No. 744,608. PATENTED NOV. 17, 1903.

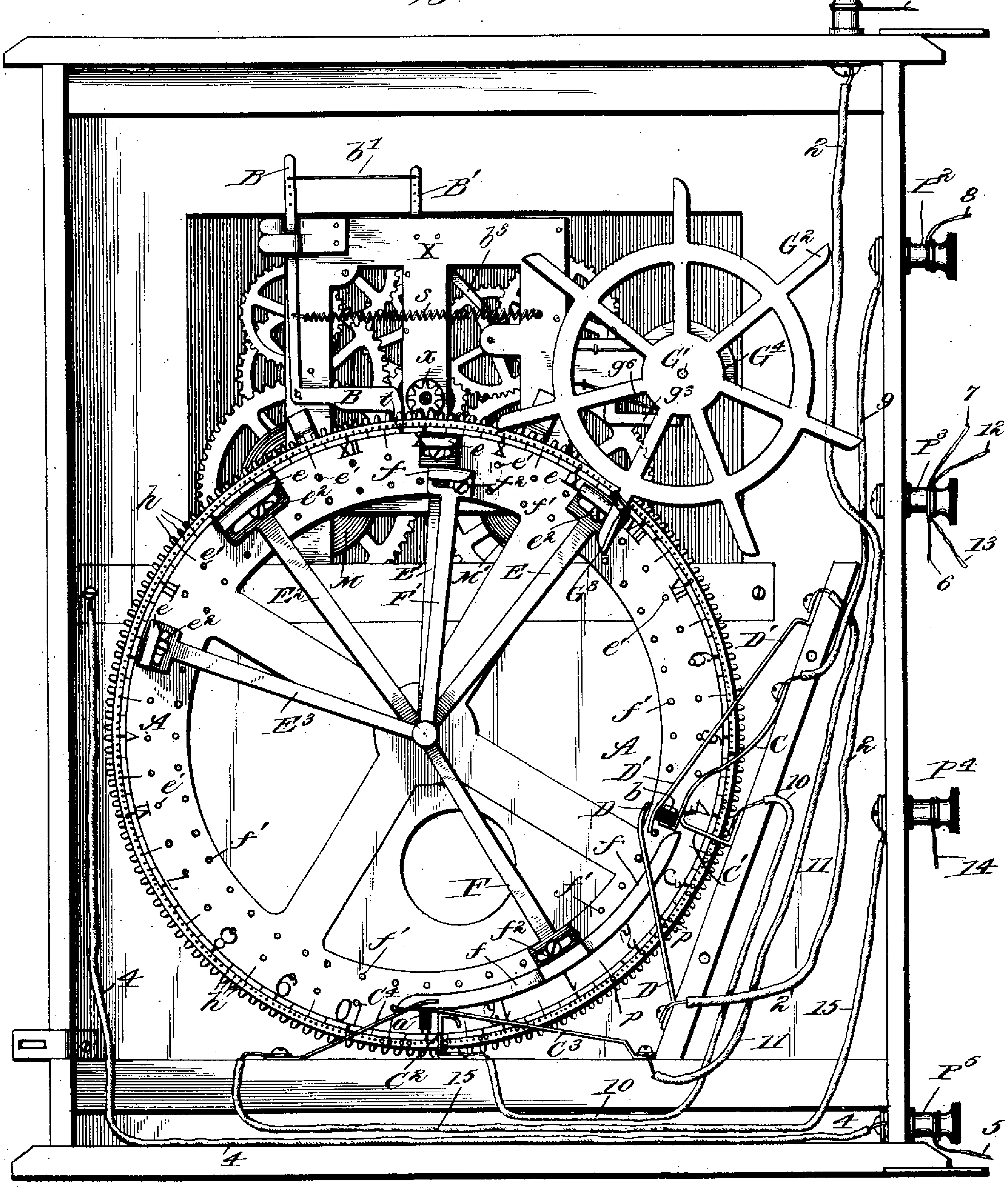
J. W. PORTIS.

ELECTRIC PROGRAM CLOCK.

APPLICATION FILED MAR. 25, 1903.

NO MODEL. 6 SHEETS—SHEET 1.

Fig. 1.



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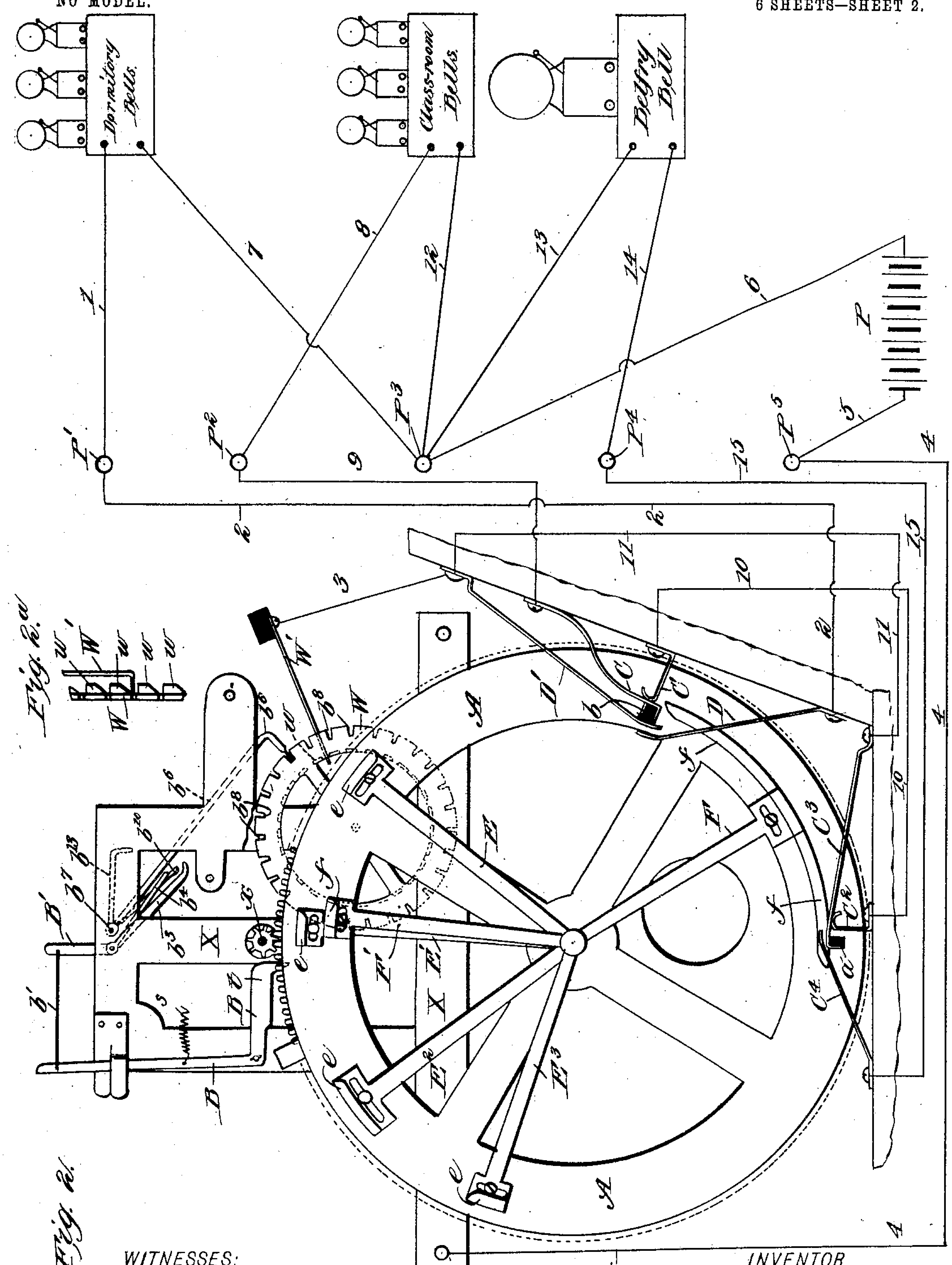
NO MODEL. 6 SHEETS—SHEET 2.



