

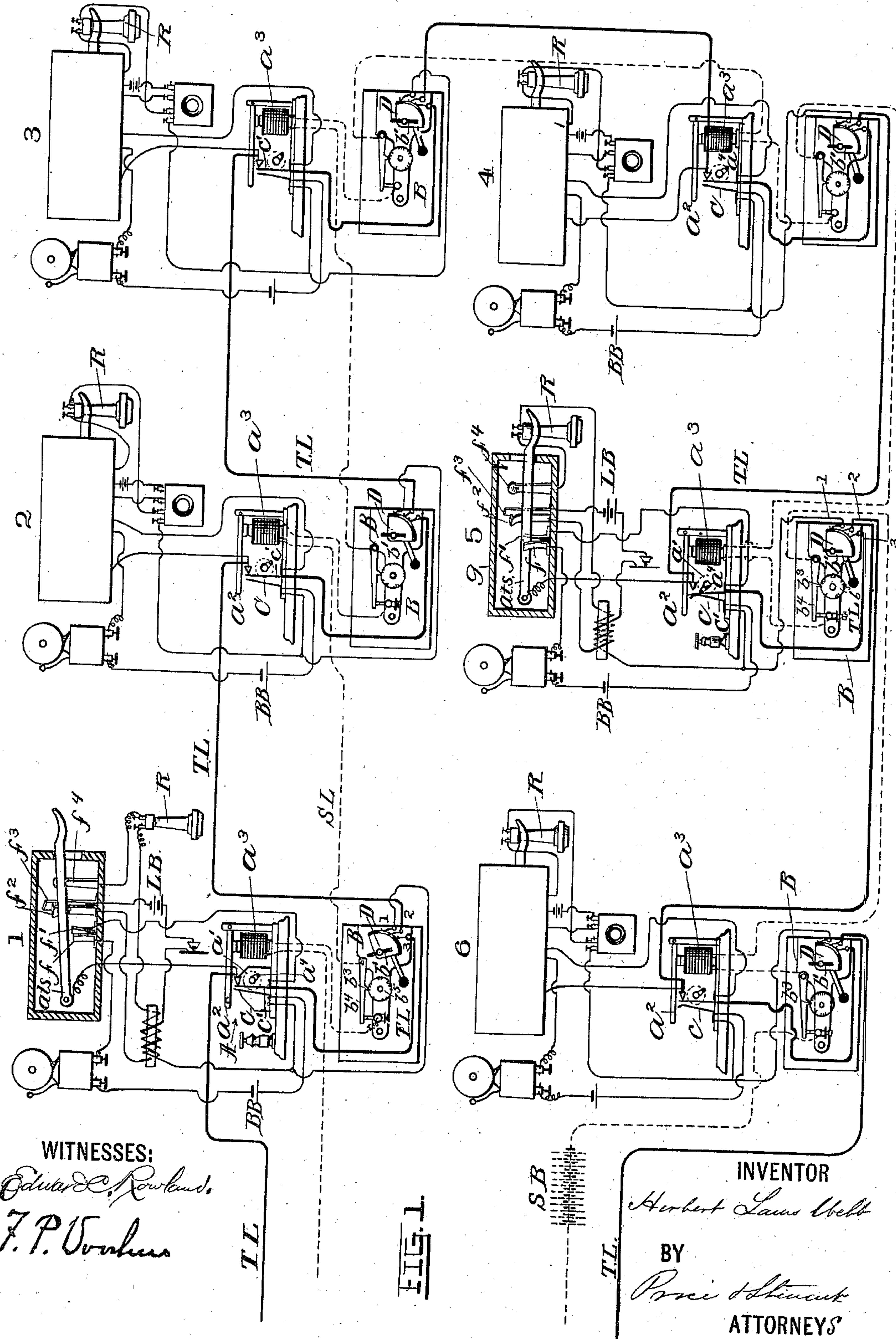
(No Model.)

5 Sheets—Sheet 1.

H. L. WEBB.  
SELECTING AND OPERATING TELEPHONES.

No. 555,984.

Patented Mar. 10, 1896.



H. L. WEBB.

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FIG. 2.

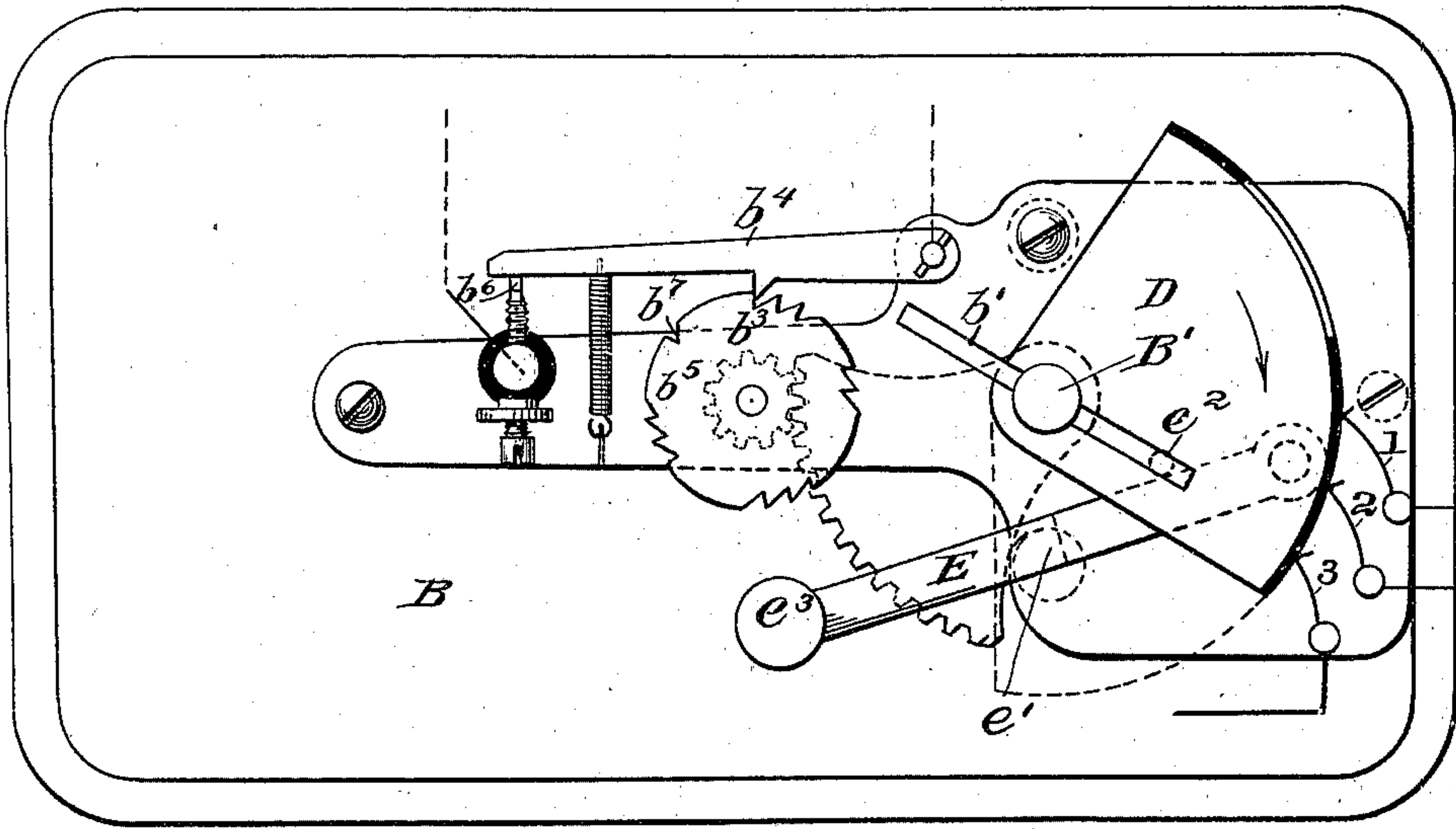


Fig. 14.

