

No. 749,308.

PATENTED JAN. 12, 1904.

F. A. LUNDQUIST & J. K. NORSTROM.

TELEPHONE EXCHANGE.

APPLICATION FILED NOV. 19, 1900.

NO MODEL.

4 SHEETS—SHEET 1.

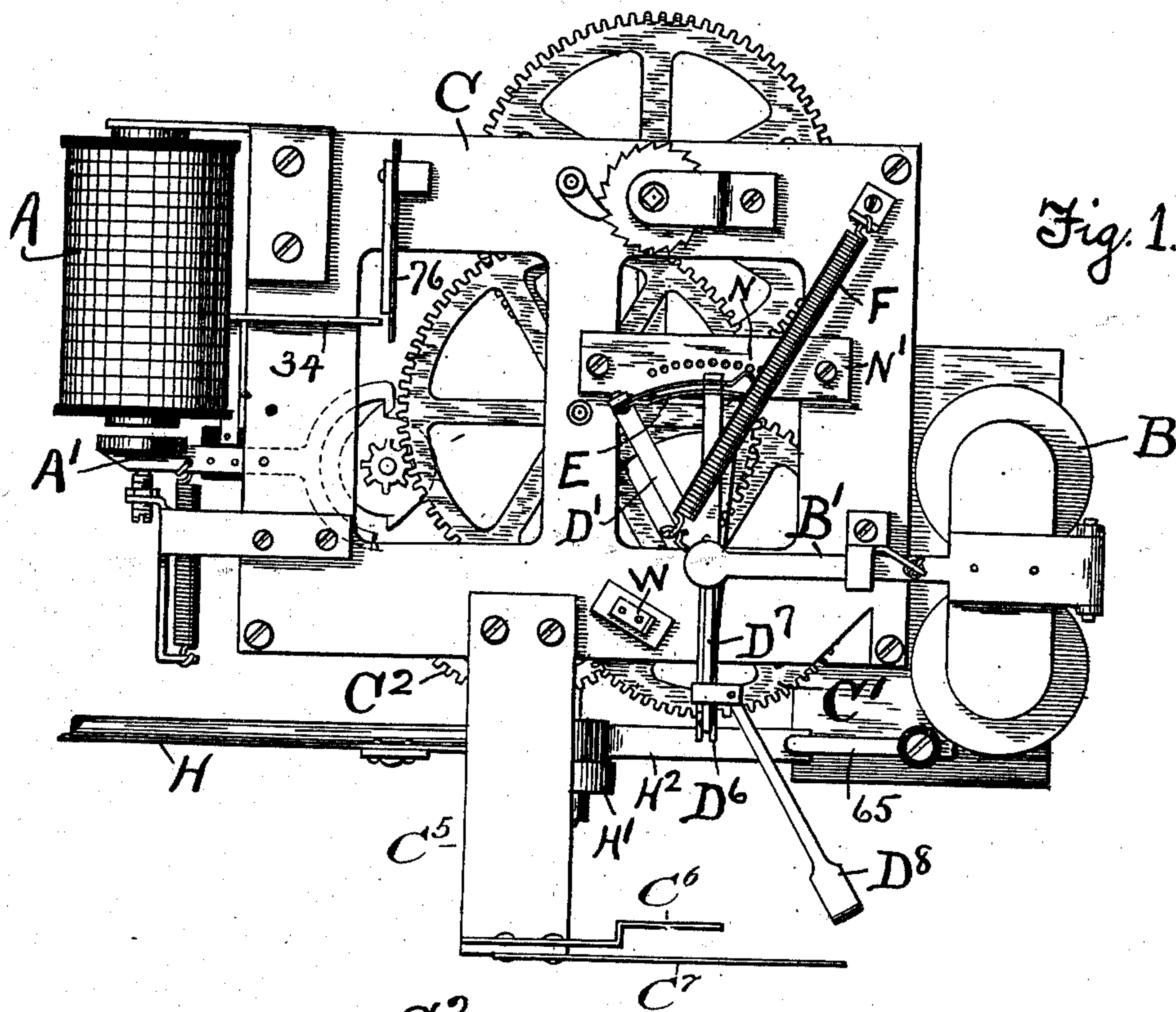


Fig. 1.

