

(No Model.)

M. G. KELLOGG.
MULTIPLE SWITCHBOARD.

No. 592,308.

Patented Oct. 26, 1897.

Fig. 1a.

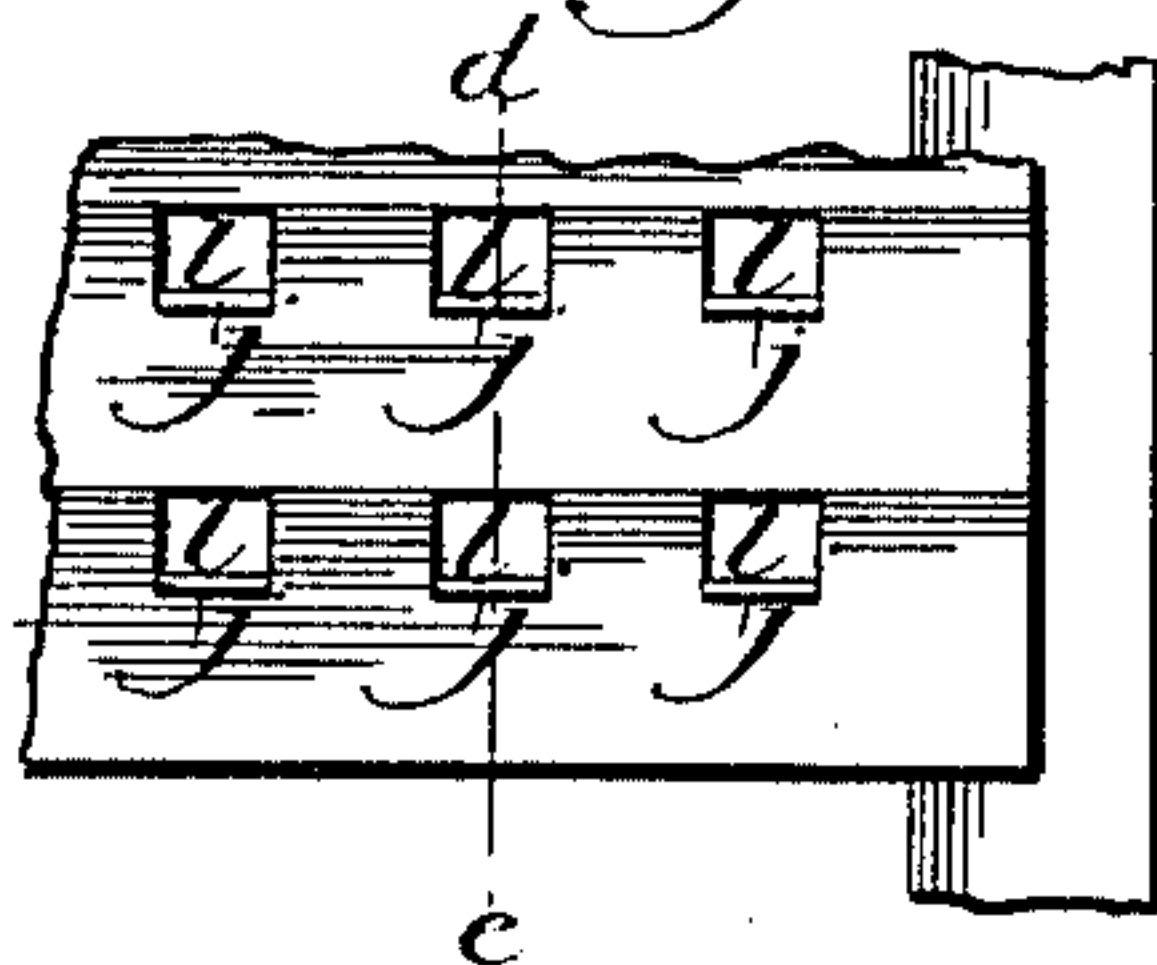


Fig. 1b.