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NO MODEL. 6 SHEETS—SHEET 3.

Fig. 3.

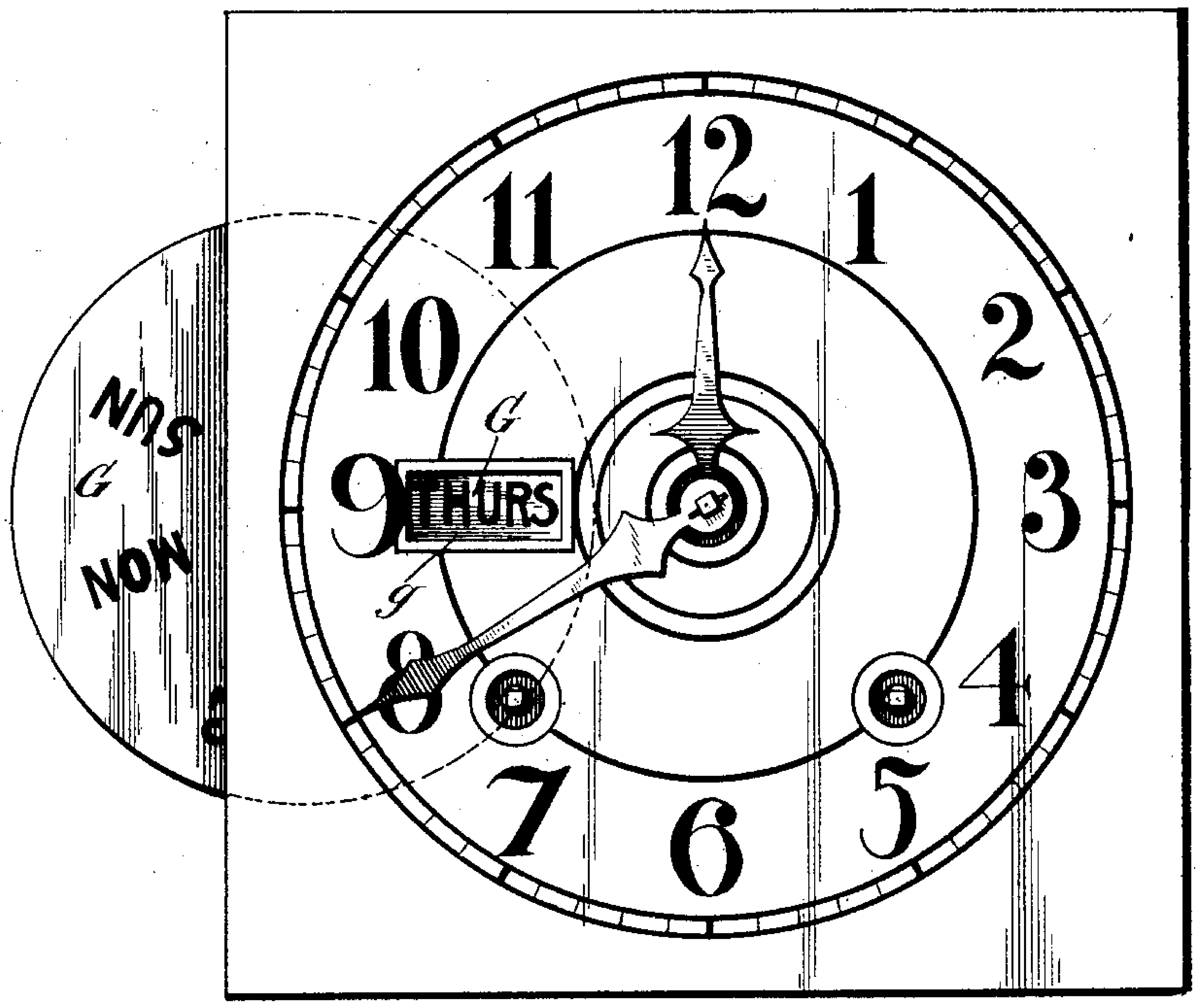


Fig. 4.