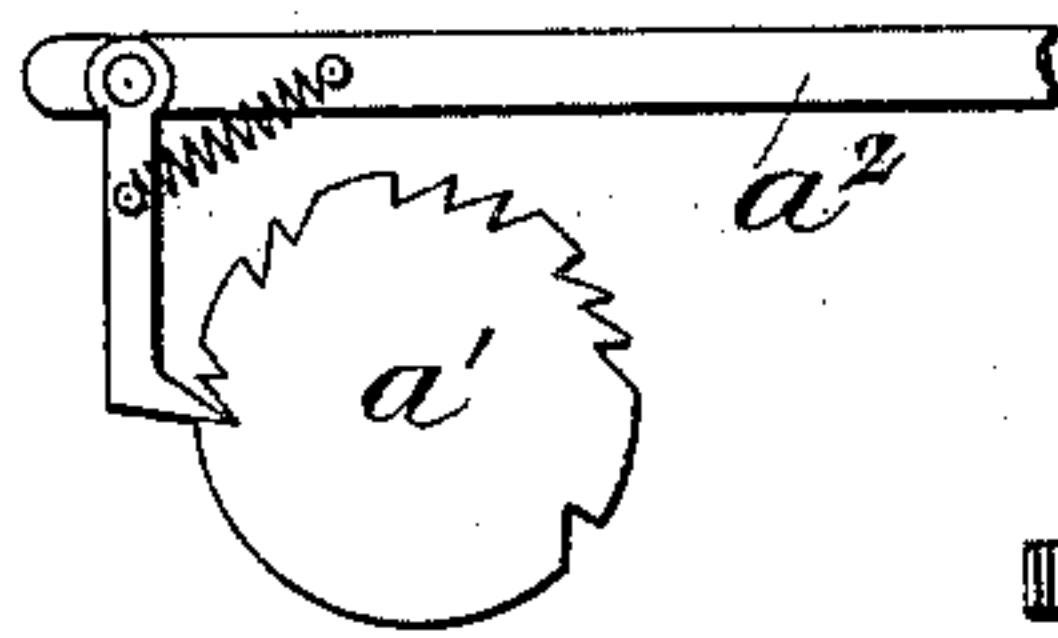


FIG. 3.

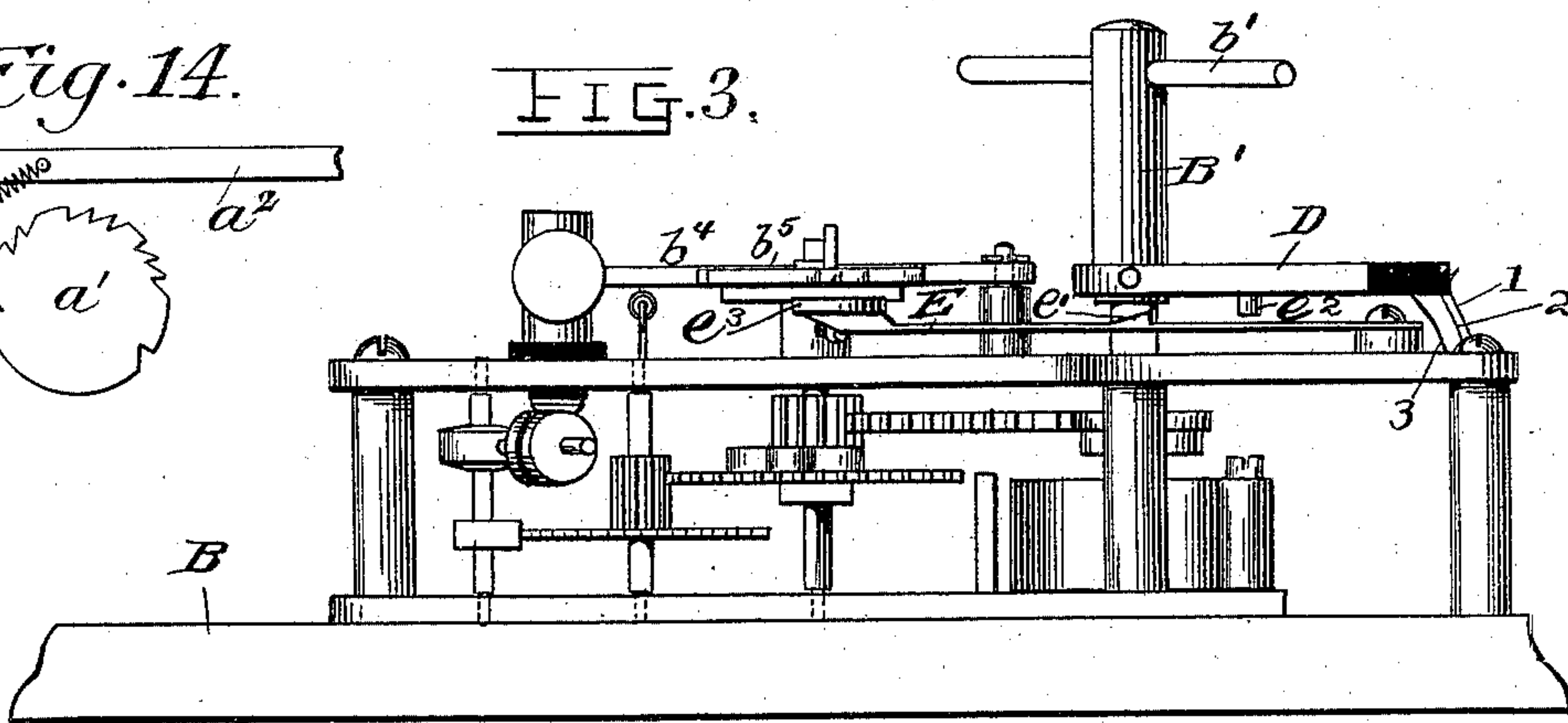


FIG. 5.