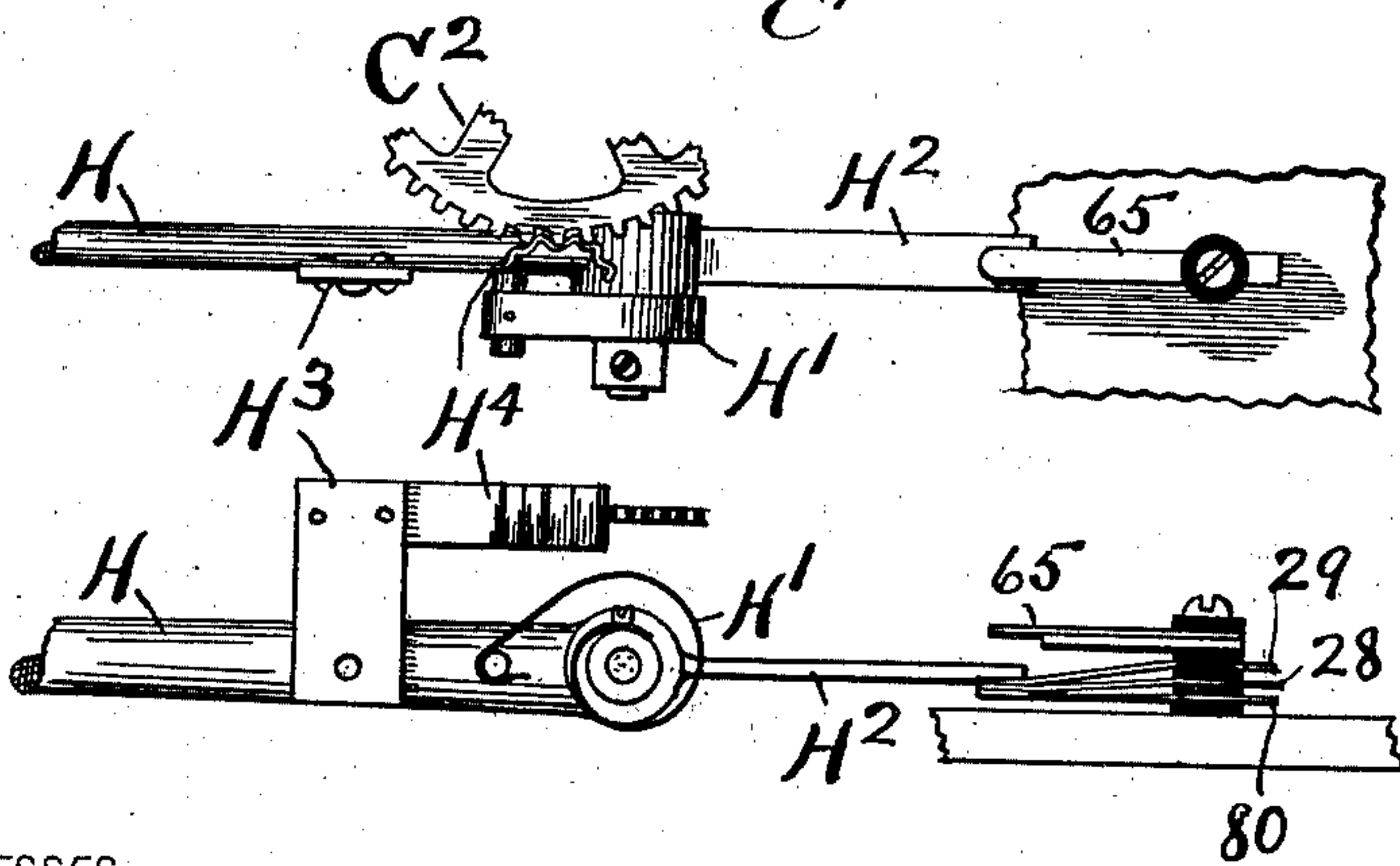


Fig. 2.

