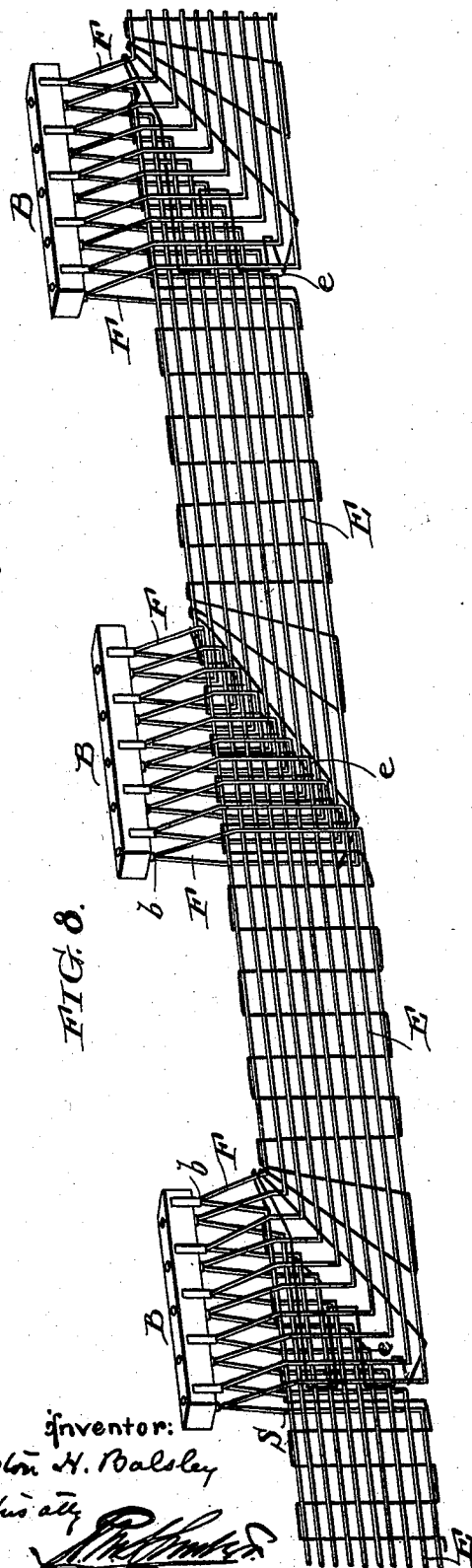
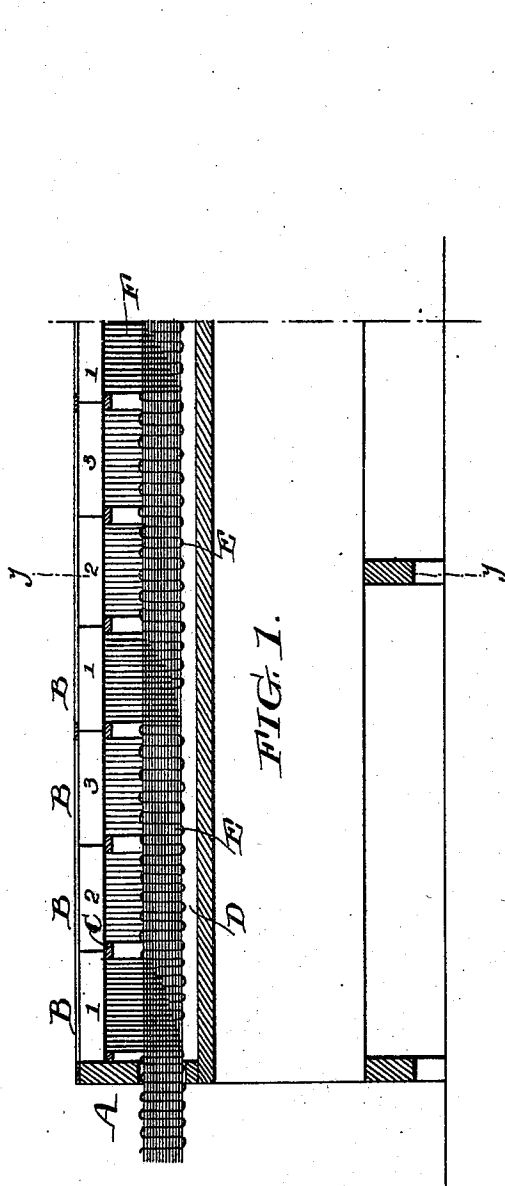


2 Sheets—Sheet 1.

No. 504,464.

