

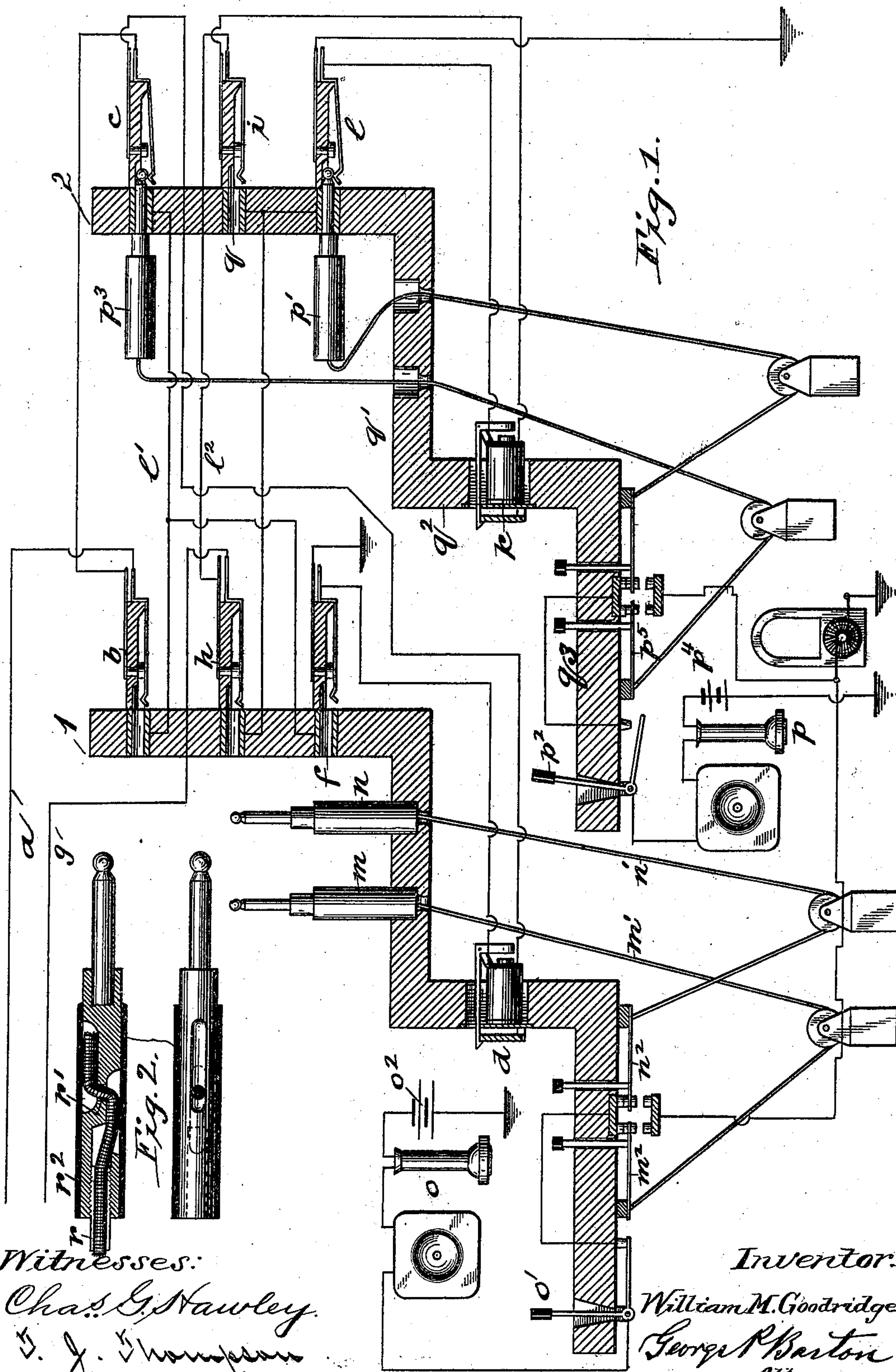
(No Model.)

2 Sheets—Sheet 1.

W. M. GOODRIDGE.
MULTIPLE SWITCHBOARD APPARATUS.

No. 504,345.

Patented Sept. 5, 1893.



Witnesses:

Chas. G. Hawley

D. J. Chapman

Inventor:

William M. Goodridge

George R. Barton
Attorney.