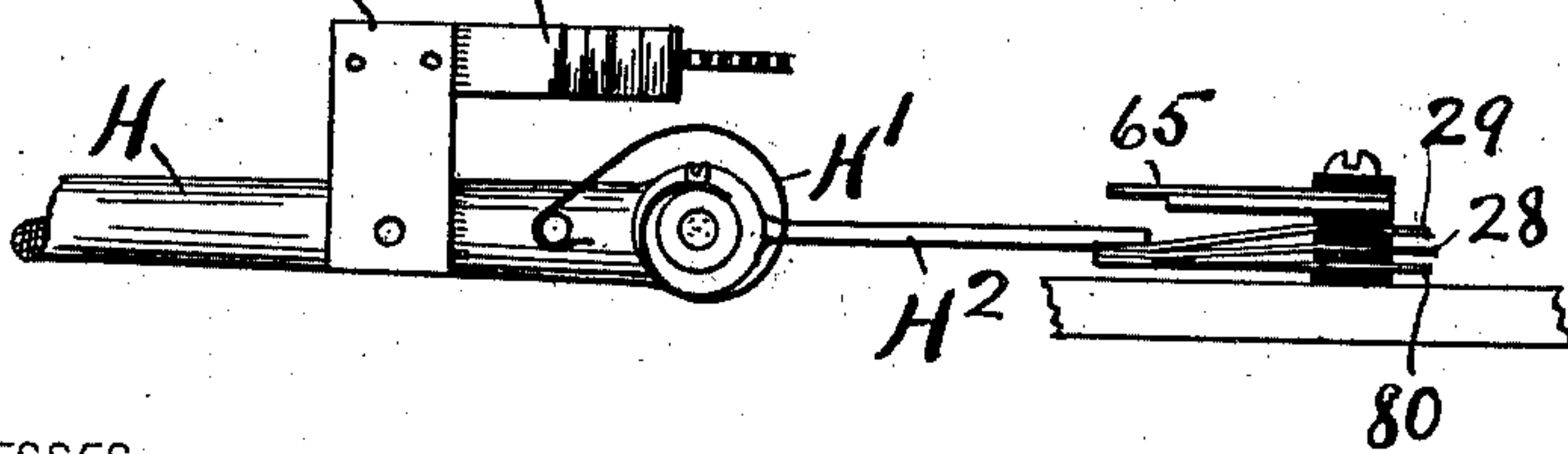


Fig. 3.