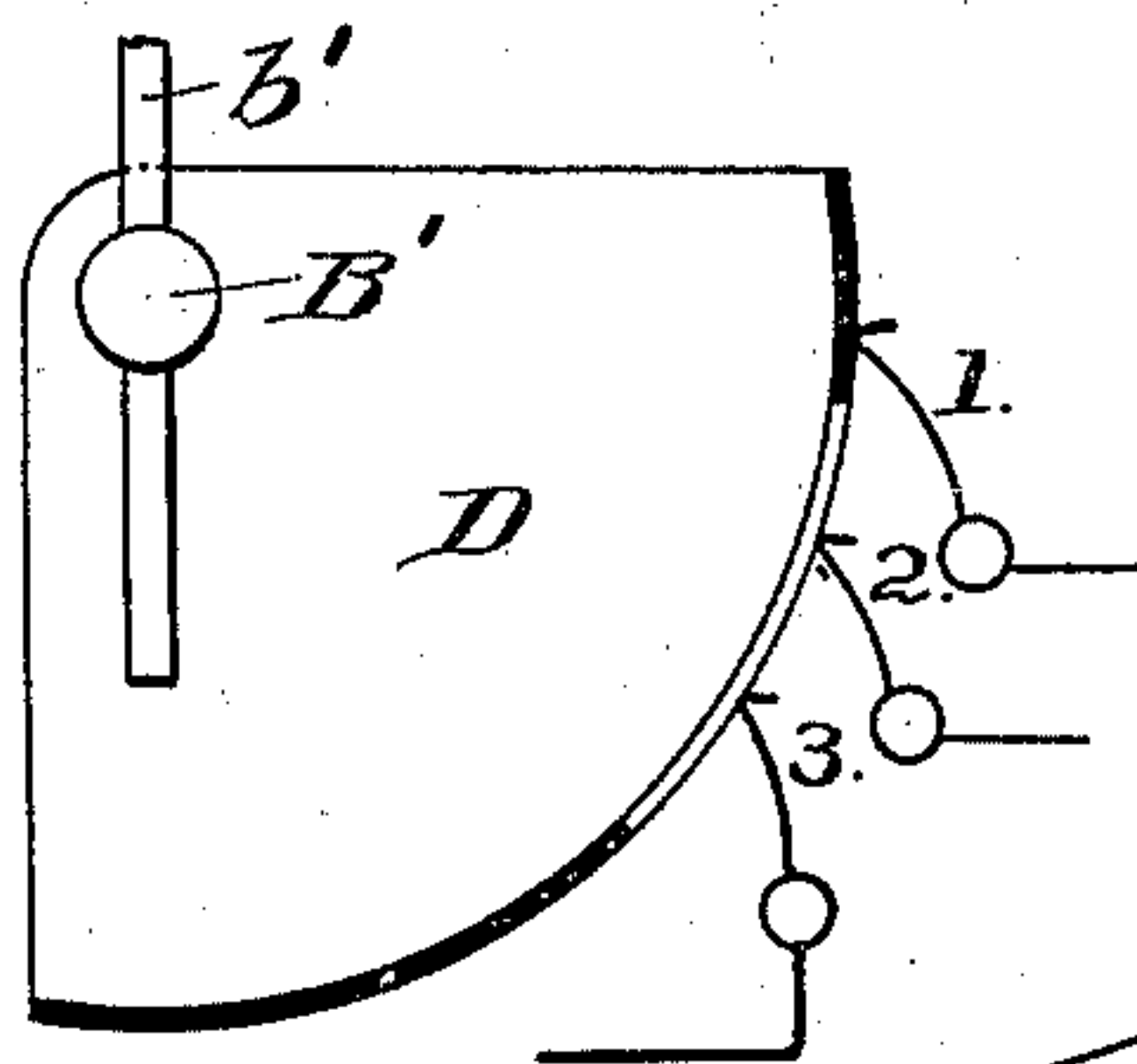


FIG. 4.

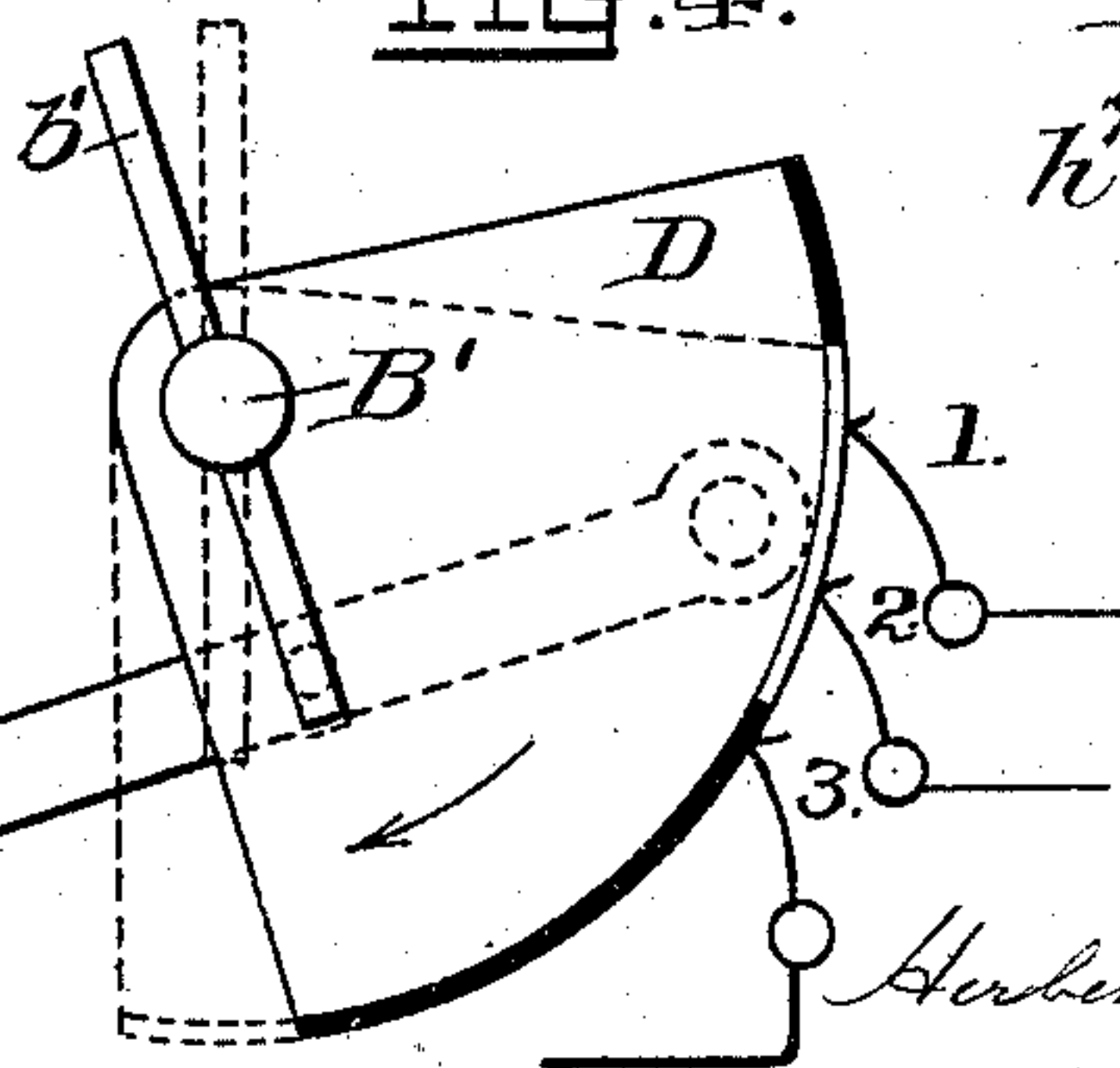
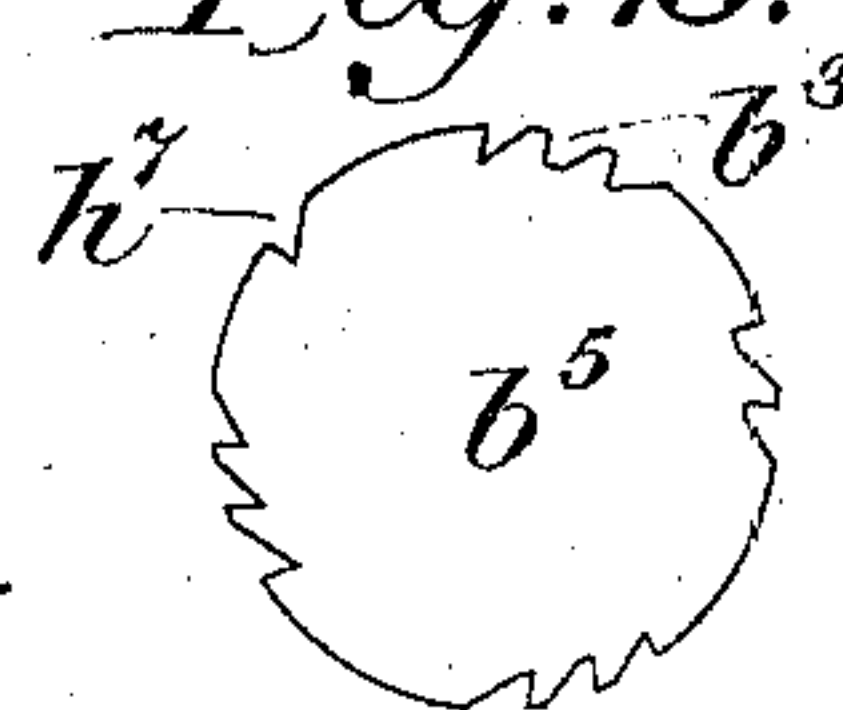


Fig. 15.



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FIG. 6.