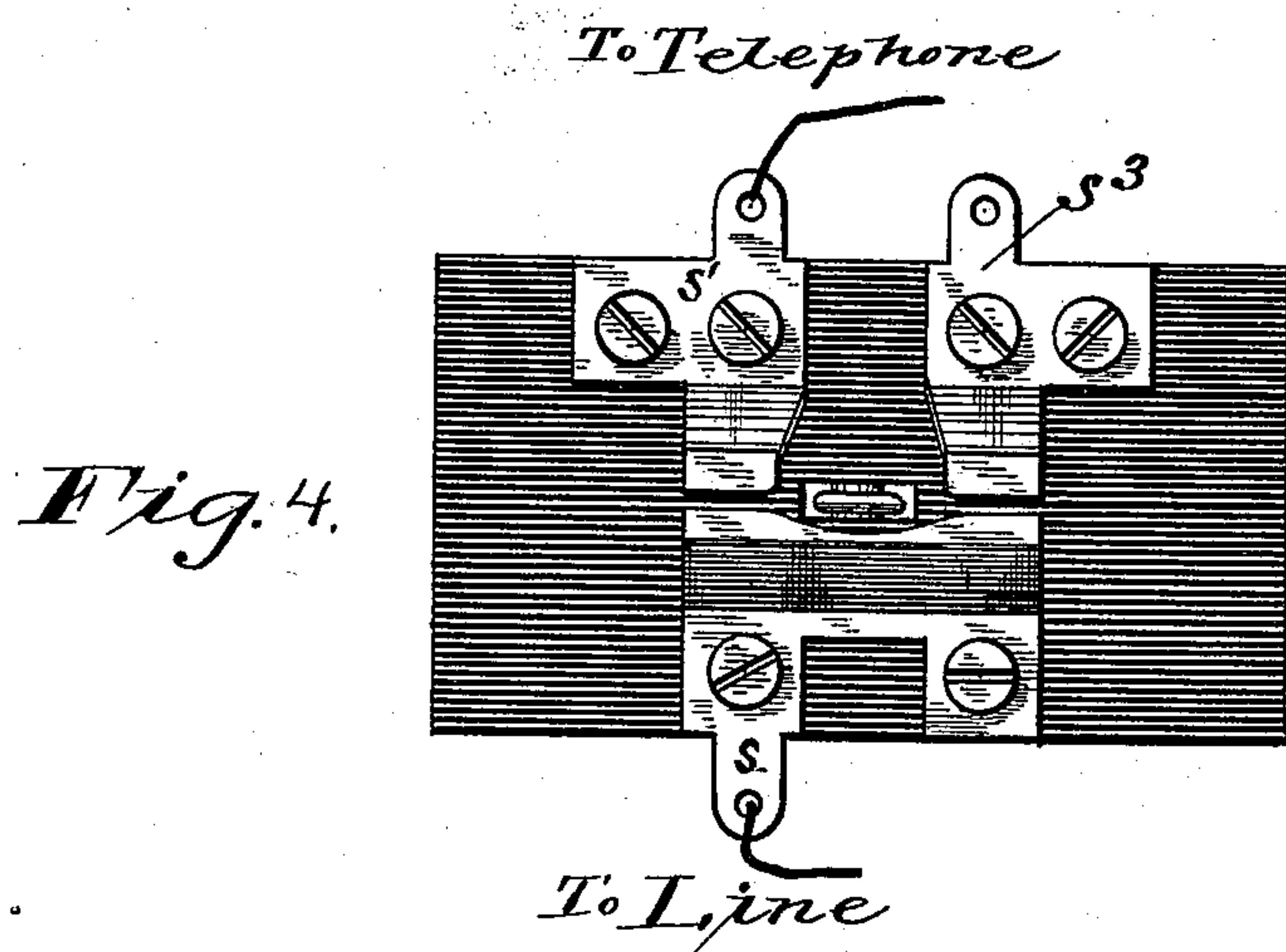
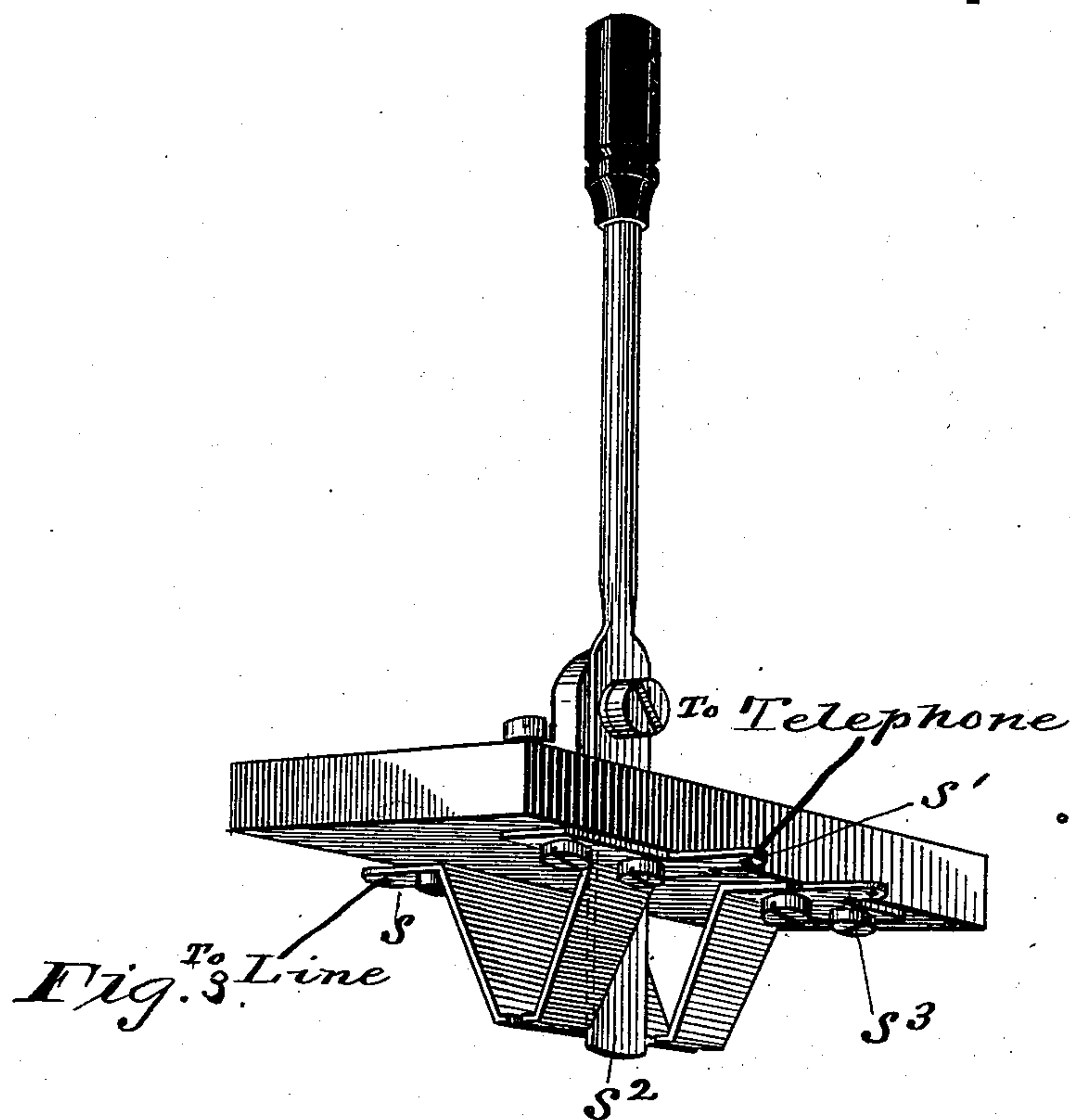
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By George P. Barton
Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM M. GOODRIDGE, OF HIGHLAND PARK, ASSIGNOR TO THE WESTERN
ELECTRIC COMPANY, OF CHICAGO, ILLINOIS.