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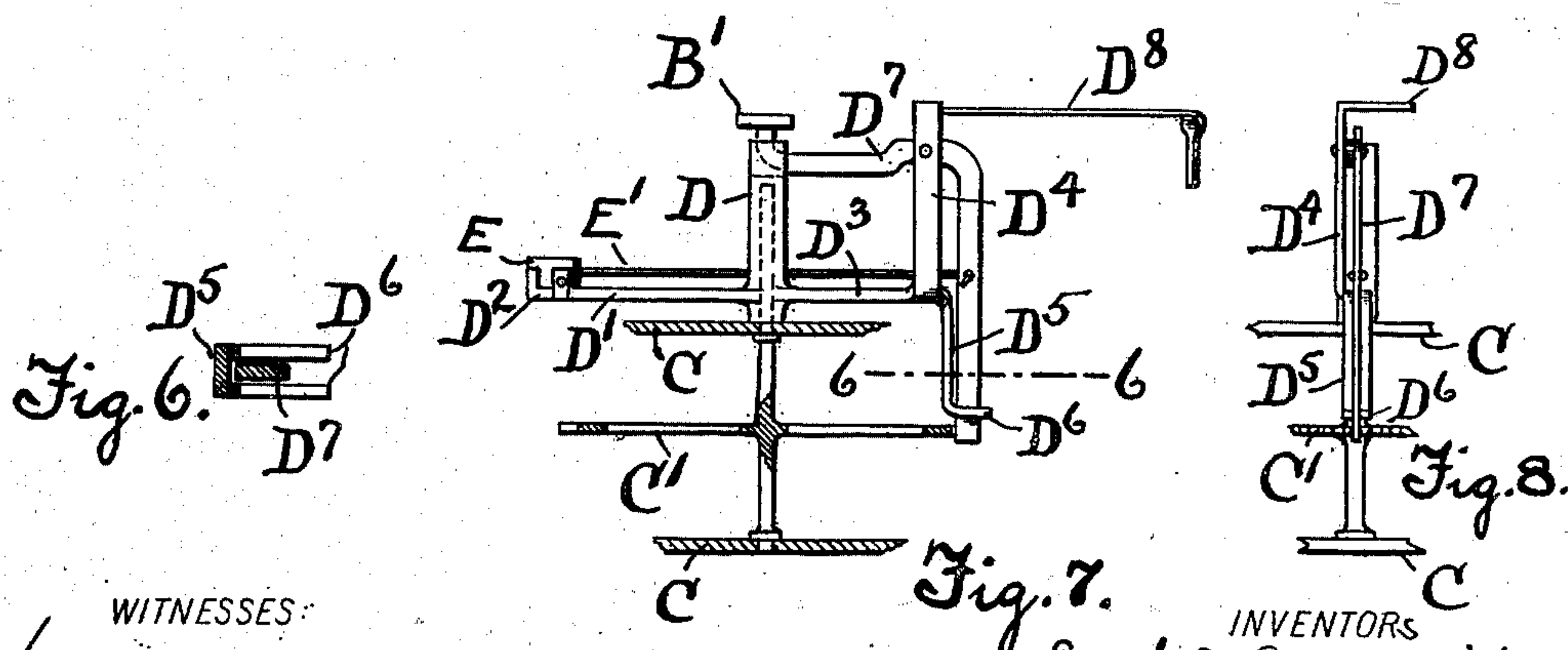
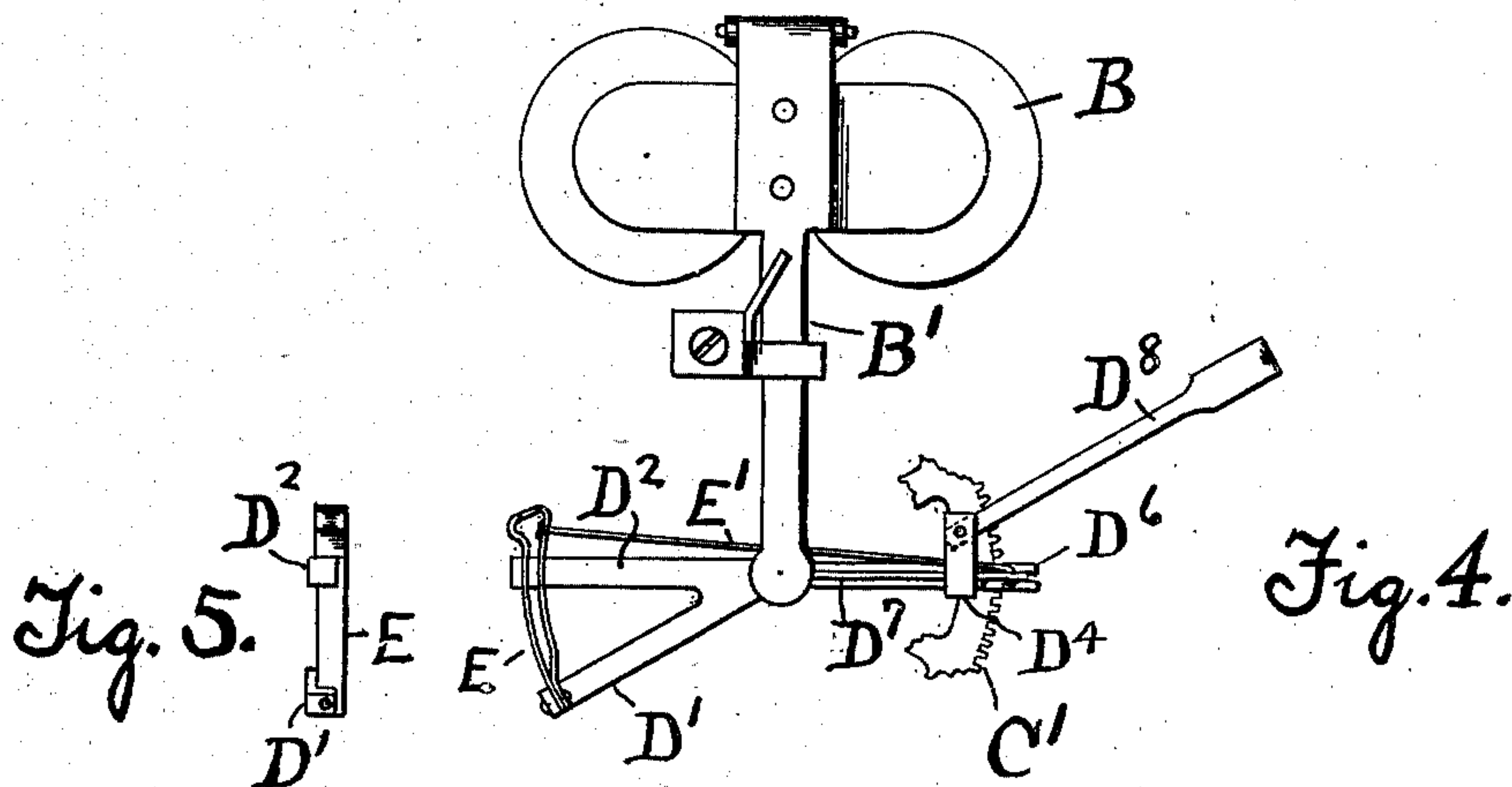
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