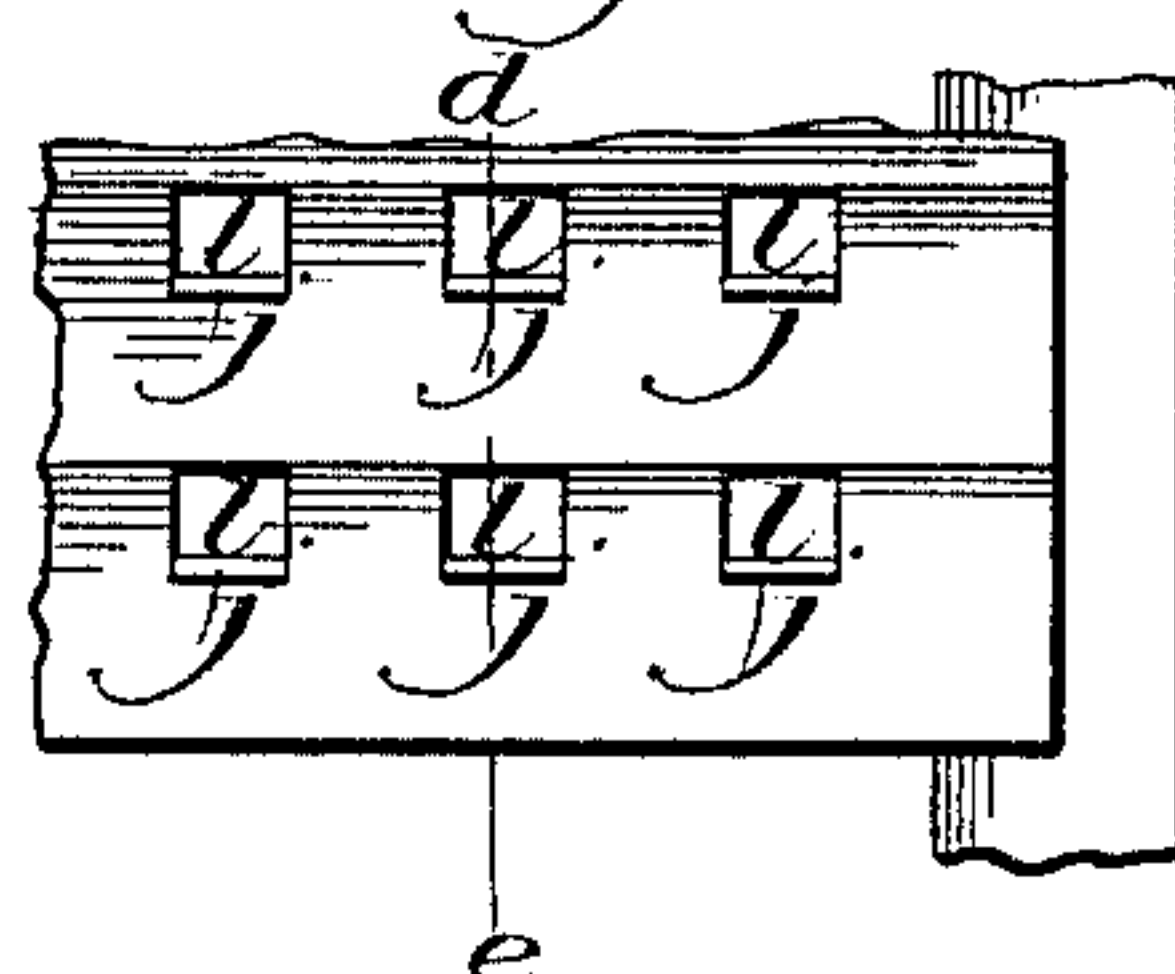


Fig. 2.

