

Fig. 1.

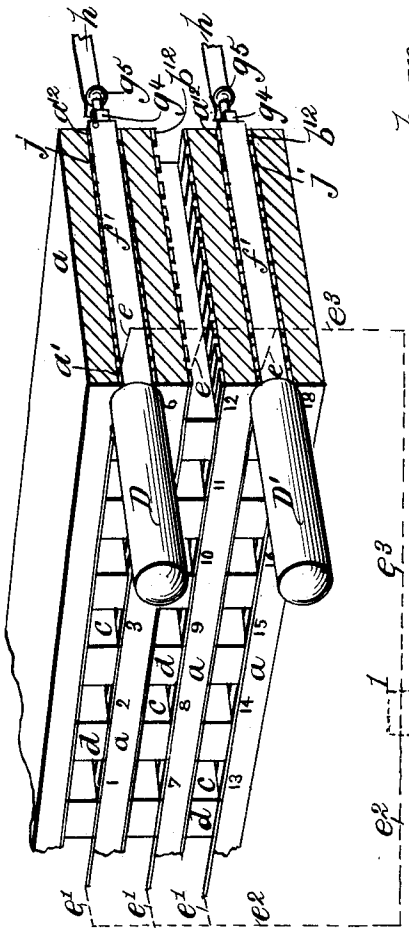


Fig. 4.

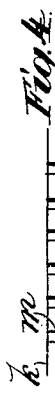


Fig. 5.



Fig. 6.



Fig. 7.



Fig. 11.



Fig. 2.

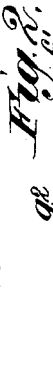


Fig. 3.



Fig. 9.



Fig. 8.



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Patented Dec. 4, 1900.

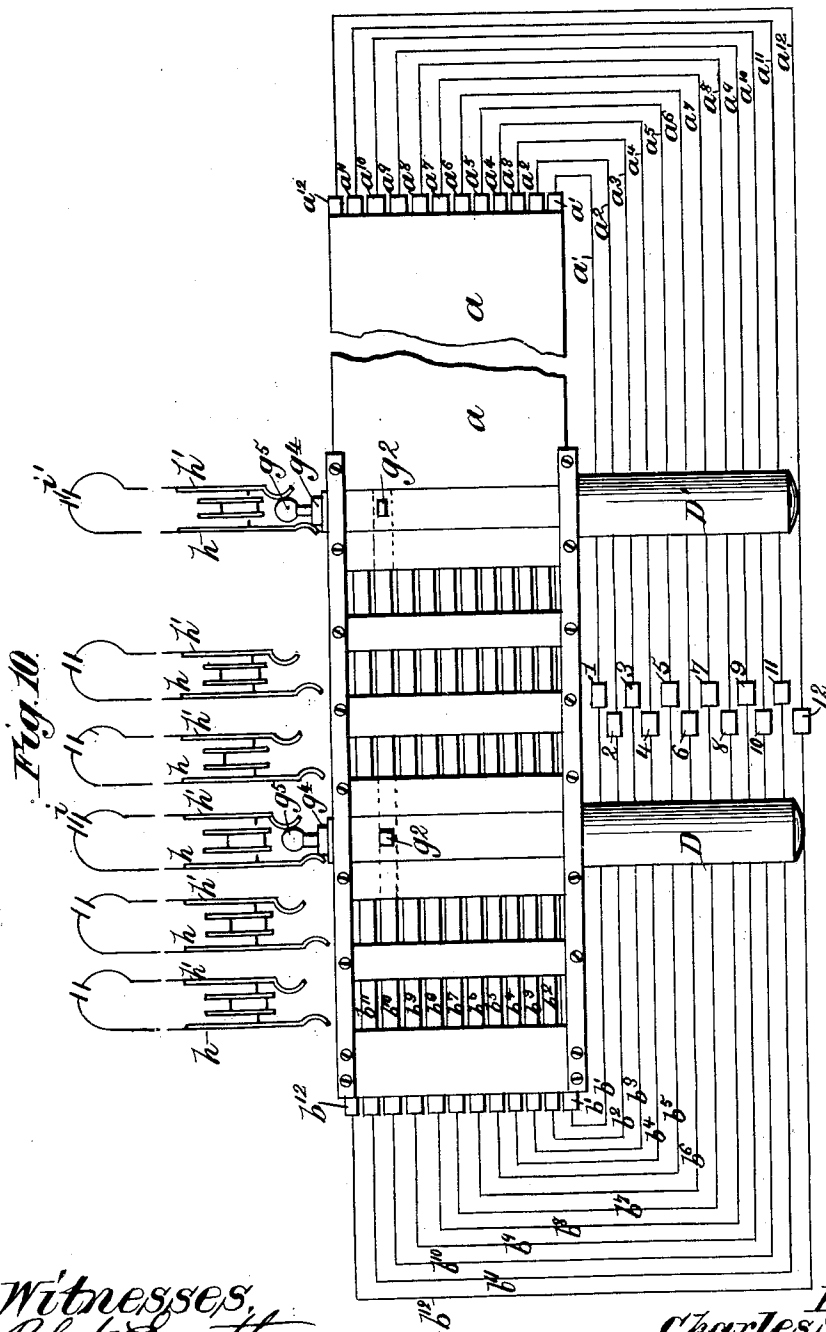
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SWITCHBOARD FOR TELEPHONIC OR TELEGRAPHIC PURPOSES.