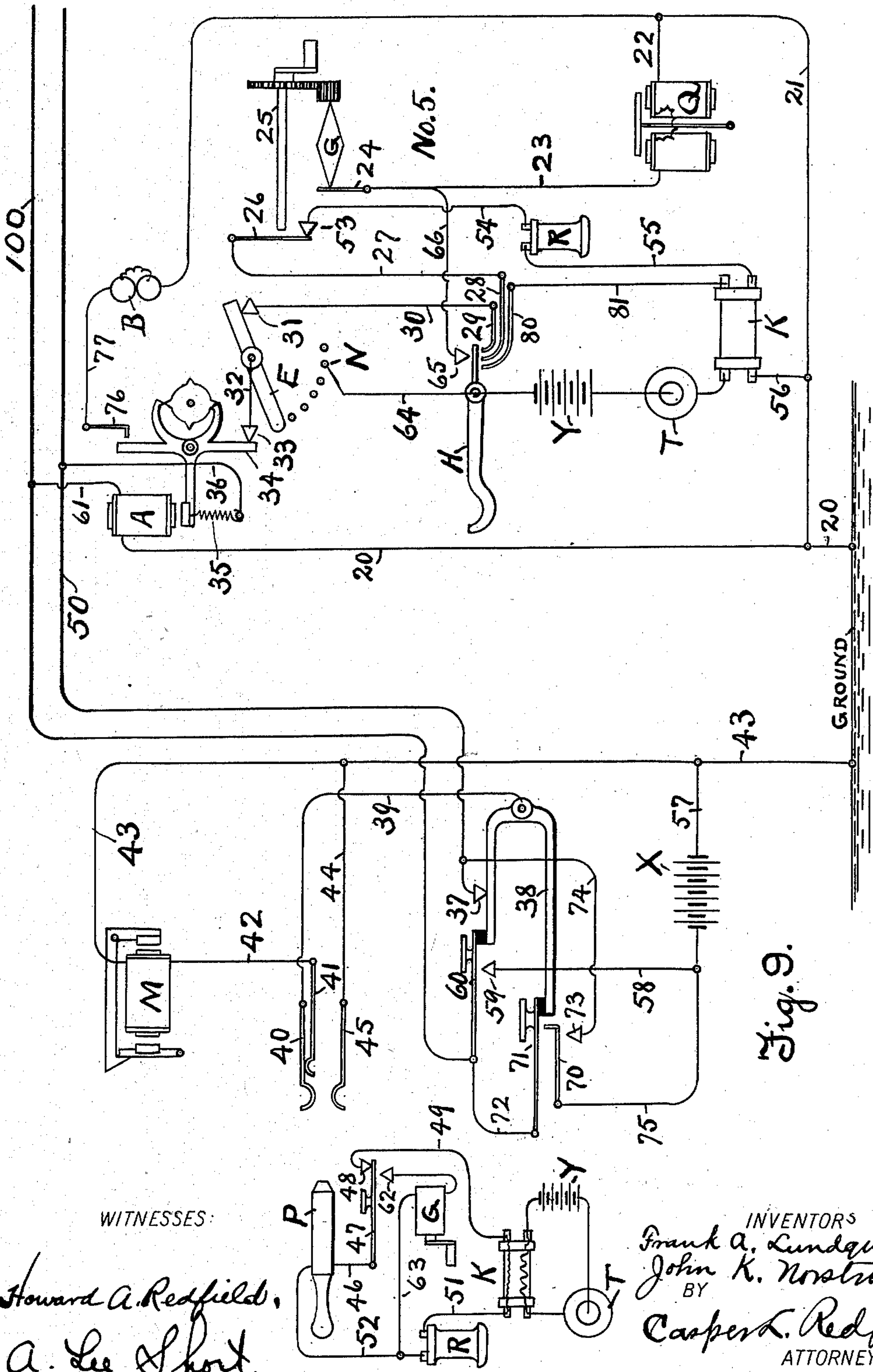
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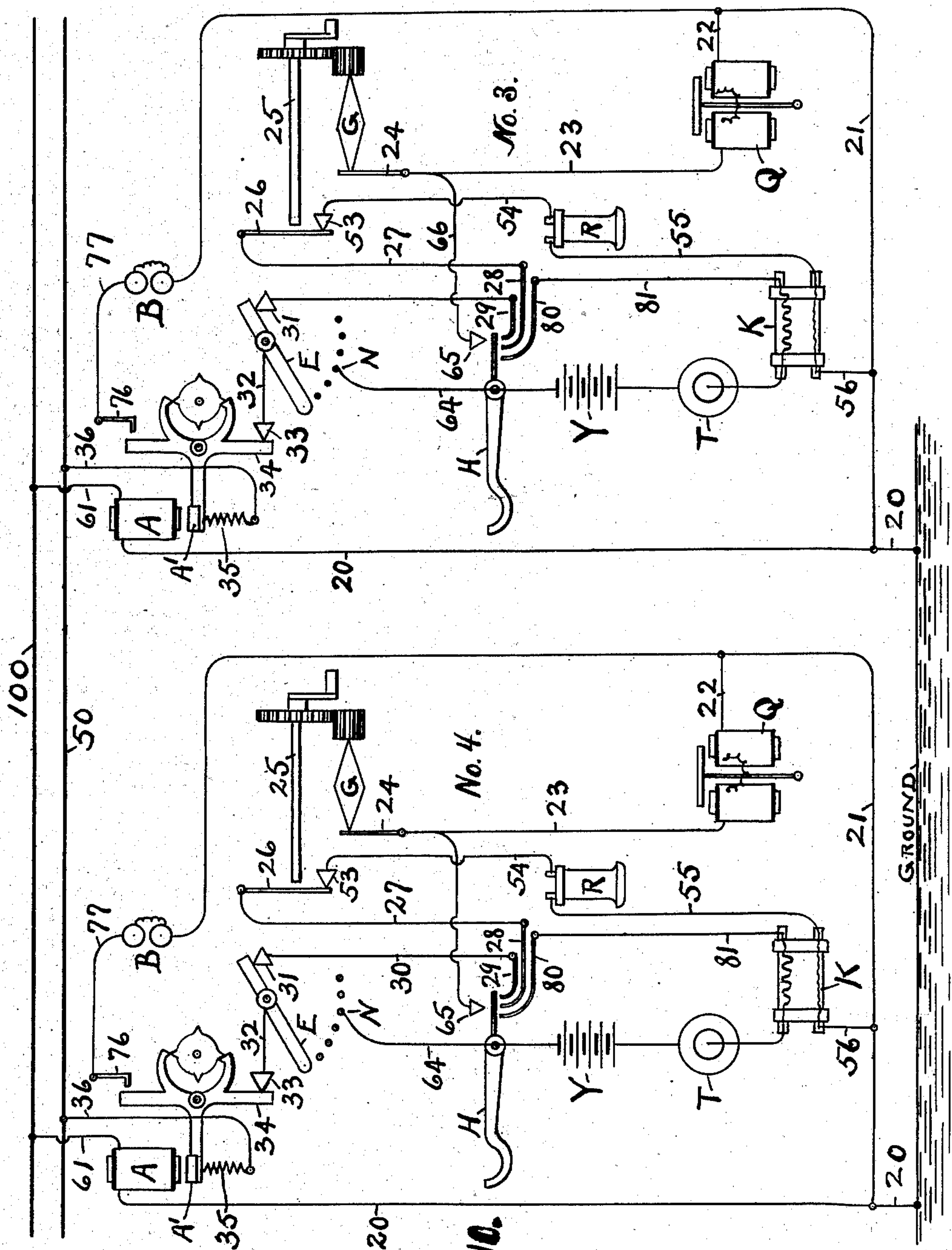
4 SHEETS—SHEET 3.