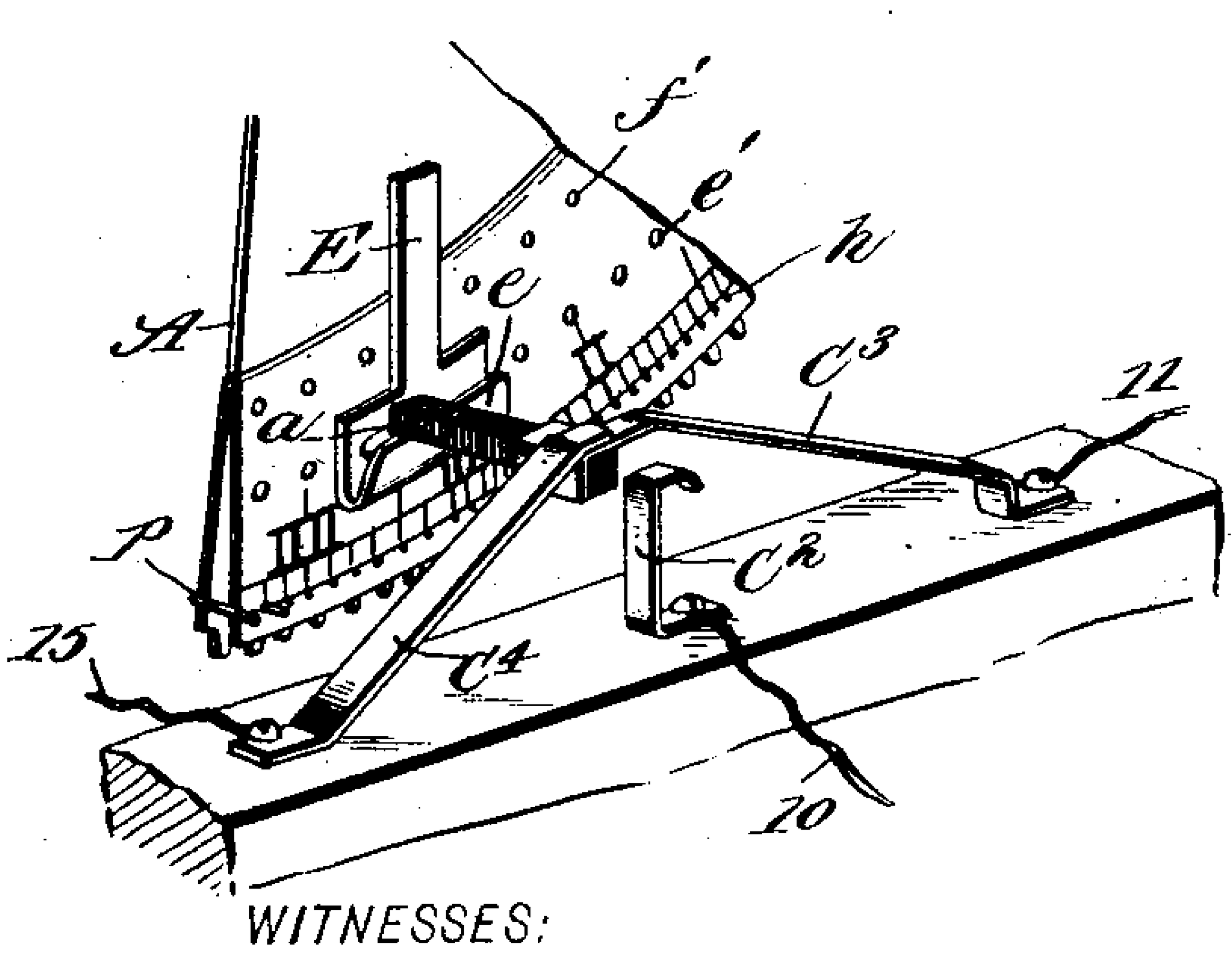
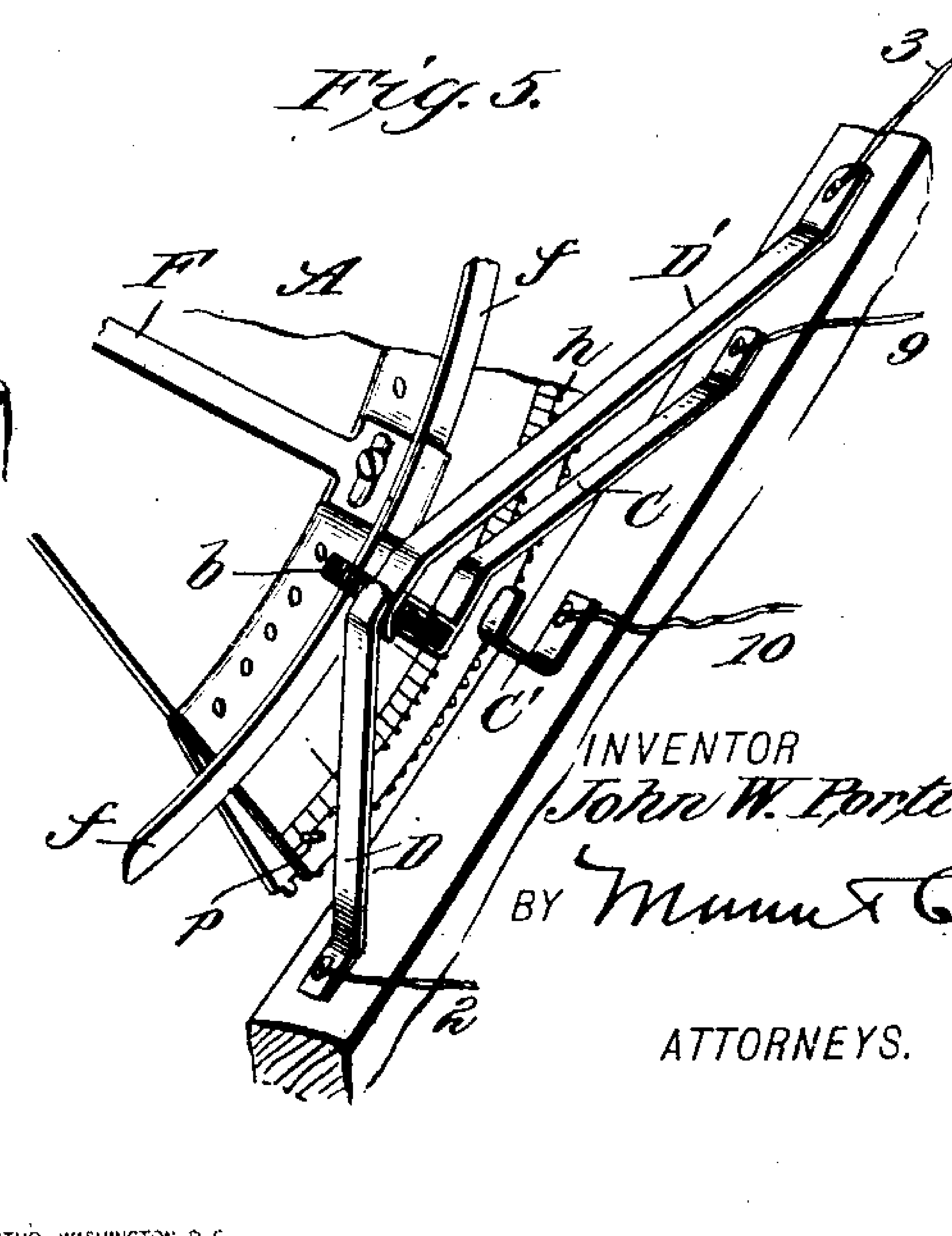


Fig. 5.



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NO MODEL. 6 SHEETS—SHEET 4.

Fig. 6.