(Application filed Oct. 7, 1896.)

(No Model.)

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# UNITED STATES PATENT OFFICE.

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## SWITCHBOARD FOR TELEPHONIC OR TELEGRAPHIC PURPOSES.

SPECIFICATION forming part of Letters Patent No. 663,367, dated December 4, 1900.

Application filed October 7, 1896. Serial No. 608,172. (No model.)

*To all whom it may concern:*

Be it known that we, CHARLES SHORE, residing at Bolton, and CHARLES HEAP, residing at Caldershaw Rochdale, in the county of Lancaster, England, subjects of the Queen of Great Britain, have invented new and useful Improvements in and Relating to Switchboards to be Used for Telephonic or Telegraphic Purposes, of which the following is a specification.

Our invention relates to multiple switchboards for telephone-exchanges, our object being to dispense with the flexible cords now in common use for completing the talking-circuits.

Our invention also comprises other features, all of which will be fully described in the following specification and then particularly pointed out and defined in the claims.

For the purposes of the following description, reference is had to the accompanying drawings, in which—

Figure 1 is a perspective view showing a portion of a multiple switchboard constructed in accordance with our invention, two plugs being shown inserted in the jacks. Fig. 2 is an elevation of one of the plugs. Fig. 3 is a central longitudinal section of the same, part of the handle being in elevation. Figs. 4, 5, and 6 are detail views showing modified forms of contact-pieces disconnected from the switchboard. Fig. 7 is a view showing a further modification of the same. Fig. 8 is an end elevation of the parts shown in Fig. 7. Fig. 9 is a view showing in three parts an end elevation of the arrangement shown in Figs. 4, 5, and 6. Fig. 10 is a plan view of the switchboard with two plugs inserted to connect two substations for conversation. Fig. 11 is a detail perspective view of the modified form of strips and contact-pieces, the strips being broken away at each end thereof.

The switchboard is composed of a series of plates *a* of non-conducting material, said plates being arranged horizontally, as shown in Fig. 1, one above another, with a suitable intervening space. They may be formed of wood, ebonite, or other suitable material, and upon their adjacent surfaces are attached narrow metallic strips running longitudinally

and slightly separated from one another. For example, on the under surface of one plate *a* are strips *a'*, *a''*, *a'''*, &c., to *a*<sup>12</sup>, and on the upper face of the next plate below are similar strips *b'*, *b''*, *b'''*, &c., to *b*<sup>12</sup>, placed directly under and parallel with the strips *a'*, *a''*, &c. At equal intervals non-conducting strips *d* are inserted between the two series of metallic strips, forming spaces *c*, which serve as jacks. The strip *a'* in each of the upper series is connected by a wire *e* to a wire *e*<sup>3</sup>, and the strips *b'* in the lower series are similarly connected by a wire *e'* to a wire *e*<sup>2</sup>, both wires *e*<sup>2</sup> and *e*<sup>3</sup> being connected to a single switch 1. (See Fig. 10.) In like manner the strips *a''* are connected by wires *e'* to a single wire *e*<sup>5</sup>, and strips *b''* are connected by wires *e'* to a single wire *e*<sup>7</sup>, both *e*<sup>5</sup> and *e*<sup>7</sup> being connected to a second and separate switch 2. Similar connections are made for the remaining strips *a'''*, *b'''*, *a*<sup>4</sup>, *b*<sup>4</sup>, &c., up to and including the final strips *a*<sup>12</sup>, *b*<sup>12</sup>.