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Fig. 10.

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# UNITED STATES PATENT OFFICE.

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## TELEPHONE-EXCHANGE.

SPECIFICATION forming part of Letters Patent No. 749,308, dated January 12, 1904.

Application filed November 19, 1900. Serial No. 36,930. (No model.)

*To all whom it may concern:*

Be it known that we, FRANK A. LUNDQUIST and JOHN K. NORSTROM, citizens of the United States of America, and residents of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Telephone-Exchanges, of which the following is a specification.

Our invention relates to telephone-exchanges, and more particularly to toll-line exchanges in which the connections from a central office are party-lines. In the patent issued to Frank A. Lundquist May 9, 1899, No. 624,666, there is illustrated a telephone-exchange of a similar character, the present application being improvements on the one therein shown.

In the accompanying drawings, Figure 1 is a plan of the switching mechanism located inside of a telephone-box at one of the local stations. Fig. 2 is a detached view in plan of a portion of the mechanism shown in Fig. 1. Fig. 3 is an elevation of the part shown in Fig. 2. Fig. 4 is a detached plan of the wiper or contact-maker and the parts immediately connected thereto. Fig. 5 is an elevation of the contact-maker shown in Fig. 4. Fig. 6 is an enlarged section on line 6-6 of Fig. 7. Fig. 7 is an elevation of some of the parts in Fig. 4 with a portion of the switch-frame and a gear shown in section. Fig. 8 is an elevation of Fig. 7. Figs. 9 and 10 constitute a diagram showing a central office and the mechanism at three local stations which are connected to the central station by the party-line wires 50 and 100.

In the said drawings, C is a framework supporting a clock mechanism of an ordinary character, the escape mechanism of which is operated by the magnet A through its armature A'. The clock mechanism is wound up in the ordinary manner and is normally in a stationary position until permitted to escape by the operation of the magnet A in same general manner as is shown in the patent hereinbefore mentioned. Briefly, the armature A', as shown in Fig. 1, has on its inner end a pallet that co-operates with the escape-wheel of the clock