MULTIPLE-SWITCHBOARD APPARATUS.

SPECIFICATION forming part of Letters Patent No. 504,345, dated September 5, 1893.

Application filed January 12, 1889. Serial No. 296,192. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM M. GOODRIDGE, a citizen of the United States, residing at Highland Park, in the county of Lake and State of Illinois, have invented a certain new and useful Improvement in Multiple-Switchboard Apparatus, (Case No. 8,) 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.

The object of my invention is to provide ready means for making the connections and disconnections between the telephone lines at the central office.

As to the state of the art prior to my invention reference is made to Letters Patent No. 283,334, granted Leroy B. Firman August 14, 1883, and No. 305,021, granted Charles E. Scribner September 9, 1884; No. 330,060, granted Charles E. Scribner November 10, 1885; No. 356,426, granted Charles E. Scribner January 18, 1887; No. 367,754, granted me August 2, 1887, and No. 384,644, granted Charles E. Scribner June 19, 1888. In none of the prior single cord systems is it possible to connect any two lines together upon any one of the switch boards which the operator may choose to elect or happen to find convenient. All the connections between subscribers' lines must be made at the board upon which one of the two lines to be connected has its terminal cord and plug. By the use of double cords, as hereinafter described, the operator is enabled to make the ordinary connection upon the board on which is placed the calling subscriber's annunciator so that the calling annunciator may be utilized as a clearing out signal, and also the same lines when desired may be connected together between their switches upon any one of the other boards as may be convenient, say at night or on Sundays when the calls are few.

My invention consists in placing the individual annunciators of the different lines each between the regular spring jack of the line on the last board and the answering spring jack of the line upon one of the boards, in combination with pairs of cords and plugs and switching apparatus constructed and arranged as hereinafter described.

My invention also relates to the manner of attaching the cord to the terminal plug and to the listening in key.

My invention will be readily understood by reference to the accompanying drawings, in which—

Figure 1 is a diagram showing two telephone lines connected with two multiple switch boards, together with the key board apparatus embodying my invention. Fig. 2 shows detailed sectional views of the plug and the manner of connecting the cord therewith. Fig. 3 is a perspective view of the listening in key. Fig. 4 is a view of the same from below.

I will describe my invention first as illustrated in Fig. 1. Telephone line *a* is connected through the spring and contact of switch *b* upon the first board and thence through the spring and contact of switch *c* on the second board, and thence through the individual annunciator *d* on the first board and thence through the answering spring jack *f* of the first board, and thence to ground. Line *g* in the same way is connected through spring jack switch *h* of the first board, spring jack switch *i* of the second board and thence through individual annunciator *k* on the second board and thence through answering spring jack *l* and thence to ground. It will be understood that a large number of such lines are provided in each exchange, each line being provided with a different spring jack switch on each of the switch boards, and each line including an individual annunciator and an answering spring jack upon one of the boards. The lines are thus distributed between the operators at the different boards so that each operator will answer the calls of a particular set or group of subscribers. Each telephone line is provided with its test circuit as described in said Scribner patent. Thus line *a* is provided with the test circuit *l'* which is connected with the frame or test piece of each of the switches *b c f*. Telephone line *g* in like manner is provided with its test circuit *l''* connected in a similar manner with the insulated frame or test piece of each of the switches *h i l* of line *g*. At each board I provide pairs of flexible cords and plugs. In Fig. 1 I have shown one such pair at each of the switch boards. At board 1 the terminal plugs *m n*

are shown in their normal positions resting in their sockets in the cord shelf. Plug m is the terminal of cord m' in the circuit of which is included the usual calling key m^2 ; the other
 5 cord n' of the pair is connected with terminal plug n and in the circuit of this cord n' is included the usual calling key n^2 . The operator's telephone o is included in a ground branch which may be connected or disconnected at will from the cords by means of a
 10 listening in key o' as shown. A test battery o^2 is included in circuit with the telephone.

I will now describe the operation of my system as illustrated in Fig. 1. Suppose a call
 15 is sent in over line g throwing down the annunciator k ; the operator at board 2, listening at telephone p , will immediately insert one of the pairs of plugs into the answering spring jack l of the line. Thus as shown plug
 20 p' of the pair which is nearest the spring jack l is inserted in said answering spring jack l . When plug p' is thus inserted, the listening in key p^2 will be in position to connect the telephone p to the pair of cords, so that the operator listening at telephone p may receive the
 25 order sent over line g . Assume this order to be for connection with line a , the operator by means of the other plug p^3 of the pair first touches the test piece of spring jack switch c to determine whether line a is busy. If the
 30 line is busy the circuit of test battery p^4 will be closed through telephone p to the tip of plug p^3 and thence over test wire l' to the switch at which connection is made with said
 35 line a , and the cross being established between line a and test circuit l' the circuit of test battery p^4 will be complete to ground through telephone p and the operator listening at telephone p will hear the click due to
 40 the closing of the circuit and will know that the line is busy. If, however, the line tested is idle the operator will insert plug p^3 as shown into spring jack switch c , thus completing the circuit. By means of calling key
 45 p^5 she then sends current over line a to call up the subscriber wanted. Thereupon listening in key p^2 is brought to the position shown, disconnecting the telephone p from the circuit of the connected lines. The two
 50 lines thus connected will include in their circuit the individual annunciator k of the calling subscriber; the shutter of annunciator k having been restored, the annunciator thus left in circuit serves as a clearing out device.
 55 The operator may then proceed with other connections in the same manner. If now, after these lines have been connected, shutter k should fall the operator will know that it is a disconnecting signal since she will find
 60 the answering spring jack corresponding to shutter k occupied. I preferably place the spring jack switches upon the upright portion q of the board in the usual manner. The plugs I preferably arrange upon a cord shelf
 65 q' . The annunciators I place upon the frame q^2 in rows in front of the operators, while the calling keys and listening in keys are placed