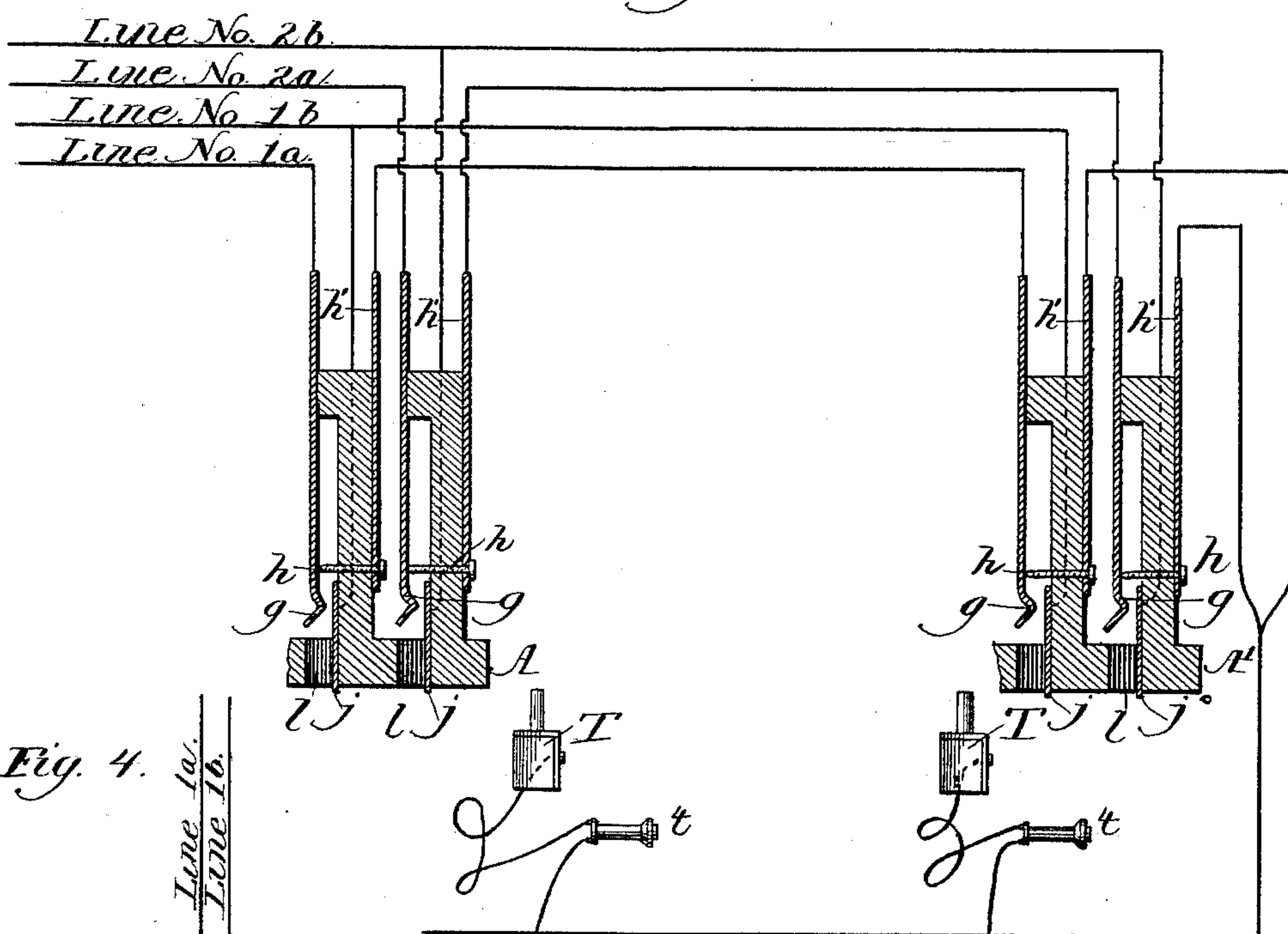
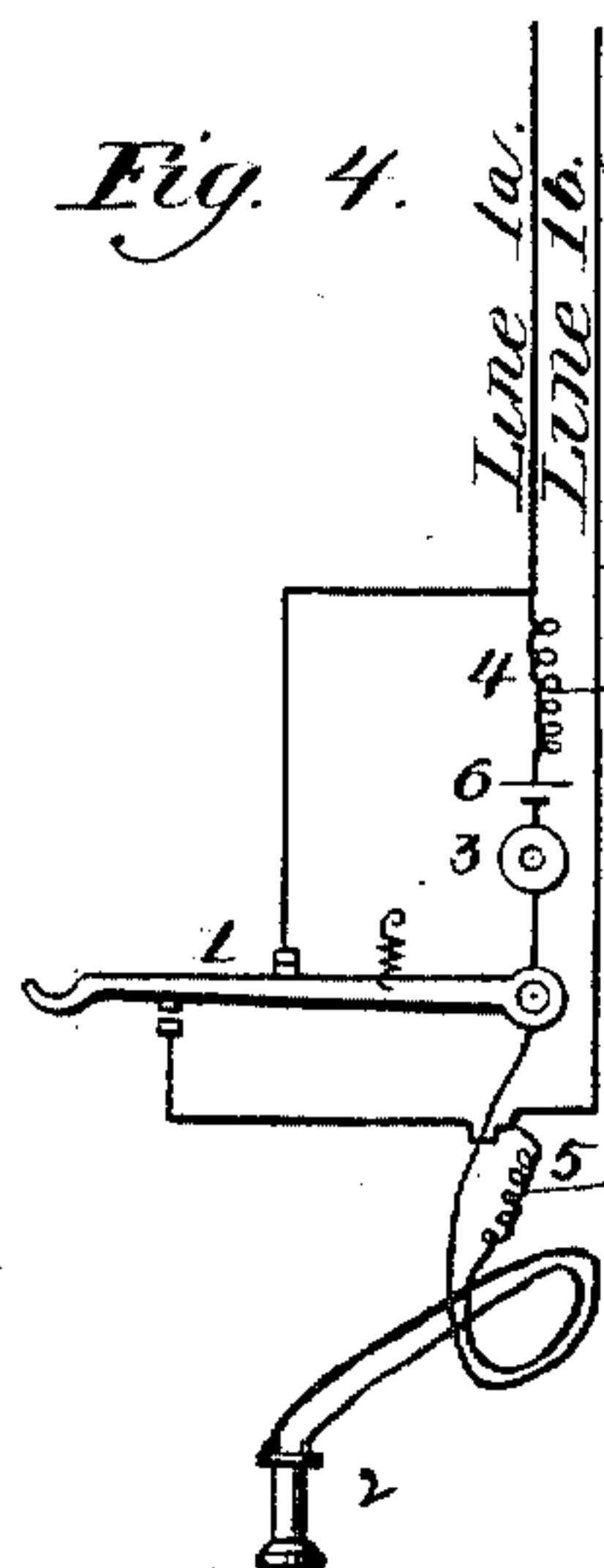