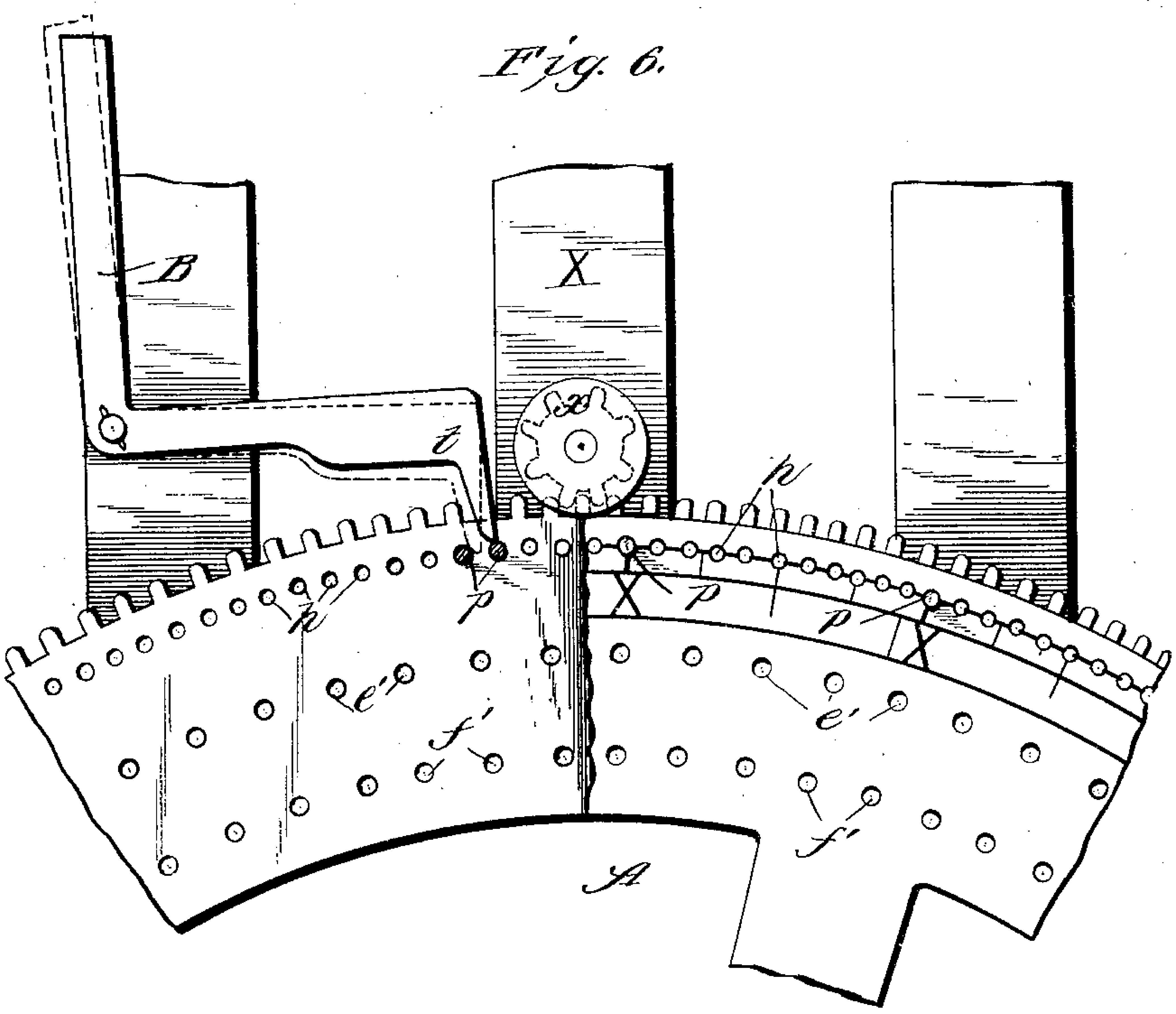
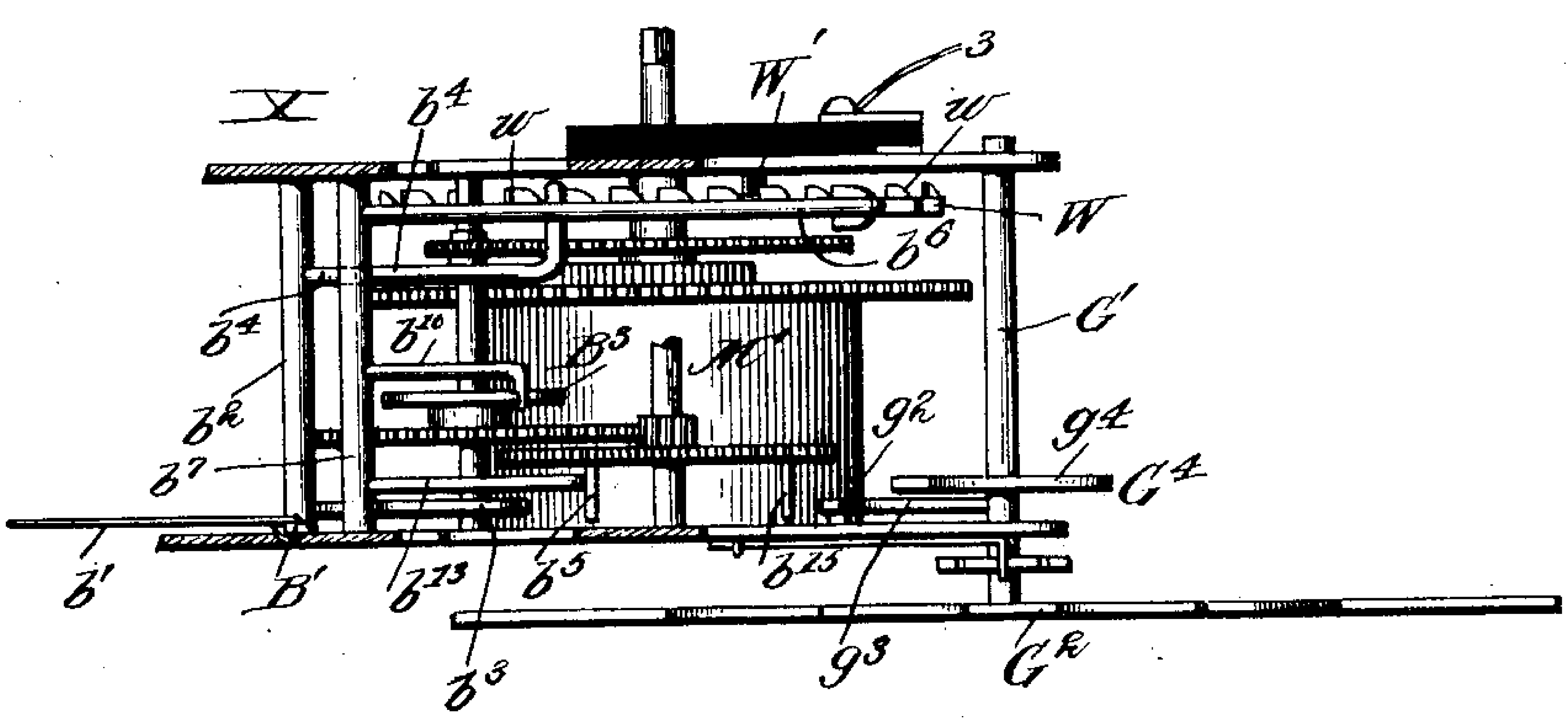


Fig. 9.



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NO MODEL. 6 SHEETS—SHEET 5.

Fig. 8.