upon the shelf q^3 below. By this arrangement the plugs and cords are separated from the keys and are not liable to become tangled,
 70 the annunciators occupying a position intermediate between the cord shelf and the key shelf.

As shown in Fig. 2 the flexible insulated cord r is inserted through an opening in the
 75 end of the plug handle. The end of this cord being bared is inserted at an angle through another opening r' . The rubber sleeve r^2 is then placed over the metallic portion of the
 80 plug as shown so as to bind the cord in position and is the only part of the plug that is composed of insulating material, the bite or friction of the bare cord passing the opening r' , serving to prevent the cord from being
 85 pulled out, while at the same time a most perfect electrical connection is provided between the flexible metallic cord and the metallic portion of the plug.

As shown in Figs. 3 and 4 the plate s may be considered as connected with the line lead-
 90 ing to the cords while the plate s' is connected with the line or wire leading through the telephone and test battery to ground. When the metallic lever s^2 is between pieces s and
 95 s' the telephone will be connected with the cords, the lever s^2 forming the medium of connection between said springs or contact pieces s s' . The spring or contact s^3 I preferably place in the position shown; this con-
 100 tact or spring s^3 as used in my system has no electrical connection with any of the lines; it serves simply as a guide for the lever s^2 .

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

1. The combination with two telephone lines each connected with a separate spring jack switch on each of two or more switch
 110 boards, of an answering spring jack and an individual annunciator upon one of the boards in each of said lines, the individual annunciator being placed between the switch of its line on the last board and the answering
 115 spring jack switch thereof and upon the same board with the said answering spring jack switch and double cord switching apparatus, whereby said two lines may be connected together, the individual annunciator of the call-
 120 ing line being left in circuit as a clearing out signal device.

2. A telephone line in combination with spring jack switches, one in each of two or more switch boards, an annunciator included
 125 in the line at one of the switch boards and an answering spring jack switch upon the same board with the annunciator included in said line between said annunciator and the ground.

3. The combination with two telephone lines each connected with two or more switch
 130 boards and each including an answering spring jack switch in its circuit between the individual annunciator thereof and the ground, of a pair of cords with terminal

plugs, one plug of the pair inserted in the answering spring jack of one of the lines and the other plug inserted in the switch of the other line upon the same switch board, whereby the individual annunciator of the line having the plug inserted in its answering spring jack is left in circuit as a clearing out device, while the individual annunciator of the other line is disconnected from the circuit.

4. The combination with a pair of cords provided with terminal plugs, of a ground branch including a telephone, a test battery and a single listening-in key, telephone lines each connected with two or more switch boards, and each provided with a test circuit, whereby while either of said plugs is inserted in the spring jack switch of one line the other plug of the pair may be used to test any other line at the same switch board; substantially as and for the purpose specified.

5. A plug with a flexible insulated cord inserted through an opening in the end of the plug handle and extended through another opening r' at an angle to the first opening, the insulating covering being removed from the end of the cord passing through said opening r' , in combination with the rubber sleeve r^2 placed over the metallic portion of the handle of the plug, whereby the cord is held in place and provided with a perfect electrical connection with a metallic portion of the plug, substantially as and for the purpose specified.

In witness whereof I hereunto subscribe my name this 2d day of January, A. D. 1889.

WILLIAM M. GOODRIDGE.

Witnesses:

GEORGE P. BARTON,
ELLA EDLER.