Patented Sept. 5, 1893.



Witnesses:
Henry D. [unclear]
Geo. [unclear]

Inventor: Upton H. Balsley
By his atty J. M. [Signature]

UNITED STATES PATENT OFFICE.

UPTON H. BALSLEY, OF PHILADELPHIA, PENNSYLVANIA.

SWITCHBOARD FOR TELEPHONING PURPOSES.

SPECIFICATION forming part of Letters Patent No. 504,464, dated September 5, 1893.

Application filed June 8, 1889. Serial No. 313,578. (No model.)

To all whom it may concern:

Be it known that I, UPTON H. BALSLEY, of the city and county of Philadelphia and State of Pennsylvania, have invented an Improvement in Switchboards for Telephoning Purposes, of which the following is a specification.

My invention has reference to switch boards for telephonic purposes, and consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings which form a part thereof.

Heretofore great difficulty has been experienced in the electrical connection of various sections of the different switch boards of a central station, the difficulty arising out of the fact that the said electrical connections between the various contacts of corresponding sections on different boards have been made in the form of separate wires, and so huddled together that it was absolutely impossible to trace a wire or make a new connection, or repair a broken circuit without the utmost difficulty, loss of time, and the interruption of the service. The connecting wires were greatly intermingled and tangled; and in switch boards where several thousand subscribers are in circuit, the mass of cables so formed in the compartment immediately beneath the sections was of such a nature that when it was necessary to make repairs on any section the entire mass of cables had to be raised to permit the switch section being lifted sufficiently to expose the terminals of the switches. New wires in repairing would have to be pulled through the mass of cables by means of a long metallic hook, with the disadvantage that every repair of the switch board as an entirety still further complicated the mass of wires forming the electrical connections between the various switches.

In carrying out my invention I dispense entirely with the loose cables or connecting wires, and provide in lieu thereof, a conductor band, fabric web, or ribbon in which a series of electrical conductors formed of insulated wires are tied or woven into a flat web or ribbon which contains in its vertical direction as many wires as there are contacts in any one of the switch sections. It will thus be seen that if there are twenty socket pieces

and twenty spring contacts there will be required forty insulated wires in the vertical width or depth of the web or ribbon. It is, however, apparent that this number is not essential as the socket contacts may have a different web or ribbon from that employed for the spring contacts. By this construction, the conductors which connect a series of sockets in a row are united into a band, web, ribbon or fabric which is composed of the wires which connect a series of sockets in a row of one section of the switch board with the row of corresponding sockets in the next section of the switch board, and when it is desired to make any repairs, the section in trouble may be lifted up bodily and draw with it the vertical ribbon or web which contains every wire leading to that section; and this elevation of the wires and sections can take place without in the least disturbing the repose of the remaining wires of the switch board. The advantage of this construction is self apparent, and on large switch boards containing as many as ten thousand subscribers its advantage is inestimable, particularly as in telephonic operations the subscribers must not be kept from the use of their lines for more than an extremely short period at best.

I do not confine myself to any particular form of web or fabric though I prefer to make it as illustrated, that is to say, in which wires are arranged in the same, or substantially the same plane preferably in pairs the wires of which are twisted together, and tied together by a weft cord or other preferably flexible material. A desirable construction of conductor fabric for this purpose is clearly set out in my Letters Patent No. 417,402, dated December 17, 1889.