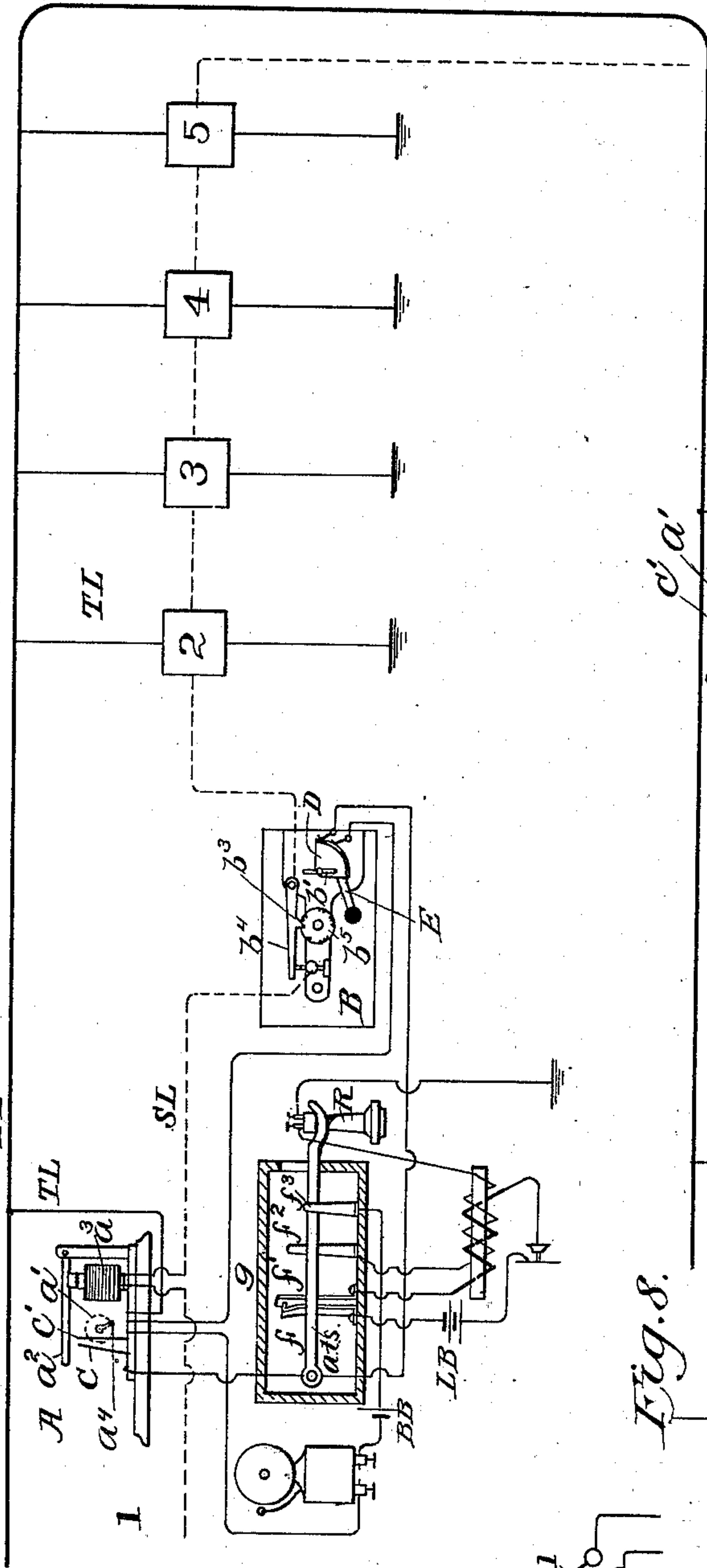


Fig. 8.

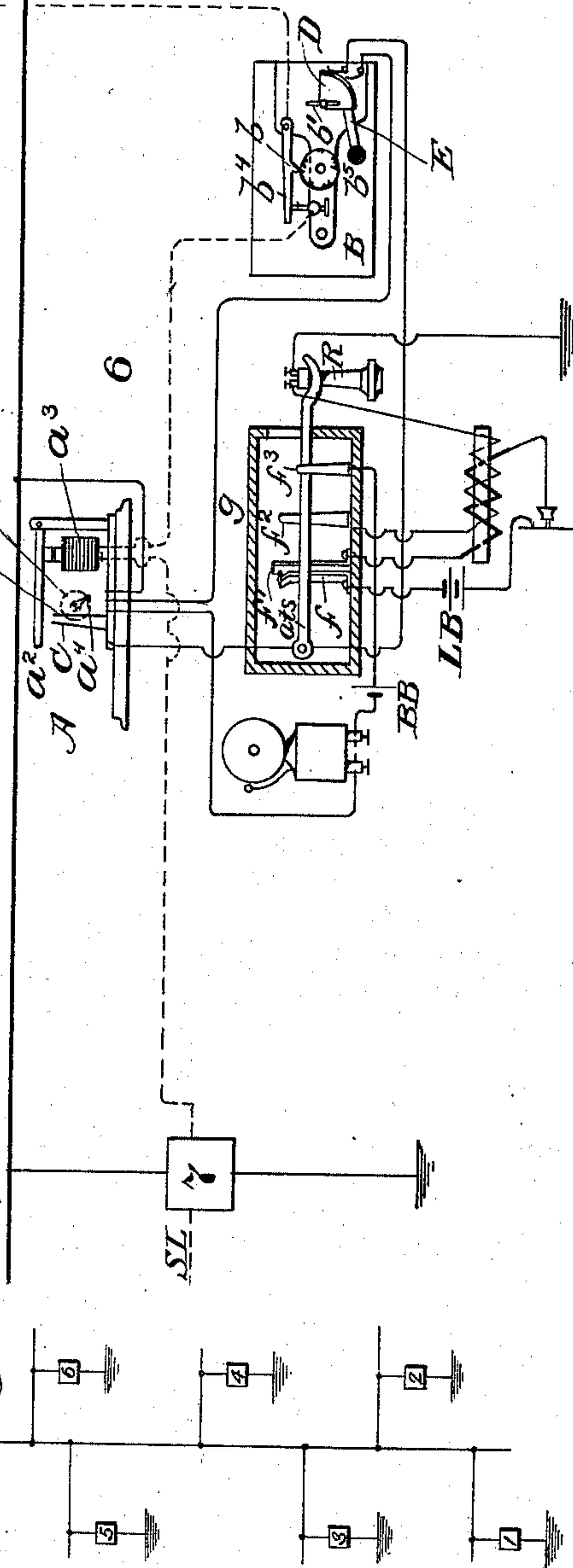
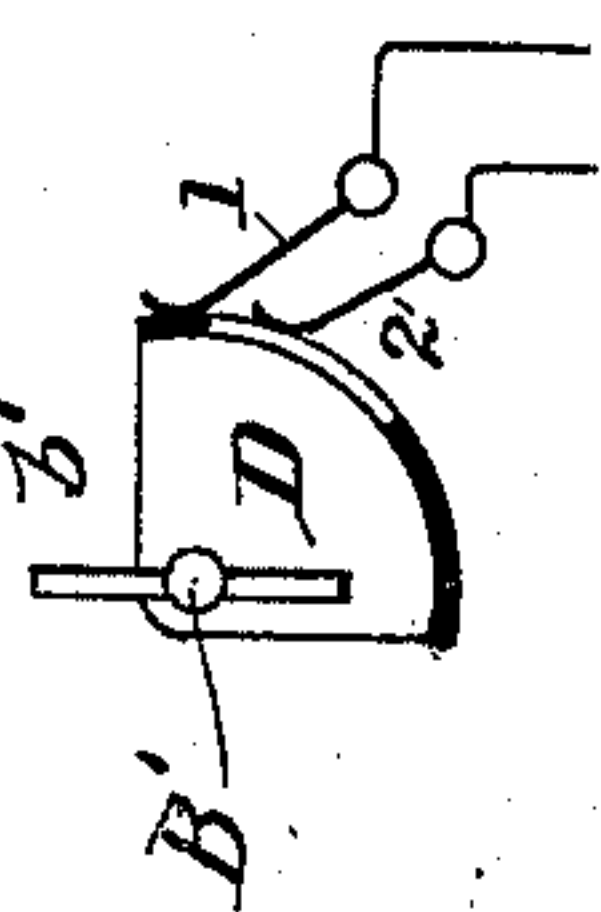


FIG. 7.