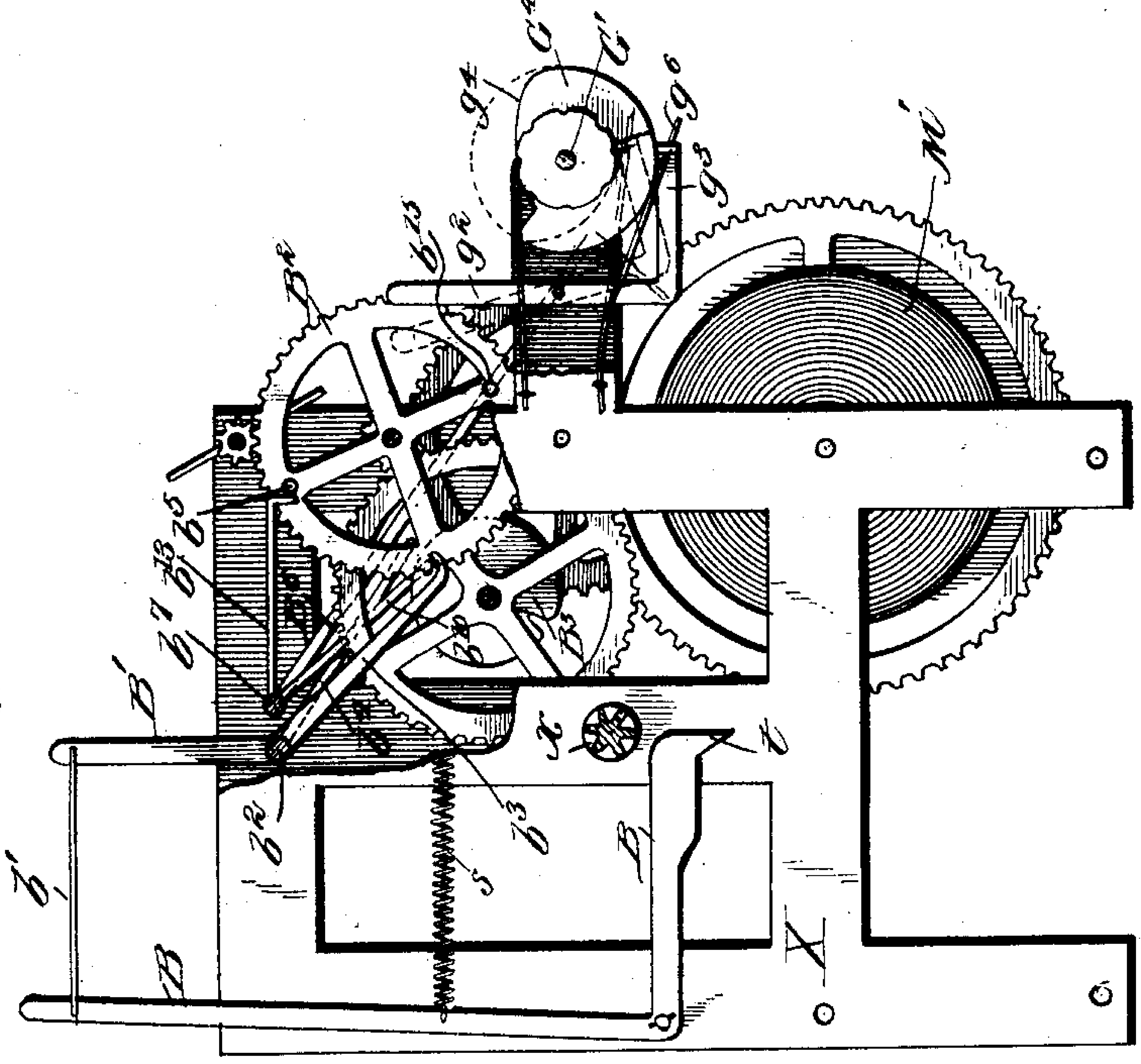
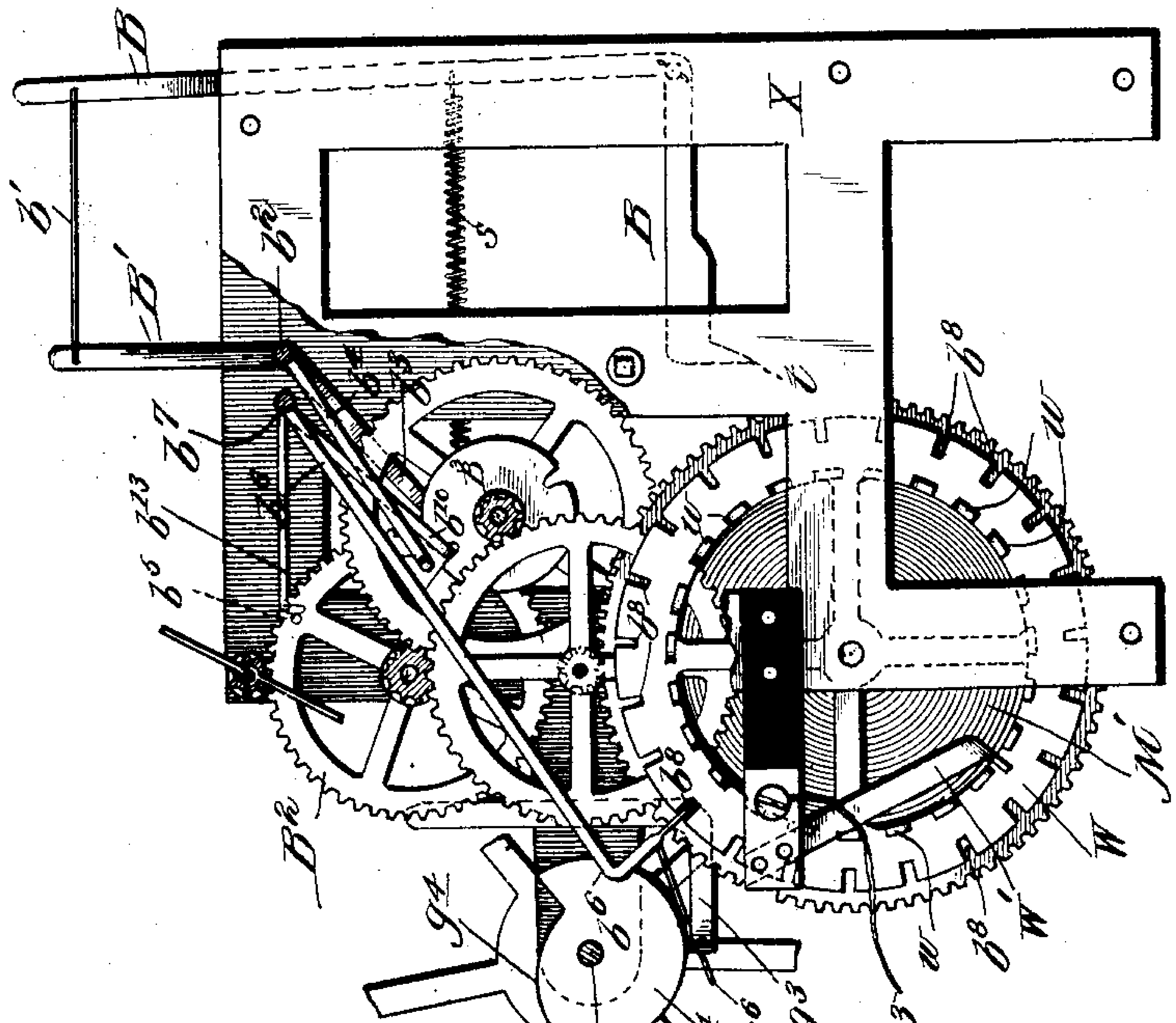


Fig. 7.



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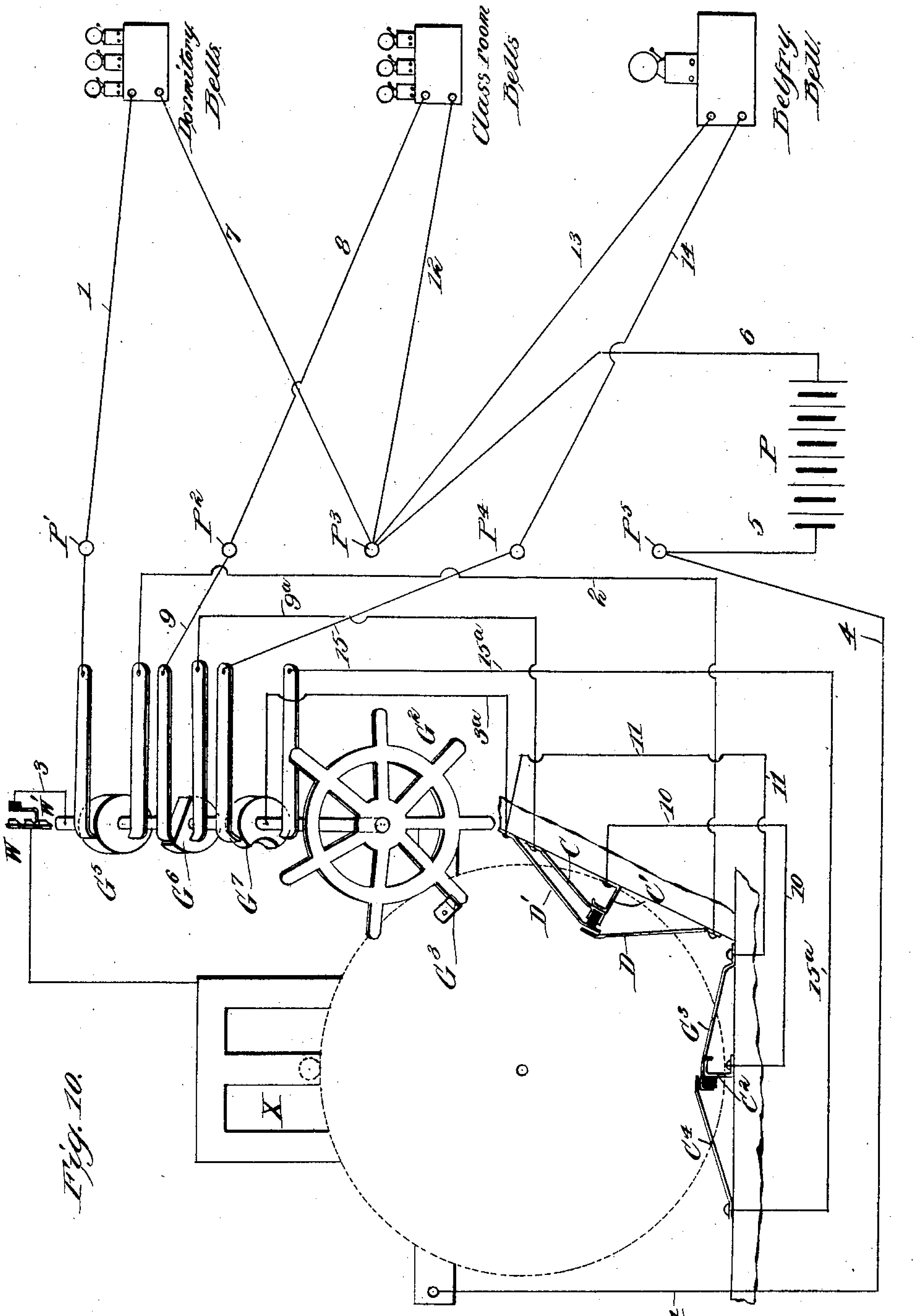
NO MODEL. 6 SHEETS—SHEET 6.