mechanism. Each time the magnet A attracts its armature it allows one tooth of the escape-wheel to escape and permits the clock mechanism to move a corresponding distance. This arrangement is shown diagrammatically in Fig. 9. Supported on the axis of the gear C' of the clock mechanism is a post D, having the lower portion of it branching out into three arms D', D<sup>2</sup>, and D<sup>3</sup>. On the arm D<sup>3</sup> there projects upward an arm D<sup>4</sup> and also downward an arm D<sup>5</sup>, which ends in the prongs D<sup>6</sup>, adjacent to the teeth of the gear C'. Supported on the post of arm D<sup>4</sup> is a bell-crank lever D<sup>7</sup>, one end of which projects downward between the prongs D<sup>6</sup>, so that it may engage the teeth of the gear C', while the other arm projects laterally to the center and into a slot in the upper end of the post D. Secured to the arm D<sup>7</sup> is a contact-maker E, which projects laterally and has its other end resting upon the arm D<sup>2</sup>. The contact-maker E is a spring and normally presses outward from the center until it is stopped by a lip on the outer end of the arm D<sup>2</sup>. From the free end of the contact-maker E a rod E' projects to and is connected with the vertical arm of the bell-crank lever D<sup>7</sup>. These parts are so arranged with respect to each other that the spring of the contact-maker E normally draws the vertical arm of the lever D<sup>7</sup> into engagement with the teeth of the gear C'.

At one side of the framework C is supported a magnet B, the armature-lever B' of which projects over the top of the post D and engages the upturned end of the bell-crank lever D<sup>7</sup>. The magnet B and its armature B' are so located that when the magnet B is energized the armature-lever B' will press the horizontal arm of the bell-crank lever D<sup>7</sup> downward, thus moving the vertical arm outward and away from engagement with the teeth of the gear C'.

Supported on the framework C is a piece of insulation N', on which are a series of contact-points or posts N. The posts N are so located with respect to the axis of the gear C' that the contact-maker E normally touches one of them.

At a convenient place on the frame C is a



stop W, which furnishes a stop holding the post D and all the mechanisms carried thereby, and consequently the contact-maker E, at a normal position when the bell-crank D' is released from the gear C' and the said parts are returned or drawn to the normal position determined by the said stop W.

Secured to the frame C is a plate C<sup>5</sup>, provided with laterally-projecting arms C<sup>6</sup> and C<sup>7</sup>. Secured to the arm D<sup>4</sup> and moving therewith is an arm D<sup>8</sup>, which in the normal position of the mechanism lies between the arms C<sup>6</sup> and C<sup>7</sup> and furnishes visual means for determining when the mechanism is not in use.

Pivoted at a convenient place on the frame C is a receiver-hook H, which is raised to an elevated position by the spring H' when the receiver is removed from the hook. On the rear end of the hook H is a projection H<sup>2</sup>, adapted to make electrical connections with the contact-pieces 65, 29, 28, and 80. Secured to the side of the hook H is an arm H<sup>3</sup> on which is secured a metal strip H<sup>4</sup>, having its free end curved and corrugated, as shown in Figs. 2 and 3. The metal strip H<sup>4</sup> is so located that when the receiver-hook is in its elevated position the corrugations engage one of the gears C<sup>2</sup> of the clock mechanism, thus locking it, and consequently the whole mechanism, from movement when the magnet A is energized. When the hook H is depressed, the corrugated strip H<sup>4</sup> is removed from the gear C<sup>2</sup>, and consequently the clock mechanism is free to move when the magnet A operates.

At the central office there is located a drop-magnet M, a battery X, the ordinary receiver, transmitter, &c., of an operator, a plug P, adapted to be inserted into a spring-jack 40 45, and certain keys by which she makes electrical connections. The central office and the local stations are connected together in the manner illustrated in the diagrams. In the said diagrams one only of the contact-points engaged by the contact-maker E is marked by the letter N. From the particular marked contact point or pin a connection extends to the receiver-hook of the telephone. The particular contact-point which is connected to the receiver-hook is at a different distance from the normal position of the contact-maker in each telephone-station. For example, for telephone-station No. 5 the connection would be from the fifth contact-point, for telephone No. 4 from the fourth contact-point, and so on.

The operation is as follows: Assuming that a subscriber at one of the telephones on the party-line, as No. 5, wishes to talk with some other subscriber on the same line, as No. 3, he first removes his receiver and then turns the crank of his generator Q, when a current flows as follows: from the ground at the local station, 20, 21, 22, Q, 23, 24, 25, 26, 27, 28, 29, 30, 31, E, 32, 33, 34, 35, 36, 50, 37, 38, 39, 40, 41, 42, M, 43, ground at the central station. The