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(No Model.)

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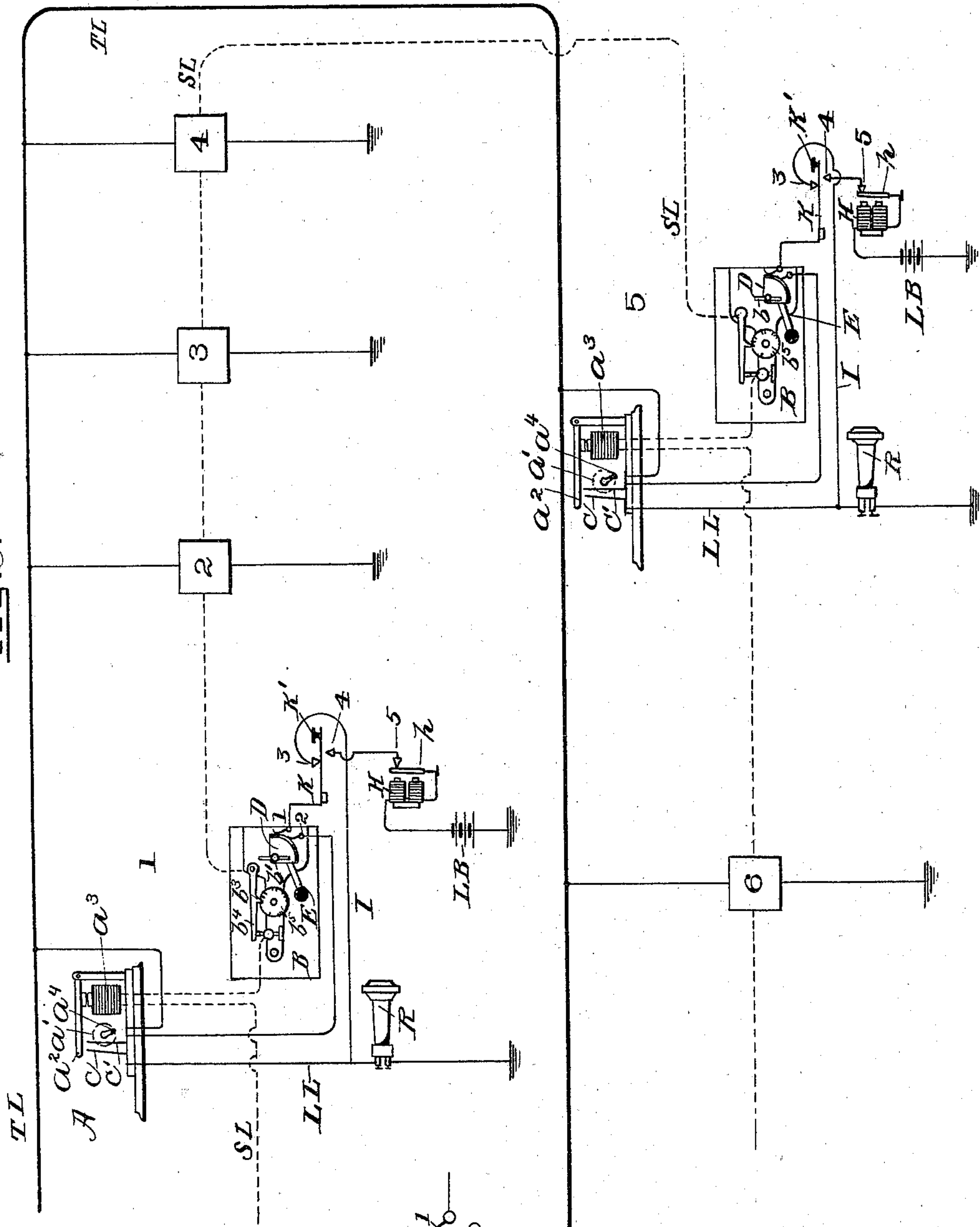
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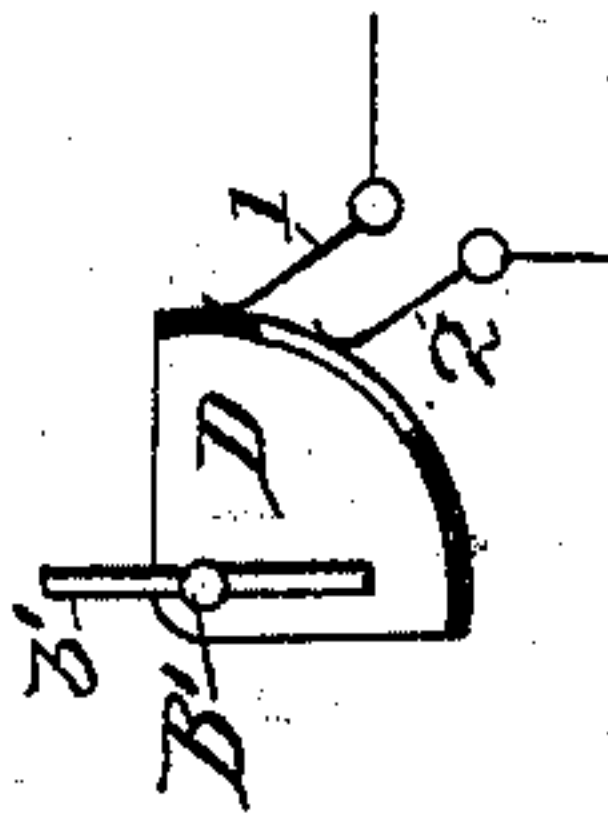
Patented Mar. 10, 1896.

FIG. 9.



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FIG. 10.



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(No Model.)

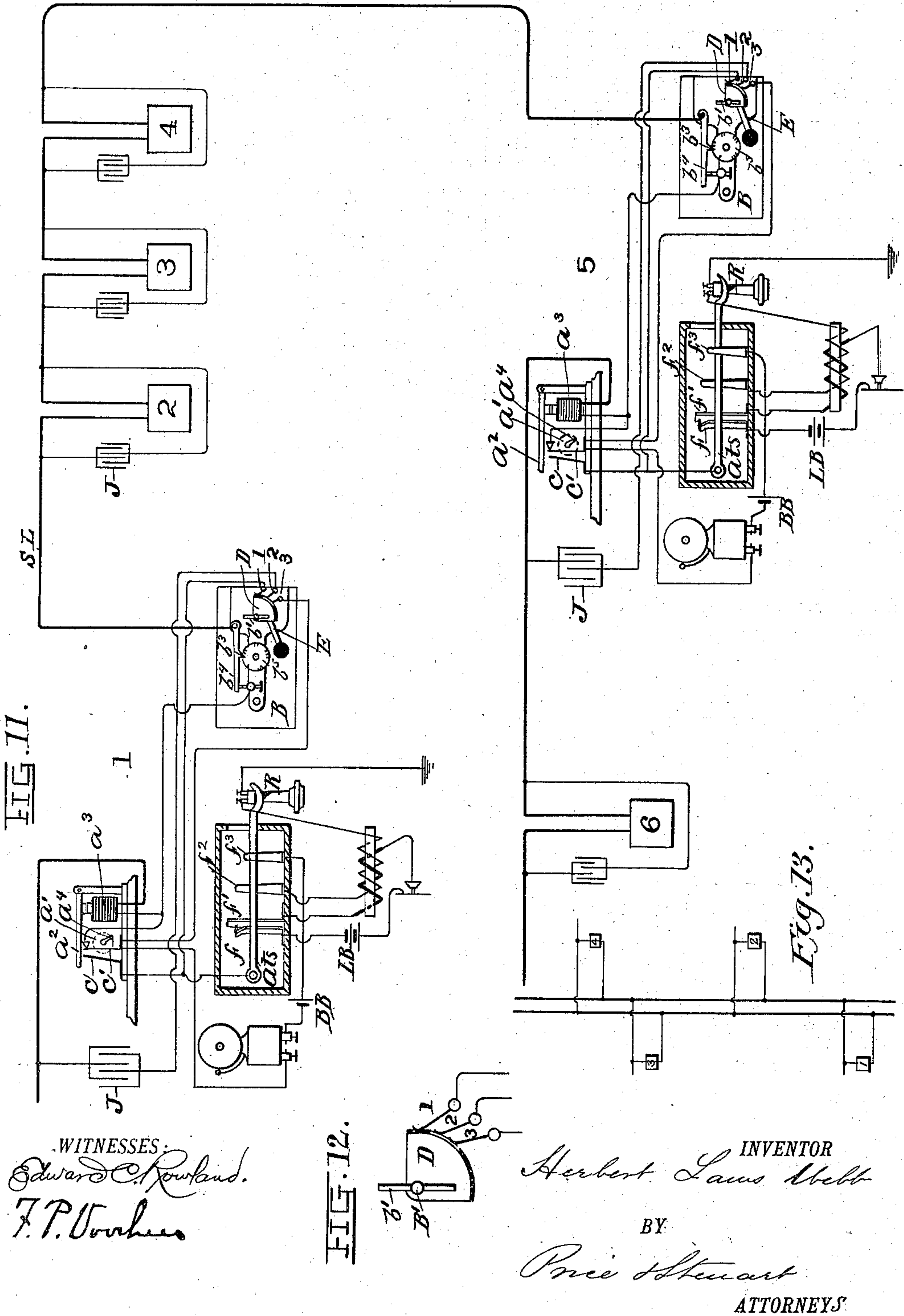
5 Sheets—Sheet 5.

