second cam step by step 100 through the range of its movement once each hour, a third lever, a hammer-lever carried thereby and arranged to be engaged by the hour-pins, a third cam engaging said third lever, means for advancing said third cam 105 step by step once each hour so as to swing said third lever through its range of movement once in twelve hours, three bells arranged to cooperate with the hammer-levers, and three pins carried by the striking-wheel 110 in position to engage the three hammer-levers substantially simultaneously in all positions of said levers.

16. In a striking-clock, the combination with a revoluble striking-wheel, and means for rotating said wheel once each minute, of a series of twelve graduated hour-pins carried by said wheel, a series of five graduated ten-minute pins carried by said wheel, a series of nine graduated minute-pins carried by said 120 wheel, three hammer-levers and cooperating bells, said hammer-levers being arranged to be engaged respectively by the hour-pins, ten-minute pins, and minute-pins in succession, means for changing the relative position of the minute-pins and cooperating hammer-lever once each minute, means for changing 125 the relative position of the ten-minute pins and cooperating hammer-lever five times each hour, means for changing the relative position of the hour-pins and cooperating hammer-lever once each hour, and three pins 130

carried by the striking-wheel in position to engage the three hammer-levers substantially simultaneously in all positions of said levers.

17. In a striking-clock, the combination with
 5 a revoluble striking-wheel, of a series of twelve graduated hour-pins carried by said wheel, a series of five graduated ten-minute pins carried by said wheel, a series of nine graduated minute-pins carried by said wheel,
 10 three hammer-levers and cooperating bells, said hammer-levers being arranged to be engaged respectively by the hour-pins, ten-minute pins, and minute-pins in succession, means for carrying said pins past their re-
 15 spective hammer-levers once each minute, means for changing the relative position of the minute-pins and cooperating hammer-lever once each minute, means for changing the relative position of the ten-minute pins and
 20 cooperating hammer-lever five times each hour, means for changing the relative position of the hour-pins and cooperating hammer-lever once each hour, and three pins carried by the striking-wheel in position to en-
 25 gage the three hammer-levers substantially simultaneously in all positions of said levers.

18. In a striking-clock, the combination with a revoluble striking-wheel, of a driving-wheel
 30 ated hour-pins carried by said striking-wheel, a series of five graduated ten-minute pins

carried by said striking-wheel, a series of nine graduated minute-pins carried by said striking-wheel, three hammer-levers and co-
 operating bells, said hammer-levers being ar- 35
 ranged to be engaged respectively by the hour-pins, ten-minute pins, and minute-pins in succession, a cam for shifting one hammer-lever with relation to the minute-pins, a star-
 wheel secured to said cam, means carried by 40
 the driving-wheel 37 for engaging said star-wheel to advance said cam one step each minute, a second cam sleeved upon the arbor of the first cam and arranged to shift the posi-
 tion of the second hammer-lever with rela- 45
 tion to the ten-minute pins, a star-wheel carried by said second cam, means carried by gear 37 for advancing said second cam one step each ten minutes, a third cam arranged
 to shift the third hammer-lever with relation 50
 to the hour-pins, a third star-wheel secured thereto, means carried by the second star-wheel for engaging the third star-wheel and advancing said third star-wheel one step each
 hour, and three pins carried by the striking- 55
 wheel in position to engage the three hammer-levers substantially simultaneously in all positions of said levers.

HENRY M. HUNT.

Witnesses:

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