current through the magnet M operates the drop calling the operator at the central station, who then inserts the plug P in the spring-jack and inquires who is wanted. The talking-circuit is then as follows: ground at central station, 43, 44, 45, P, 46, 47, 48, 49, K, (induction-coil,) 51, R, 52, P, 40, 39, 38, 37, 50, 36, 35, 34, 33, 32, E, 31, 30, 29, 28, 27, 26, 53, 54, R, 55, K, 56, 21, 20, ground at the local station. Subscriber then states who is wanted, when the operator presses the button 60 in her office, when the current flows as follows: from the ground of the central office, 43, 57, X, 58, 59, 60, 100, 61, of each station on the line, magnet A of each telephone, 20, ground at the several local stations. This operates the escapement of each switching mechanism, which causes each one to move its contact-maker E forward one step, except the one which has its receiver off of the hook, which switching mechanism cannot move, because it is locked by engagement between the corrugated strip H<sup>4</sup> and the gear C<sup>2</sup> of the switching mechanism. The operator repeats this movement until the switching mechanisms are all moved to the position corresponding to the subscriber who is called. For example, if subscriber No. 5 is called then all of the switching mechanisms will be operated five times to have their contact-makers E moved to the fifth contact-pin N; but as only the subscriber at telephone No. 5 has any electrical connection to the fifth contact-pin it therefore follows that he alone will be in connection with the lines 50 and 100. The operator at central then calls the subscriber by turning her generator-crank and at the same time pressing the button 47, when a current flows as follows: ground at central office, 43, 44, 45, P, 46, 47, 62, G, 63, 52, P, 40, 39, 38, 37, 50, 36, 35, 34, 33, 32, E, N, 64, 65, (subscriber's hook being down,) 66, 23, Q, 22, 21, ground at the local station. The called subscriber then removes his receiver, when the talking-circuit between the two subscribers is as follows: beginning at the induction-coil of the calling subscriber K, 55, R, 54, 53, 26, 27, 28, 29, 30, 31, E, 32, 33, 34, 35, 36, line 50 to 36 of the called subscriber, 35, 34, 33, 32, E, N, 64, H, 28, 27, 26, 53, 54, R, 55, K, 56, 21, 20, A, 61, 100, back to the calling subscriber, 61, A, 20, 21, 56, K. With the plug inserted the operator at central can listen, so that when talking ceases she presses the button 71, which closes 71 to 70 and immediately thereafter 70 to 73. The current then flows as follows: from the ground at central, 43, 57, X, 75, 70, 71, 72, 100 to 61 of the telephones which had their switching mechanisms moved, A of each such telephone, 20, ground at the local stations. The operation of the magnets A closes 34 to 76, when an additional current flows as follows: from the ground at central, 43, 57, X, 75, 70, 73, 74, 50, 36 of each local station, 35, 34, 76, 77, B, 21, ground at the several local stations. The operation of the magnets B releases



the bell-crank arms D<sup>7</sup> from the gears C', when the springs F return the mechanisms to their normal positions against the stops W.

What we claim is—

5 I. In a switching mechanism operated by a clock mechanism and released by a magnet, a contact-maker and a support therefor, a lever pivoted to said support and adapted to engage  
10 teeth on one of the gears of the clock mechanism, and a guide for said lever carried by said support at a point adjacent to the teeth of the gear engaged by said lever.

2. A clock mechanism, a magnet for releasing the escapement of said mechanism so as to  
15 cause it to move, a supporting-frame loosely mounted on the axis of one of the gears of said mechanism, a lever pivoted to said support and movable radially to and from said gear so as to engage and disengage the teeth thereof,  
20 a spring for causing such engagement, and a second magnet for causing such disengagement.

3. A propelling mechanism provided with a gear, a spring contact-maker supported at  
25 the axis of said gear and movable thereabout, a device for connecting said contact-maker to and releasing it from said gear, a connection by which the spring of said contact-maker causes said device to engage said gear, and a  
30 magnet for releasing such engagement.

4. The combination with a series of switches and mechanisms for moving them simultaneously, of a receiver-hook located adjacent to  
35 each switch and movable to upper and lower positions, and means operated by each receiver-hook for locking the adjacent switch in a fixed position when the hook is in one position and releasing it from such locking when the hook is in the other position whereby one

or more of said switches may be held stationary while the remaining switches are simultaneously moved.

5. The combination with an escapement, a contact-maker detachably connected thereto, and a magnet for operating said escapement,  
45 of a receiver-hook movable to two positions, and means controlled by the movement of the receiver-hook for locking said escapement against operation by said magnet.

6. The combination with a clock mechanism, a magnet for causing its operation, and a contact-maker detachably connected to said clock mechanism, of a movable receiver-hook, a piece as H<sup>4</sup> supported on said hook, and means for causing said piece to come into contact  
55 with one of the gears of said mechanism by the movement of said hook so as to hold said mechanism from movement.

7. The combination with a central office, lines 50 and 100 leading therefrom, and means  
60 by which electrical impulses may be sent over said lines, of a series of telephone-stations connected to said lines, a switch located at each telephone-station, a magnet for operating each switch and connected to one of said  
65 lines so that when an electrical impulse is sent over that line it will cause a movement of the connected switch, and a locking device connected to each switch and arranged to be operated by a movement of the receiver-hook  
70 for that telephone, substantially as described.

Signed at Chicago, Illinois, this 20th day of October, 1900.

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Witnesses:

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