H. L. WEBB.

SELECTING AND OPERATING TELEPHONES.

No. 555,984.

Patented Mar. 10, 1896.





# UNITED STATES PATENT OFFICE.

HERBERT LAWS WEBB, OF NEW YORK, N. Y., ASSIGNOR TO THE ELECTRIC  
SELECTOR AND SIGNAL COMPANY, OF WEST VIRGINIA.

## SELECTING AND OPERATING TELEPHONES.

SPECIFICATION forming part of Letters Patent No. 555,984, dated March 10, 1896.

Application filed March 18, 1893. Serial No. 466,670. (No model.)

*To all whom it may concern:*

Be it known that I, HERBERT LAWS WEBB, a citizen of Great Britain, residing in New York city and State of New York, have invented a new and useful Improvement in Selecting and Operating Telephones, whereby a number of telephone-stations may be placed on a single line and each selected and operated at will by any one of the stations, and by means of which a main central station for the telephones may be dispensed with, of which the following is a specification.

In the drawings, Figure 1 shows a series of six telephone-stations, each provided with the ordinary telephone transmitter, receiver, and call-bell, and each provided with an electrical transmitting and selecting instrument, and showing the position of the parts when No. 1 has called No. 5. Fig. 2 is a top view of an impulse-transmitting instrument provided with a movable circuit-changing device, the dotted lines showing the normal position of the circuit-changer and the full lines showing the extreme position of this device when turned to be started; Fig. 3, a side elevation of the impulse-transmitting instrument. Fig. 4 shows in full lines the circuit-changing device when it has stopped its rotation at the end of the combination impulses and the position of contacts at this stage and in dotted lines the end of its course. Fig. 5 shows the normal position of the circuit-changing device and the position of the contacts. Fig. 6 illustrates the system as constructed for use upon a grounded circuit and shows the instruments in their normal positions. Fig. 7 shows the normal position of the transmitter-sector as used with the grounded circuit. Fig. 8 is a diagram showing a number of stations legged upon a grounded circuit. Fig. 9 illustrates the system, showing a line of six stations wherein the communicating telephones are brought into circuit by the action of the selecting-instrument, and stations 1 and 5 show the normal position of the instruments, while the others are shown in diagram. Fig. 10 shows normal position of sector D on transmitting-instrument as used with the devices illustrated in Fig. 9. Fig. 11 illustrates the system when used on single line with condenser interposed in the circuit to equalize

the resistance of selector-magnets and shows the parts in normal position. Fig. 12 shows normal position of sector D on transmitting-instrument when the devices are used on single line, as shown in Fig. 11. Fig. 13 illustrates a metallic circuit upon which the instruments are arranged in multiple arc. Figs. 14 and 15 represent wheels having upon them a selected combination and answer to such combination.

The selecting-instrument and transmitting-instrument are shown as of a class, as any of the known selecting-instruments will answer the purpose, and any transmitting-instrument adapted to operate the selectors will perform the services required of it in this system.

The devices may be operated upon a metallic or grounded circuit.

In the drawings, TL represent the telephone-line, and SL the selector-line. Viewing Fig. 1, it will be seen that at each of the stations there are placed the ordinary telephonic devices, consisting of the transmitter, receiver, call-bell, and automatic telephone-switch. Each of the telephones is furnished with the usual local battery, (marked L B.) The selecting-instruments and their corresponding transmitting-instruments are placed on the selector-line or dotted line, (marked SL.) The selecting-instruments therefore are operated by the transmitting-instruments, and the first effect of this operation is to close the signal-circuit of the bell-battery B B.

The normal position of the telephones and their appliances is shown in the stations 2, 3, 4, and 6 of Fig. 1. The selector-line is furnished with a generator S B.

In the drawings, A is a selecting-instrument of any of the known forms, and, as herein represented, the form selected is of the class which operates a wheel  $a'$  provided with teeth or notches on its periphery and operated by an armature-lever, as  $a^2$ , of an electromagnet, as  $a^3$ , by means of impulses transmitted through the coils of said magnet from an impulse-transmitting instrument adapted to send a fixed combination or predetermined number or arrangement of impulses corresponding with the requirements of each of the selecting-instruments at the stations on the line. It is understood that a selecting-



instrument and a transmitting-instrument are placed at each of the stations and may be operated by any member within the circuit.

The transmitting-instrument on the selector-line is marked B in the drawings. On the end of an upright shaft B' (see Figs. 2 and 3) is placed a handle  $b'$ , intended to be turned by the hand in one direction and to be revolved by a spring in the opposite direction one revolution, and is stopped at the end of the revolution by a notch in a wheel (propelled by the shaft in turning) and a detent on a make-and-break finger which drops into the notch. The notch is marked  $b^3$ , and the finger  $b^4$ , and the wheel  $b^5$ . The position of this wheel with the detent in the notch marks the end of the revolution of the wheel, as well as the stopping and starting point of the device. In Fig. 2 this position is shown. The shaft has been turned by the handle  $b'$ , and the transmitting-instrument is ready to begin its reverse movement and send out its arrangement of impulses to some one of the receiving-instruments on the line.

It will be observed in viewing Fig. 2 that in the form of transmitting-instrument chosen for illustration the wheel  $b^5$  is furnished with other notches and raised surfaces beyond that which marks its starting-point, looking to the right of the detent around the edge of the wheel, and as the wheel revolves the detent slides upon the raised surfaces and drops into the notches, making an irregular series of makes and breaks at the contact  $b^6$ , and these makes and breaks form the combination or predetermined arrangement of impulses which go out to a chosen selecting-instrument, and as each selector on the line has a predetermined arrangement of its own any number of disks, as  $b^5$ , may be used interchangeably on the device, or it may be provided with a multiple transmitting-instrument in which a shaft having a number of disks may be revolved, and a plug be arranged to make contact with a brush on a particular disk, or an expert telegraph-operator may give the impulses with an ordinary telegraph-key. When a receiving-instrument has received its particular arrangement of impulses, it works out to the end, and any additional impulse thereafter will restore it to its starting-point. As there are a number of such instruments, they may be said to be well known and require no further explanation. The gearing in the transmitting-instrument is so arranged that the handle  $b'$  may be turned in one direction, leaving the wheel  $b^5$  at rest and ready to be started, as shown in Fig. 2, by the reverse movement of the shaft. Such an arrangement of gearing is well known and needs no further explanation.