To connect two substations for conversation, two plugs are required, the construction being the same for both. Each consists of an ebonite handle *f*, having an attached non-conducting portion *f'*, which enters the jacks *c* and is provided with two metallic pieces *g*, *g'*, arranged inside the hollow portion *f'*, opposite each other and out of contact. These pieces have contact-terminals *g*<sup>2</sup>, *g*<sup>3</sup>, which project in opposite directions through openings in the portion *f'*, said terminals projecting beyond the opposite outer surfaces of said portion *f'* and at such a distance from the ebonite handle *f* that the contact-terminals engage the strips *a'*, *b'*. A second pair of plugs differs from these only in the location of the said contact-terminals at such a point that when the plug is inserted in the jack they will engage the strips *a*<sup>2</sup>, *b*<sup>2</sup>. In a third pair they will be so located as to engage the strips *a*<sup>3</sup>, *b*<sup>3</sup>, and so on. At the end of the part *f* is a contact *g*<sup>4</sup> and a separate contact-terminal *g*<sup>5</sup>, which when the plug is placed in the jack engage contact-springs *h*, *h'*, respectively, at the back of the board. These springs form part of the talking-circuit between two substations, which are conventionally indicated at *i* and *i'* in Fig. 10. To establish this circuit, a subscriber calls the central office or exchange

in the well-known manner, (not shown in this case,) and the operator at the latter point inserts a plug D in the jack of the subscriber, who calls and inquires what station he desires to communicate with, and, upon ascertaining, the second plug D is inserted in the jack of the subscriber wanted. The circuit now is from substation *i* through spring-contact *h*, to which the subscriber's wire is connected, through the contact *g*<sup>4</sup> of plug D to the upper spring *g*<sup>1</sup>, and contact *g*<sup>2</sup>, which is shown in Fig. 10 as engaging the strips *a*<sup>10</sup>. Through this strip the current passes to the contact-terminal *g*<sup>2</sup> of plug D', and thence by spring *g*<sup>1</sup> and contact *g*<sup>4</sup> to the spring-contact *h* and to the other subscriber's wire. From the second substation *i'* the current returns to the spring-contact *h'* and contact-terminal *g*<sup>5</sup> of the plug D', to the lower spring *g* of said plug, to contact-terminal *g*<sup>3</sup>, metal strip *b*<sup>10</sup>, contact-terminal *g*<sup>3</sup>, and spring *g* of plug D to contact-terminal *g*<sup>5</sup> and spring *h'* of station *i*. In Fig. 1 the plugs D D' are shown inserted in jacks in different rows of the switchboard—the plug D, for example, in jack No. 6 and plug D' in jack No. 18. In this case the plug D' has springs *g g'* of the same length as those on the plug D, so that the contact-terminals *g*<sup>2</sup> *g*<sup>3</sup> will engage the corresponding strips in the respective jacks, which are connected by wires leading to a single switch, as already described. When conversation is over, the subscriber "rings off" in the well-known manner.

In Figs. 4, 5, 6, 7, 8, 9, and 11 we have shown a modified form of strip *a'*, &c., *b'*, &c., in which the strip is formed in three parts *k k' k*<sup>2</sup>, insulated from each other by pieces *l l'*. These strips are so narrow that all three together take up no more space than those already described. Each part is provided at

the top edge thereof with contact-pieces *m m' m*<sup>2</sup>, which have the appearance, when placed together, of a solid strip. (See Figs. 7 and 8.) When in place in a jack, the strip appears as one piece, and any of the contacts *m, m', or m*<sup>2</sup> may make contact with the terminals *g*<sup>2</sup> *g*<sup>3</sup> of the plugs, so that three times as many connections may be made as would be possible where the strips are composed of one piece each.

What we claim is—

1. In a multiple switchboard for telephone-exchanges the combination with a plurality of jacks, each bearing an upper and lower series of insulated metal strips, of plugs without cords having non-conducting portions insertible in the jacks, contact-terminals projecting from said portions to engage the metal strips, spring-contacts to engage projecting ends of said plugs, and electrical connections between the corresponding metal strips of the separate jacks, substantially as described.

2. In a telephone-switchboard, the combination with a plurality of jacks each having two separate series of insulated metal strips, of wires connecting the strips of one jack with the corresponding strips of the other jacks, plugs having contact-terminals projecting from opposite sides of their non-conducting insertible portions, to engage said metal strips, said contact-terminals being also connected to contacts at the end of the plug, and spring-contacts arranged to engage said contacts on the ends of the plugs, when the latter are inserted in the jacks, substantially as described.

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