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No. 744,608. Patented November 17, 1903.

UNITED STATES PATENT OFFICE.

JOHN W. PORTIS, OF BUIES CREEK, NORTH CAROLINA.

ELECTRIC PROGRAM-CLOCK.

SPECIFICATION forming part of Letters Patent No. 744,608, dated November 17, 1903.

Application filed March 25, 1903. Serial No. 149,549. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. PORTIS, of Buies Creek, in the county of Harnett and State of North Carolina, have invented a new and useful Improvement in Electric Program Signal-Clocks, of which the following is a specification.

My invention is in the nature of a program signaling-clock designed to ring vibrating electrical bells at various points and at various intervals for schools, colleges, factories, and such other places or institutions where a daily program is necessary. For schools and colleges my device has three or more automatic circuit-switches, to one of which is connected by suitable wires a large electric bell in the belfry of the school-building to ring calls for the students to go in at various times. No other bells ring when this does. From another switch runs a line to which bells are attached in the various recitation-rooms. These bells ring at opening and closing of recitation periods, as desired, and no other bell or bells ring when these do. From another switch runs a line to the dormitory for sounding signals for study-hours, for study-hours to close, for students to go to bed, for students to get up in the morning, and as many other signals as desired. No other bells ring when these do. These different lines are all operated from one battery, and this battery-circuit is never closed except while ringing signals on one of the lines.

The clock is provided with a program-wheel with various movable parts for giving the various signals at various times, which program-wheel is actuated by the clock and in turn automatically adjusts the several switches to direct the ringing-circuits through the three different and isolated signal-points.

In addition to the ringing of the bell-signals this clock shows the time from an ordinary time-dial, and the days of the week through an opening in time-dial. The mechanism is so arranged that none of the signals will ring on Saturdays or Sundays or any other one or two days or more in the week, as desired. An arrangement is also made so that any one or more of the lines can be operated every day in the week or any one line on any days, as desired, and any program desired.

My invention consists in the novel construction and arrangement of the various parts of the clock, operating in the manner above described, as will be hereinafter more fully described, with reference to the drawings, in which—

Figure 1 is a rear elevation of my program-clock with the outer casing removed. Fig. 2 is a similar view of the principal parts of the mechanism shown in connection with a diagram of the circuits. Fig. 2[a] is a detail in edge view of the primary circuit-closer. Fig. 3 is a front elevation of the clock-dials. Figs. 4 and 5 are enlarged details in perspective of the two secondary circuit-closers. Fig. 6 is an enlarged detail of a portion of the program-wheel, showing the tripping mechanism. Fig. 7 is a front view, Fig. 8 a rear view, and Fig. 9 a top plan view, each partly in section and all showing the time-interval mechanism and the mechanism for operating the week-day dial. Fig. 10 is a diagrammatic view showing how certain bell-circuits are thrown out on certain days of the week.

In carrying out my invention I employ an ordinary eight-day clock having two mainsprings, one for running and the other as ordinarily used for striking. The running mainspring operates mechanically the parts of the clock and my circuit-closing switches, and the other mainspring, which in ordinary clocks controls and operates a striking mechanism, has no such function in my clock, but is made to segregate or break up time into short intervals and close a switch and a main circuit in these intervals, and during which intervals also other special switches may close individual circuits, the main circuit being normally open at all other times—that is to say, I have two systems of circuit-closing devices, both of which are necessary to fully closing any circuit, one system being the circuit-closing switches operated by a program-wheel, and which I term the "secondary" circuit-closers, and the other system being what I term the "primary" circuit-closing device, common to all the circuits and which is operated at regular intervals by the striking part of the clock, but only for a brief period during which any secondary circuit-closing switch is to be closed. This gives me the very desirable result of requiring but one battery to actuate all the bells, and yet allows this battery to be open normally, so that it does not rapidly run down, being closed only for a very brief interval in which both the primary circuit-closer and a secondary circuit-closer are coincidently closed, it being understood that by the use of the ordinary interval striking mechanism of a clock I am enabled to close the primary circuit-closer for intervals of a few seconds only, while with a rubbing contact of a mechanically-operated switch actuated by the hour-hand of a clock the closure of contacts thereby is prolonged through a relatively longer period, which would allow the batteries to rapidly run down.

It will be understood that the mechanism for operating the primary circuit-closer is the ordinary striking part of a clock as made to strike the hours and half-hours during the day and night of twenty-four hours, which is wound up once every eight days, and which of itself I do not claim, but only its modified structure and its combination with the primary circuit-closing devices, which it is thus made to control.

In the drawing Fig. 1, X is an eight-day-clock movement of the kind described, having the two mainsprings M and M′, of which M runs the clock mechanism and M′ controls the primary or interval switch. The minute-hand of this clock has its shaft extended through the back of the frame, and on the end of it is rigidly attached a small gear-wheel *x*, containing eight teeth, and into this is arranged to mesh another large gear-wheel A, which has one hundred and ninety-two teeth, or twenty-four times as many as the one with eight teeth, which large wheel I call the "program-wheel." This program-wheel will therefore make one revolution in twenty-four hours. This program-wheel A controls the secondary circuit-closing switches, and it shows the hours half in Arabic and half in Roman characters, "7 8 9 10 11 12 1 2 3 4 5 6" representing the hours in the day-time and "VII VIII IX X XI XII I II III IIII V VI" representing the hours of the night-time.

The program-wheel A has a deep circumferential groove around the same, Figs. 4 and 6, which receives and guides the toe *t* of an elbow-lever B. Said program-wheel is also perforated near its periphery with a series of small holes *h*, there being twelve such holes between every hour-mark, which makes the said holes five minutes apart. There are therefore two hundred and eighty-eight of such holes, representing as many five-minute intervals as there are in twenty-four hours. These holes or perforations go through both flanges of the wheel on opposite sides of the groove in which the toe *t* of lever B trails. In the said holes *h*, or as many of them as may be desired, there are placed removable pins *p*, which as the program-wheel rotates act one at a time upon the toe *t* of lever B and lift it till the pin passes by, as seen in Fig. 6, at which time the toe of said lever drops down behind the pin, being made to move quickly and positively in this drop by a helical spring *s*, Fig. 1, attached to the upright portion of the elbow-lever.

The program-wheel A has hung upon its center and adjustable about the same around its circumference two sets of radial arms E E′ E^2 E^3 and F F′, which bear at their outer ends cams or shoes *e* and *f*. One set of cams *e* extends farther from the center than the other set *f*, so as to have a different reach in acting upon the switches hereinafter described. These radial arms and cams are adjustable around the center of the program-wheel to any desired position, being fixed in such position by screws $e^2 f^2$, which pass through slotted portions of the arms and enter one or the other of the two circular series of holes $e' f'$, formed in the program-wheel. These holes are spaced at any desired distance apart, being, as shown, for hours and half-hours. These two sets of cams *e* and *f* when the program-wheel revolves with the minute-hand regulate the two secondary switches C C′, D D′, and C^2 C^3 C^4, through which the circuits are made to the several isolated sets of bells, while the trip-lever B, as operated upon by the pins *p* of the program-wheel, starts and stops the interval-making mechanism and opens and closes the primary switch.