Viewing Figs. 2, 14 and 15, number 15 represents the wheel on the selecting-instrument, 2 and 14 representing the wheel on the transmitting-instrument. It will be seen that when the wheel is started the following arrangement will follow: 2, space, 2, space, 3,

space, 3, space, 1. This brings the wheel  $b^5$  on the transmitting-instrument to a point where the detent on the finger  $b^4$  enters the notch  $b^7$  (see Figs. 2 and 14) and the wheel on the selecting-instrument (see Fig. 15) into the corresponding notch  $b^7$ . The selector-wheel has at this point reached the end of its course and has performed the work required of it and is ready at the proper time to be returned to zero or starting-point. The wheel on the transmitting-instrument is stopped at this point, leaving a space to be traversed between the notch  $b^7$  and the end of its revolution or starting-point, (represented by the notch  $b^3$ ), which wheel when released, as will be explained, makes the necessary break which returns the selecting-instrument to zero, which is done after the parties have ceased their conversation through the telephone. Suitably attached to a part of the framework of the selecting-instrument are two contact-springs  $c c'$ . These springs are normally open and are closed by the wheel of the selecting-instrument in responding to its predetermined arrangement of impulses.

The wheel  $a'$  of the selecting-instrument, as before described, has its combination arranged around its edge, and at a point on its plane there is placed a pin  $a^4$ , which revolves with the wheel and strikes the spring  $c'$ , forcing it against its companion spring  $c$ . This occurs when the combination impulses are completed and the detent on the finger  $b^4$  of the transmitting-instrument is resting in the notch  $b^7$  and the pawl on the armature-lever of the selecting-instrument is holding the wheel and is in its notch  $b^7$ .

Viewing Figs. 2, 4, and 5, there is shown attached to the main shaft a sector D, which turns with the shaft. The normal position of this sector is shown in Fig. 5. The extreme position of this sector when turned by the hand is shown in Fig. 2, and when released is revolved by its spring in the direction of the arrow until it has accomplished a complete revolution of the wheel  $b^5$  and returns to its starting-point, as shown in Fig. 5 and in the dotted lines in Fig. 2. A part of the rim of this sector is provided with insulating material, as shown by the heavy black lines, and part of it with conducting material, as shown by the space between the black lines, and against the edge are placed the three contacts 1 2 3. These contacts regulate the telephone-circuit in accordance with the position of this sector. When the sectors are in normal position, as shown in Fig. 1, in stations 2, 3, and 4, the telephone-circuit is as follows: beginning at the left, to spring  $c'$ , thence to contact No. 3 on the sector D, thence across conducting-space to contact No. 2, and thence out to line. When this sector has been revolved by its spring, it is stopped before it reaches the end of its course by suitable mechanism for that purpose. The means shown herein for stopping it are exhibited in Figs. 2 and 3. Upon a suitable part of the frame-



work is placed the spring E, and may be provided with a catch or projection  $e'$ , and upon the sector is placed a pin  $e^2$ , which comes in contact with the catch and stops the revolution of the sector at a point, as shown in Fig. 4. It will be seen that contact No. 3 is now on the insulated part of the sector and Nos. 1 and 2 are joined by the conducting-surface. The telephone-circuit, as above described, is then broken at No. 3, while the catch and pin are holding the sector, the detent on the finger  $b^4$  is resting in the notch  $b^7$  of the wheel  $b^5$ , and this last impulse has stopped the combination-wheel of the selecting-instrument at the end of its combination and is holding it there with the pawl of the armature-lever in the notch  $b^7$  of the selector-wheel, and the pin on that wheel has just closed the springs  $c c'$ . This position of the two stations is represented in Nos. 1 and 5 of Fig. 1. The bell is now ringing at No. 5 station, and the circuit is from bell-battery B B to spring  $c$ , thence to  $c'$ , thence to springs  $f f'$ , to bell-magnet, and to battery. The party called at No. 5 station now takes his receiver off the hook preparatory to receiving the communication. Upon an insulated frame, as  $g$ , are erected the contact-springs  $f f' f^2 f^3 f^4$ , through which the circuits are opened and closed by the upward and downward movement of the automatic telephone-switch  $a t s$ . When this switch is down, it closes the bell-circuit through the springs  $f f'$ , and when the receiver R is taken from the hook the switch ascends and the circuit is broken at the springs  $f f'$  and the bell stops ringing.

Now beginning at station 1, the telephone-circuit is to switch  $a t s$ , to spring  $f^4$ , to receiver, to secondary winding of induction-coil, to contact No. 1 of sector of transmitting-instrument, thence to contact No. 2, and out to line, and the primary circuit of the telephone-transmitter is from battery  $t b$  to telephone-transmitter, thence to winding of induction-coil, thence to springs  $f^2$  and  $f^3$ , and thence to battery. In No. 5 station the telephone-circuit goes to switch  $a t s$ , thence to spring  $b^3$ , to receiver R, to secondary winding of induction-coil, to springs  $c c'$ , to contact No. 3 on transmitter-sector, thence to contact No. 2, and out to line. The parties are now ready to converse by telephone in the ordinary way, while the instruments are held in their respective positions, as described.

When the conversation is over, the receivers are hung upon the hooks and the catch-spring E of the transmitting-instrument is depressed by pressure upon the thumb-button  $e^3$ . This releases the sector D, when its shaft revolves and finishes its course, restoring the parts to the starting-point, and as the detent on the finger rises out of the notch  $b^7$  and rides upon the adjoining space it makes the necessary break in the circuit, which, operating upon the selecting-instrument, restores that instrument to starting-point. This system of selective telephone service may readily be

carried out on a grounded circuit, as illustrated in Figs. 6, 7, and 8, or on a metallic circuit with the instruments connected in multiple arc, (instead of in series,) as illustrated in Fig. 13.

Viewing Fig. 6, it will be seen that seven stations are shown, of which stations 1 and 6 show all the appliances of the device and the others are represented in diagram. As shown in the drawings, the line T L is connected by a short conductor to the spring  $c'$  erected upon the base of the selecting-instrument in position to be forced against its companion spring  $c$  by the pin  $a^4$  on the wheel  $a'$ . In the arrangement of the device upon the grounded circuit, as shown in the drawings, Figs. 6 and 8, I have made some convenient changes in the springs located within the frame or box  $g$ , which are operated by the movement of the automatic telephone-switch  $a t s$ . The springs  $f f'$  form the terminals for the primary circuit of the telephone-transmitter. I am also enabled to use two contacts 1 and 2 upon the sector D instead of three, as illustrated in the drawings hereinbefore described, as shown in Fig. 7, which illustrates the normal position of this sector when the line is not in use. In this normal position of the operative parts of the device the telephone-circuit is open and the selector-circuit (shown by the dotted lines S L) is through the coils of the selector-magnet  $a^3$ , thence through the selecting-instrument out to line, or vice versa, as the relative positions of the selector and transmitting-instrument at the stations are immaterial, as they are all connected on the line in series.

Viewing Fig. 7 it will be seen that station No. 1 on the line will send out a call to station No. 6 by turning the sector-shaft of the transmitting-instrument and allowing it to be reversed by its spring. The sector D will pass through its reverse movement, transmit the combination impulses to No. 6 station, and the sector will stop at the end of these impulses, with the contacts 1 and 2 resting upon the conducting-surface. At No. 6 station the wheel  $a'$  of the selecting-instrument will force spring  $c'$  against its companion spring  $c$ . This action will close the bell-circuit at No. 6 station, which runs from battery B B to spring-contact  $f^3$ , to switch  $a t s$ , to springs  $c$  and  $c'$ , to bell-magnet, to battery. The parties at the two stations now take the receivers R off the hooks on the switch  $a t s$ , which then rises and closes springs  $f f'$  and makes contact with  $f^2$ . The bell-circuit of station 6 is now broken at  $f^3$ . The telephone-line at station 1 runs from spring  $c'$  to contact 2 on sector D, thence to contact 1, thence to switch  $a t s$ , to spring  $f^2$ , to secondary winding of induction-coil, to receiver R, to ground, and the primary circuit of telephone-transmitter runs from battery to telephone-transmitter, to primary winding of induction-coil, to springs  $f^2 f'$ , to battery. At No. 6 station the telephone-circuit entering at



spring  $c'$  runs thence to spring  $c$ , thence to switch  $a t s$ , contact  $f^2$ , to secondary winding of induction-coil, to receiver  $R$ , to ground, and the primary circuit of telephone-transmitter is from battery  $L B$  to telephone-transmitter, to primary winding of induction-coil, to springs  $f^2 f'$ , to battery. The parties at the two stations are now ready to converse while the instruments are held in their respective positions. When the conversation is over, the receivers are hung upon the hooks of the switches, and the spring  $E$  at station 1 is pressed, releasing the transmitting-instrument to finish its revolution and make the necessary break in the circuit, which restores the selecting-instrument at No. 6 to starting-point and brings the devices to their normal positions, as shown in Fig. 6.