Fig. 4.



Primary of Induction coil.

Secondary of Induction coil.

Fig. 3.



Inventor:

Milo G. Kellogg

Witnesses:
Milton Head
Calvin DeWolf

UNITED STATES PATENT OFFICE.

MILO G. KELLOGG, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF SAME PLACE.

MULTIPLE SWITCHBOARD.

SPECIFICATION forming part of Letters Patent No. 592,308, dated October 26, 1897.

Application filed July 16, 1888. Renewed December 20, 1890. Serial No. 375,311. (No model.)

To all whom it may concern:

Be it known that I, MILO G. KELLOGG, of Chicago, (Hyde Park,) Illinois, have invented certain new and useful Improvements in Multiple Switchboards for Telephone-Exchanges, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to a telephone-exchange system in which the subscribers' lines are metallic-circuit lines connected to multiple switchboards; and it consists in a system of testing at any board to determine whether any line is in use.

I place as many switchboards in the central office as are found necessary or desirable in order to properly answer the calls and connect and disconnect the subscribers' lines. On each board I place for each line a spring-jack or similar switch having two insulated contact-points which are normally in contact and a third contact point or piece normally insulated from the others except by the line connections, said switch being adapted to receive a loop-switch plug and, when the plug is inserted, to disconnect the switch-points which are normally in contact and connect one of them to one of the contact-pieces of the plug and at the same time connect the other contact-piece of the plug with the third contact point or piece of the switch mentioned above.