Before proceeding to further describe the clock mechanism I will now describe the circuits and their connections with the isolated sets of bells and the switches of the clock, referring more especially to the diagram view, Fig. 2. On the right-hand side of the figure are shown the different bells seggregated into the three classes, the dormitory-bells being shown at the top, the class-room bells in the middle, and the belfry-bell below. The dormitory-bells, it will be understood, may be widely separated in the several dormitories, but are in one circuit to themselves. The class-room bells are placed one in each class-room in another circuit to themselves, and the belfry-bell is in still another circuit and is placed in a tower and is a very large vibrating-bell, capable of being heard throughout the college grounds.

P is the battery which actuates the whole system, and P′ P^2 P^3 P^4 P^5 correspond to binding-posts on my instrument, as in Fig. 1, for connecting the wires for the bells, the battery, and the related parts of the clock mechanism.

The battery P is connected at one pole by a wire 6 with the binding-post P^3, and this binding-post is by three branched wires 7 12 13 connected to one side of each of the three bell-circuits. The other side of the dormitory-circuit is connected by wire 1, binding-post P′, and wire 2 with a spring D. The other side of the class-room circuit is connected by wire 8, binding-post P^2, and wire 9 with a spring C, which normally rests on and is in contact with metal support C′, connected by wire 10 with metal support C^2. The other side of the belfry-circuit is connected by wire 14, binding-post P^4, and wire 15 with spring C^4. Beneath spring C^4 and above metal support C^2 is a spring C^3, having an insulated or non-conducting arm a (see Fig. 4) extending laterally into range of engagement by the cams e of the program-wheel. Spring C^3 normally rests on C^2 and is normally out of contact with C^4, but when any cam e on the program-wheel passes under and lifts arm a spring C^3 is lifted from contact with C^2 and closes contact with C^4, as seen in Fig. 4, after the manner of a three-point switch. The spring C^3 is connected by wire 11 with wire 3 and leads to the primary switch, hereinafter described, and this wire 3 is also connected to a spring D', which rests normally above spring C, but out of electrical contact with both spring C and spring D. The spring C has a laterally-projecting non-conducting arm b, (see Fig. 5,) which extends into range of engagement by the inner set of cams f of the program-wheel. When spring C is thus lifted by the passage of one of said cams, spring C is removed from support C' and spring D' is pressed against spring D. The contacts D and D' are the terminals of the dormitory-circuit. Contacts C^3 C^4 are the terminals of the belfry-circuit, and contacts C C' and C^2 C^3 are terminals of the class-room circuit.

The battery P, it will be remembered, is connected on one side by wire 6 and binding-post P^3 to one side of each of the three bell-circuits. The other side of the battery is connected by wire 5 and binding-post P^5 to wire 4 and the metallic frame of the clock mechanism X. From the metallic frame the main circuit passes to the wire 3 through an interval circuit-closing switch, hereinbefore termed the "primary" circuit-closer. The mechanical construction of this circuit-closer is mechanically illustrated in Figs. 2 and 2^a by the wheel W and the insulated arm W', the wheel being in electrical contact with the metal frame of the clock and the metal arm W' being connected to wire 3. The wheel W has laterally-projecting cam-flanges w and can be made to turn the space of one cam-flange every five minutes, and when a cam-flange touches arm W' the main circuit is closed through this primary circuit-closer, and when a cam-flange leaves the arm W' the main circuit is broken. The intermittent motion of wheel W is caused by the power of the main-spring M', Figs. 1, 7, and 8, and its starting into action is effected by the tripping of lever B by the pins of the program-wheel. While the wheel W may move the space of a cam-flange every five minutes, it must be understood that contact between arm W' and the cam-flange is not maintained for five minutes, but only for a few seconds. This is effected by making the wheel W move quickly while a cam-flange is touching arm W' and causing the wheel to come to a standstill when the circuit is broken and arm W' is between two cam-flanges. The means by which this is effected will be described farther along. For the tracing of the various circuits it will be sufficient to remember that the primary circuit can be made and broken for a brief period every five minutes between wheel W and arm W' or at such intervals as the pins p follow each other in the program-wheel.

For ringing class-room signals (see Fig. 2) the secondary switches are in the normal position of rest with C resting upon C' and C^3 on C^2, D D' being open and C^3 C^4 being open. Now whenever a pin p lifts lever B wheel W turns (through mechanism hereinafter described) one space and closes contact temporarily with arm W', and the circuit is made and class-room bells are rung over the following circuit: From battery P to wire 6, binding-post P^3, wire 12, class-room bells, wire 8, binding-bost P^2, wire 9, spring C, rest C', wire 10, rest C^2, spring C^3, wire 11, wire 3, arm W', wheel W, frame of clock X, wire 4, binding-post P^5, and wire 5 to the other pole of the battery. The class-room bells will therefore be rung every time lever B is tilted, and while it may be tilted every five minutes, it is, in fact, only tilted at such hours or fractions of an hour as may be desired, the pins p being put in the holes h of the program-wheel at any desired points within five minutes' variation, but not every five minutes, as class recitations are longer than five minutes' duration.

For ringing the dormitory-bells the class-room circuit is broken by cams f acting on arm b (see Fig. 5) and lifting spring C away from rest C' and bringing D' against D, which latter constitute terminals of the dormitory-circuit, which circuit is made over the following path: From battery P to wire 6, binding-post P^3, wire 7, dormitory-bells, wire 1, binding-post P', wire 2, spring D, spring D', wire 3, arm W', wheel W, frame of clock X, wire 4, binding-post P^5, wire 5 to the other pole of the battery.

For ringing the belfry-bell the class-room circuit is broken by cams e acting upon arm a (see Fig. 4) and lifting spring C^3 from rest C^2 and bringing C^3 into contact with C^4, which latter constitute the terminals of the belfry-circuit, which circuit is made over the following path: From battery P through wire 6 to binding-post P^3, wire 13, belfry-bells, wire 14, binding-post P^4, wire 15, spring C^4, spring C^3, wire 11, wire 3, arm W', wheel W, frame of clock X, wire 4, binding-post P^5, and wire 5 to the other pole of the battery.

It will be obvious that as many of the adjustable arms E and F, with corresponding cams e and f, may be used as may be desired. For the dormitory I prefer to use one arm F' and with a short cam f to ring once in the morning and a nearly-opposite arm F' with a long cam f long enough to hold the secondary switch of the dormitory-circuit closed—say for three hours—to signal study-hours at seven p. m.—the close of study-hours—say at nine p. m.—and for bed-time—say at ten p. m. There may, however, be separate cams for these hours; but as the battery-circuit is only closed when a pin trips the mechanism of the primary-circuit closer this evening-dormitory-circuit closer may as well be held closed by a single long cam *f*.