Fig. 13 illustrates, by way of diagram, the method of connecting the telephone-station in multiple-arc circuit.

Fig. 9 illustrates a selective telephone system whereby the automatic switch is dispensed with and the conversing parties put into communication with each other by the operation of the transmitting and selecting instrument alone and held in position until the end of the conversation, when the devices are released and restored to normal position.

Fig. 9 represents a line of six stations, of which stations 1 and 5 show the normal positions of the instruments. The telephone-line  $T L$  is connected with the base of spring  $c'$ , and the transmitting and selecting instruments are in circuit with the selector-line  $S L$ , which runs through the coils of the magnet of the selecting-instrument, thence through the transmitting-instrument, and out to line. Connected with one of the contacts, as No. 1 in the drawings, is a conductor which terminates in a key  $K$ , designed to be pressed by the thumb-button  $k'$  and be stopped in its up-and-down movement by the two contacts 3 and 4. From the spring  $c$  a local line  $L L$  runs to a magneto-telephone  $R$  and thence to ground, and from this line a branch runs to contact No. 3. From contact No. 4 a line runs to contact 5, thence through armature  $h$ , through the coils of an electromagnet  $H$ , thence to battery  $L B$ , thence to ground. When a call has been made from No. 1 to No. 5, No. 1 station has called No. 5 by sending out from the calling-station the combination or predetermined arrangement of impulses which answer to No. 5 station. No. 1 (the caller) has started off his transmitting-instrument, which has finished the arrangement of impulses on its wheel and has stopped with the contacts 1 and 2 upon the conducting-space of the sector  $D$ . The current is then from line  $T L$  to base of spring  $c'$ , thence to contact No. 2 on sector  $D$ , thence to No. 1, thence to contact No. 3 and branch to line  $L L$ , through magneto-telephone to ground. At No. 5 station the selecting-instrument has closed the springs  $c c'$ , and the current en-

tering from line  $T L$  at spring  $c'$  runs thence to spring  $c$ , thence by line  $L L$  through magneto-telephone to ground. The parties are then in position for conversation, and the devices are held in this position, as heretofore explained, by stopping the sector  $D$  of the transmitting-instrument at station 1, which holds the selecting-instrument at station 5, with the springs  $c c'$  closed until the end of the conversation. When the two telephones are thus connected, the caller at No. 1 presses the button  $k'$ , which gives an interrupted current and makes a noise in the magneto-telephone  $R$ , which is sufficient to signal the party at No. 5 that his station is called. At the end of the conversation the sector  $D$  at the calling-station is released to finish its course and restore both stations to normal position.

What I claim, and desire to secure by Letters Patent, is—

1. In a selective telephone system a single line on which is placed a telephone and a single line on which are placed an impulse-transmitting instrument and a selecting-instrument at each of the stations, means operated by each of the selectors in response to impulses from any one of the transmitting-instruments over the selector-line, to thereby bring into circuit and connect the communicating telephones with each other.

2. In a selective telephone system a single line on which is placed a telephone, and a single line on which are placed an impulse-transmitting instrument and a selecting-instrument at each of the stations, means operated by each of the selectors in response to impulses from any one of the transmitting-instruments over the selector-line, to thereby connect the communicating telephones with each other, and means operated by a vibratory current transmitted through the telephone-line when the communicating telephones are connected to thereby sound an audible signal at the station called.

3. In a selective telephone system a single line on which is placed a telephone and a single line on which are placed an impulse-transmitting instrument and a selecting-instrument at each of the stations, means operated by each of the selectors in response to impulses from any one of the transmitting-instruments over the selector-line to thereby sound an audible signal and prepare the telephone-lines to admit the communicating telephones into circuit with each other, and means actuated by the telephone-switches, to thereby connect the communicating telephones with each other and cut out the audible signal.

4. In a selective telephone system the combination with two or more telephone-circuits, of a single line on which is placed a telephone and a single line upon which are placed an impulse-transmitting instrument and a selecting-instrument at each of the stations, means operated by each of the selecting-instruments in response to impulses from the



transmitter over the selector-line to call up any one of the stations and means operated by the telephone-switches to connect the communicating telephones with each other.

5 5. In a selective telephone system a single line on which is placed a telephone and a single line on which are placed an impulse-transmitting instrument and a selecting-instrument at each of the stations, means operated  
10 by each of the selecting-instruments in response to impulses from the transmitter over the selector-line to call up any one of the stations, means operated by the telephone-switches to connect the communicating tele-  
15 phones with each other, and means for retaining the circuit through the communicating telephones during the conversation.

6. In a selective telephone system a single line on which is placed a telephone and a single line on which are placed an impulse-transmitting instrument and a selecting-instrument at each of the stations, means operated  
20 by each of the selecting-instruments in response to impulses from the transmitter over the selector-line, to call up any one of the stations, means operated by the telephone-switches to connect the communicating tele-  
25 phones with each other and means operated by the transmitting-instrument to retain the circuit through the communicating telephones  
30 during the conversation and to restore the instruments to starting-point when the conversation is closed.

7. In a selective telephone system the combination with two or more telephone-stations, provided with their respective telephones arranged upon a single line, of a selector-line having in its circuit an impulse-transmitting instrument and a selecting-instrument at  
35 each of the telephone-stations, and means operated by each of the selecting-instruments in response to any one of the transmitting-instruments to prepare the telephone-line to admit the communicating telephones into  
40 circuit with each other.

8. In a selective telephone system the combination with two or more telephone-stations each provided with its respective telephone arranged upon a single line, of a selector-  
45 line provided with an impulse-transmitting

instrument and a selecting-instrument located at each station, means operated by each of the transmitting-instruments to select and operate any one of the selecting-instruments on the line and thereby signal its  
55 respective station, and devices operated by the transmitting-instrument in sending out its signaling impulses to prepare the telephone-line to establish circuit through its telephone-switches.  
60

9. In a selective telephone system the combination with two or more telephone-stations each provided with its respective telephone arranged upon a single line, of a selector-line provided with an impulse-transmitting in-  
65 strument and a selecting-instrument, located at each station, means operated by each of the transmitting-instruments to select and operate any one of the selecting-instruments on the line, and prepare the telephone-line  
70 at the selected station to establish circuit through its telephone-switch.

10. The combination with an electrical impulse-transmitting instrument, a selecting-instrument in circuit therewith and adapted  
75 to be selected and actuated by impulses therefrom, of devices for arresting the movement of the transmitting-instrument before it has completed its course and thereby arrest and  
80 hold the selecting-instrument and prevent it from returning to normal position.

11. In a selective telephone system the combination with two or more telephone-stations, each provided with its respective telephone arranged upon a single line, of a se-  
85 lector-line provided with an impulse-transmitting instrument and a selecting-instrument located at each station, devices for arresting the movement of the transmitting-instrument before it has completed its course,  
90 and thereby adjusting the instruments at both stations to establish the circuits through the communicating telephones.

Signed at the city of New York, in the county of New York and State of New York,  
95 this 25th day of February, A. D. 1893.

HERBERT LAWS WEBB.

Witnesses:

F. P. VOORHEES,  
WM. C. COX.