The third contact points or pieces of the switches above described are so placed and arranged that an operator may at will apply a test-plug or similar device to them.

The switches of a line on the different boards may be called a "series" of switches, and the test-pieces of a line may be called a "series" of test-pieces.

At each subscriber's station is a battery which for purposes of testing should be in the circuit of his line when it is not in use and which may be in said circuit all of the time.

Figures 1^a and 1^b of the drawings are front views of sections of two multiple switchboards to which the same wires are connected. Fig. 2 is a diagram of the boards and the cir-

uits and connections necessary to illustrate my invention. Fig. 3 shows a double or loop plug adapted to be used with the switches. Fig. 4 is a diagram of a subscriber's-station apparatus necessary to illustrate my invention.

In the drawings like parts and apparatus are indicated by the same letters and figures of reference.

In Fig. 2, A is a sectional view of the switchboard shown in Fig. 1^a, and A' is a sectional view of the switchboard shown in Fig. 1^b, each as indicated by the line *d e*.

a b represent rubber strips, of the shape substantially as shown, on which the metal parts of the spring-jack switches are mounted. These strips may be of a length to receive any convenient number of spring-jack parts.

l l, &c., are square holes through the fronts of and at the edges of the strips adapted to receive and guide the switch-plugs. The contact-springs *g g*, &c., are mounted to the rear of and are parallel to the holes *l l*, &c., to which they belong, as shown. The contact-points *h h*, &c., corresponding to the contact-springs pass through the rubber strips, as shown, and are connected with the connecting-pieces *h' h'*.

j j are the contact-pieces of the switches, insulated from the rest of the parts except by the line-wire, each adapted to connect one side of its line to one of the contact-pieces of a loop-plug when inserted, and also to be the test-piece of its line at its board. The switch-plugs are substantially as shown in Fig. 3.

The several parts mentioned above are so made, shaped, arranged, and adjusted that when a plug is inserted into any switch-hole it raises the spring in the rear of the hole from the contact-point, (on which it normally rests,) and the spring is connected to one of the contact-pieces of the plug, while the other contact-piece of the plug is connected to the contact-piece *j* of the switch which is used. Each section of a rubber strip, with its contact-spring, contact-point, contact-piece, and the hole, all arranged and operating as shown, may be considered as a spring-jack switch.

t t in Fig. 2 are test receiving instruments, and T T are test-plugs, one instrument and

one plug at each board, and each plug connected to one side of its test receiving instrument by a flexible cord, as shown. The plugs and cords are so constructed that the operators may at will bring the metal tips of the plugs in contact with any contact-pieces *j j* at their respective boards.

In the subscriber's-station apparatus shown in Fig. 4, 1 is the telephone-switch, 2 is the subscriber's hand-telephone, 3 is the battery-transmitter, 4 is the primary of its induction-coil, 5 is the secondary of its induction-coil, and 6 is the transmitter-battery. The contact-points of the switch and the circuits are substantially as shown. The calling generator and bell are not shown, as they are not necessary to illustrate the operation of the test system. Line No. 1^a and line No. 1^b represent the two sides or branches of the metallic-circuit line of the subscriber. It will be seen that the battery is in the circuit of the line, as is also the battery-transmitter and primary of the induction-coil, and that when the telephone is off from its switch a short local circuit is closed, in which is the battery, the transmitter, and primary of the induction-coil, and that the battery therefore operates as a transmitter-battery. It also operates as a test-battery for its line, as will hereinafter appear.

The circuit of each subscriber's line may be traced as follows: One branch, starting out from one side of the subscriber's-station apparatus, is connected with all the contact-pieces *j j* of the switches of the line on the several boards. The other branch, starting out from the other side of the subscriber's-station apparatus, passes successively through the pairs of contact-points normally in contact of its switches on the several boards, being connected in each case to the spring *g* first. From the last contact-point *h* the line passes or is connected to all the test receiving instruments on the several boards on the other side of the instruments from what their test-plugs are connected. The connections, line No. 1^a and line No. 1^b in Fig. 2, are for the line of which the subscriber's-station apparatus shown in Fig. 4 is a part.