I will now proceed to describe how the primary or main circuit-switch is automatically operated by the lever B at any time within five minutes' variations by the tilting action of pins *p*, acting on lever B, as the program-wheel A revolves. The upper end of lever B is connected by a light link or wire *b'* with an arm B', Figs. 7 and 8, of a rock-shaft b^2, which has two radial arms b^3 b^4 attached to it. (See Fig. 9.) One of these radial arms, b^3, passes into range of engagement to be struck by a pin b^5 on a gear-wheel B^2, which latter is a part of the fly-fan train actuated by the mainspring M', which is ordinarily a part of the striking mechanism of a clock. The other arm, b^4, lifts the long stop-arm b^6, fixed to a rock-shaft b^7, which stop-arm has a right-angular flattened end that descends into the radial slots b^8 of the wheel W and which has on it the cam-flanges *w*, adapted to rub against the insulated arm W'. (See Figs. 2^a and 7.) On the rock-shaft b^7 is another arm b^{10}, whose bent end rests upon a diametrically-notched disk B^3, which is also a part of the fly-fan clock-train, and when the bent end of arm b^{10} drops into one of the diametrical notches of the disk B^3 then the long stop-arm b^6 can drop into one of the radial slots b^8 of the wheel W to stop that wheel, and when the long stop-arm b^6 is lifted up by the disk B^3, raising the arm b^{10}, then the train of gearing is released and the fly-fan operates and the wheel W turns one space until it is stopped by the long stop-arm dropping into one of its radial slots. When the arm b^3 is lifted into the path of pin b^5 on the gear-wheel B^2 and the latter starts, said pin catches against this arm, and when a pin of this program-wheel allows lever B to drop this arm b^3 is taken out of the way of pin b^5 on wheel B^2 and the latter turns, and so does the wheel W, and consequently one of its cam-flanges makes a brief period of contact against the arm W', and thus closes the primary circuit for a short interval. When wheel B^2 is at rest, its pin b^5 rests against an arm b^{13} on rock-shaft *b*, as seen in Fig. 8.

On Saturdays and Sundays the apparatus for school use is usually not required to sound any signals, and I will now describe how this is accomplished, reference being had to Figs. 3 and 9. G is a dial behind the main dial of the clock and having seven radial subdivisions marked with the days of the week, which successively show through a window *g* in the main clock-dial. This week-dial is fixed to a shaft G', and at the rear end of this shaft there are seven radial arms G^2, corresponding to the seven days of the week-dial. These radial arms are successively acted upon once every time the program-wheel A rotates by means of an arm G^3, Fig. 1, on said program-wheel coming in contact with one of said seven arms G^2 and moving the dial one-seventh of a revolution to change the day, showing in front once every twenty-four hours. On the shaft of this week-dial there is a rigid disk G^4, cut away at g^4, (see Fig. 8,) through two-sevenths of its periphery to provide for the two days out of seven to be skipped, and on this disk rests an arm g^3 of an elbow-lever, whose other arm g^2 is allowed to drop into the path of the pin b^{15} on wheel B^2 whenever the arm g^3 falls into the cut-away space g^4 of the disk. This elbow-lever is tilted by a spring g^6, and when its arm g^2 falls into the path of pin b^{15} of the wheel B^2 the latter cannot turn, and consequently the fly-fan mechanism is stopped, and there can be no movement of the primary-circuit-closing wheel W during the two days that arm g^3 is in the notch g^4 of disk G^4. When the disk G^4 rides against and tilts the arm g^3 on Monday morning, the entire apparatus is operative again.

In some cases it may be desirable to have a certain set or sets of the bells rung on Saturdays and Sundays—as, for instance, the dormitory-bells. In such case I provide on the shaft of the week-dial three commutating disks G^5, G^6, and G^7, with brush-springs and circuit connections, as shown in Fig. 10, in which the dormitory-bells are arranged in circuit always. The belfry-bell is cut out on Sunday and the class-room bells are cut out on both Saturday and Sunday, the disk G^5 for the dormitory being unbroken, the belfry-disk G^7 being cut out one-seventh and the class-room disk being cut out two-sevenths.

When the arrangement just described is in action, the elbow-lever g^3, which acts on a pin in the wheel that gears into fly-wheel, as in Fig. 1, will have to be removed.

In making use of my invention I would have it understood that many changes may be made in the special construction and arrangement of parts without departing from my invention, as set forth in the claims hereto appended.

I am aware the program-clocks are not new, and I do not claim the same broadly. I am also aware that program-clocks have been arranged to be operated by electromagnets.

It will be perceived that my device while having the broad scope of utility described is not operated in any of its parts by electromagnets, being entirely mechanical in all of its parts and requiring only a single battery for ringing all of the various bell-circuits, the life of which battery is also specially conserved and prolonged by the special devices described for maintaining a normally open circuit.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. An electric program signaling device, comprising a battery, a multiplicity of separate bell-circuits with bells, a clock-gearing having two mainsprings, a program-wheel

actuated by one of said mainsprings, a primary-circuit-closing device, mechanism for moving this primary-circuit closer at regular intervals, said mechanism being connected to and operated by the second mainspring and started into action by the program-wheel and secondary switches for diverting the battery-current individually through any one of the separate bell-circuits simultaneously with the closing of the circuit by the primary-circuit closer, said secondary switches being arranged adjacent to and operated by the program-wheel substantially as described.

2. An electric program signaling device, comprising a battery, a multiplicity of separate bell-circuits with bells, a clock-gearing having two mainsprings, a program-wheel actuated by one of said mainsprings, a primary-circuit-closing device, mechanism for moving this primary-circuit closer at regular intervals, said mechanism being connected to and operated by the second mainspring and started into action by the program-wheel, secondary switches for diverting the battery-current individually through any one of the separate bell-circuits simultaneously with the closing of the circuit by the primary-circuit closer, said secondary switches being arranged adjacent to and operated by the program-wheel, a week-day dial having a shaft with radial projections extending into range of engagement by the program-wheel to be moved thereby once every day substantially as described.

3. An electric program signaling device, comprising a battery, a multiplicity of separate bell-circuits with bells, a clock-gearing having two mainsprings, a program-wheel actuated by one of said mainsprings, a primary-circuit-closing device, mechanism for moving this primary-circuit closer at regular intervals, said mechanism being connected to and operated by the second mainspring and started into action by the program-wheel, secondary switches for diverting the battery-current individually through any one of the bell-circuits simultaneously with the closing of the circuit by the primary-circuit closer, said secondary switches being arranged adjacent to and operated by the program-wheel, a week-day dial having a shaft with radial projections extending into range of engagement by the program-wheel to be moved thereby once every day, and a disk with cut-away periphery and a tripping-arm dropping into the same and engaging in the drop with the motor mechanism of the primary-circuit closer to prevent its operation during a portion of the week substantially as described.

4. An electric program signaling device, comprising a battery, a multiplicity of separate bell-circuits with bells, a clock-gearing having two mainsprings, a program-wheel actuated by one of said mainsprings, a primary-circuit-closing device, mechanism for moving this primary-circuit closer at regular intervals, said mechanism being connected to and operated by the second mainspring and started into action by the program-wheel, secondary switches for diverting the battery-current individually through any one of the bell-circuits simultaneously with the closing of the circuit by the primary-circuit closer, said secondary switches being arranged adjacent to and operated by the program-wheel, a week-day dial having a shaft with radial projections extending into range of engagement by the program-wheel to be moved thereby once every day, and a series of commutators corresponding in number to the bell-circuits and arranged as described to cut in or leave out through any portion of the week any one of said bell-circuits as described.

5. In a program signaling device, the combination with the minute-hand shaft of a clock; of a gear-wheel fixed to the same, a program-wheel meshing with the said gear-wheel and arranged to rotate once in twenty-four hours and having the twenty-four hours spaced thereon, said program-wheel having also a circular series of holes around its periphery with movable pins located in the same, a tripping-lever having one end arranged to be engaged by said pins, and a time-interval device connected to and started into action by the said tripping-lever substantially as described.

6. In a program signaling device, the program-wheel having teeth on its periphery, a peripheral groove and circular series of lateral holes with movable pins in the same, a tripping-lever arranged to trail in said groove and be acted upon by the pins as the wheel revolves, radial arms connected axially to the wheel and adjustable thereabout and having cams at their outer ends, a clock mechanism for rotating the program-wheel and switches and electric circuits substantially as described.

JOHN W. PORTIS.

Witnesses:
E. F. YOUNG,
V. L. STEPHENS.