The lines and the test receiving instruments are not normally grounded, but the test receiving instruments are open to the ground at the central office, and an accidental ground on the line tested between the subscriber's station and the pairs of line-switch contact-points would not occasion, on testing, a false signal that the line was free when it was switched at the central office, as would be the case were the test receiving instruments connected with the ground at the central office. It is well known that such accidental grounds are liable to occur on metallic circuits, but in the system described above such a ground would not affect the testing or other operation of the system.

It is apparent that each line is normally

open at the central office and that its battery is on closed circuit only when in use. It is also apparent that when a test-plug is applied to the contact-piece *j* of any line and the line is not switched there is a complete circuit through the line, the subscriber's battery, back to the central office, and through the pairs of contact-points of the switches of the line and the test receiving instrument to which the plug belongs, and the instrument being energized by the battery will respond and indicate that the line is not in use. If, on the other hand, the line is switched at any board, this test-circuit is opened at the pair of contacts at the board where the line is switched and the instrument will not respond. The operator will then know that the line is in use and will not connect to it.

I have not indicated in detail the calling apparatus or the operator's answering and connecting apparatus, as it is not necessary to do so in the illustration of my invention, and well-known forms of apparatus can be used for them.

For the calling system an independent calling-circuit common to many stations—such as the Law or the American district system—may be used.

I claim as my invention and desire to secure by Letters Patent—

1. In a telephone-exchange system, a metallic-circuit telephone-line and a test receiving instrument at the central office, said line being normally connected at the central office but not elsewhere on one of its sides to one side of said test receiving instrument and open on its other side to said instrument, and said instrument being open to the ground in combination with an electric battery at the subscriber's station in the circuit of said line when it is not switched for conversation, a switching device to disconnect said line from its normal connection with said test receiving instrument when the line is switched for conversation, and a switch testing plug or device adapted, at the will of the operator, to connect said instrument on its other side to the side of said line normally open to it, substantially as set forth.

2. In a telephone-exchange system, two or more multiple switchboards at the central office, metallic-circuit lines connected to them and test receiving instruments, one at each board, each line being normally connected at the central office but not elsewhere on one of its sides to each of said test receiving instruments, and said instruments being open to the ground in combination with electric batteries, one in the circuit of each line at its subscriber's station when the line is not switched for conversation, switching devices, one at each board for each line to disconnect the line from its normal connection with said test receiving instruments, and switch testing plugs or devices, one for each test receiving instrument, adapted, at the will of the operator,

ator, to connect its instrument on the other side to the normally open end of any of said lines, substantially as set forth.

3. In a telephone-exchange system, metallic-circuit lines and electric batteries, one in the circuit of each line at the subscriber's station when the line is not switched for conversation, in combination with multiple switchboards for said lines at the central office, test receiving instruments, one for each board, switches for said lines, one for each line on each board, each switch having a pair of contact-points normally in contact but opened to each other when its line is switched for conversation, one side of each line passing successively through said pairs of contact-points of its switches on the different boards and thence connected to one side of each of said test receiving instruments and not connected to it elsewhere, and said instruments being open to the ground, test bolts or pieces one for each line on each board and to each of which the other side of its line is connected, and switch-testing plugs or devices, one for each of said instruments and each adapted, at the will of

the operator, to connect its instrument on the other side to any test bolt or piece located at its board, substantially as set forth.

4. In a telephone-exchange system, metallic-circuit lines, multiple switchboards for said lines and switches, one on each board for each line, in combination with test receiving instruments, one at each board, each instrument being open to the ground, and normally connected on one side to one side or branch of each of said lines, but disconnected from the line when the line is switched for conversation, and connected on its other side to a switch testing plug or device, adapted, at the will of the operator, to be brought into connection with the other side or branch of the line when the line is not in use, substantially as set forth.

In witness whereof I hereunto subscribe my name this 9th day of July, A. D. 1888.

MILO G. KELLOGG.

Witnesses:

MILTON HEAD,
CALVIN DE WOLF.