Referring to the drawings:—Figure 1 is a sectional elevation of a switch board embodying my invention taken on line *xx* of Fig. 2. Fig. 2 is a cross section of a switch board embodying my invention taken on line *yy* of Fig. 1. Fig. 3 is a perspective view showing the method of connection between the web or ribbon conductors, and the corresponding switch connections of separate boards. Fig. 4 is a transverse section across a portion of the conductor fabric. Fig. 5 is an elevation illustrating the construction of the conductor fabric. Fig. 6 is a diagram illus-

trating the connection of the conductors of the web or ribbon with the terminals of the switches. Fig. 7 is a cross section illustrating one form of switch such for instance as is set out in my Patent No. 417,402, dated December 17, 1889, and Fig. 8 is a perspective view similar to Fig. 3 on an enlarged scale showing the successive sections or portions of the web between successive sections of board separate from one another.

A is the frame work of the switch board.

B B are the switch sections and consist of insulated series of contacts of suitable construction which are removably placed in position side by side and end to end as illustrated.

In Fig. 1 the sections marked 1 correspond to one series of subscribers and are connected as indicated in Figs. 3 and 6. Likewise sections marked 2 belong to another series of subscribers, and are connected in the same manner, and so on with the remaining sections. It will be seen that a wire entering the switch board and being connected with the first contact of section 1, will through the web or ribbon E of insulated conductors be connected with the first contact of each of the successive corresponding sections 1 throughout the entire switch board, so that any operator who has control of a given number of sections (including all of the subscribers) may couple the plugs corresponding to her subscribers with any one of the total number of subscribers of the entire central station.

G represents the wire-making up the web or ribbon, and these are tied together in the form of a web or ribbon by the wefts *g*, which are preferably of cord or other flexible material. It is evident that in place of cord wire might be used, and in fact the flexibility might be dispensed with when considering my invention broadly. Wires G are bent up in succession to couple with the terminals on the switch sections, forming the vertical parts F which connect directly with the terminals *b* and *b'* of the said switch sections B. This upwardly bending of the ends of the ribbon E in the manner described forms oblique ends which are indicated at *e* in Figs. 1 and 3. It is a preferable construction, though not essential to my invention when considered broadly. The webs or ribbons are arranged side by side in a vertical position within the box D extending longitudinally on the frame A and under the switch sections B. The vertical parts or conductors F between the ribbon and the contact terminals are equal at least to the depth of the sections B, and preferably somewhat greater so that as the section is raised for exposing the terminals the upper edges of the webs or ribbons E shall just reach the supports C for the switch sections B. Each of the conducting wires which compose the web or ribbon is turned or bent up from the web, preferably at a right angle as stated, and this turned or bent up portion F is connected with its appropriate terminal of

a switch section and then returns down again to the web and continues in the web until it reaches a position adjacent to the next corresponding switch section, when it is again bent or turned up and connected with the corresponding terminal of that switch section and then returns again to the web and continues to the next switch section and so on, connecting corresponding terminals of successive sections of switch board.

In the construction shown in Fig. 8 the successive sections or portions of the web between each two successive corresponding sections of board are shown separate, the portion of the web from the first section of board to the second being separate from the portion from the second section of board to the third and so on, the arrangement of the wires, however is the same as in the construction shown in Figs. 1, 3 and 6, the difference being merely that the incoming portions F of the wires at any section are not bound together with the outgoing or returning portions of the same or corresponding wires. It will be seen that in switch section B all of the connecting wires F may be lifted upward in the switch board so as to expose all of the connections between the said conductors F and the switch terminals B B', and thereby allow in the most ready manner repairs to be made in case of accident by the breakage of any connection. The fabric forming the web or ribbon E may have the conductors G G thereof twisted upon each other in pairs, and such pairs of insulated conductors treated as a single warp in weaving the web or ribbon as shown in Fig. 5. The object in twisting the wires in this manner is to overcome as far as possible induction. This twisting however is not essential in the carrying out of my invention. Where the wires F are bent up vertically forming the continuation of the horizontal conductors G they are caused to lie against the face of the web or ribbon and are preferably tied thereto along the upper edge as at S Fig. 3.

It is immaterial to my invention what particular manner of holding the warps in the form of a flat web or ribbon may be used as any simple mechanical expedient may be resorted to, though I prefer to weave the ribbon or web in a loom. The web or ribbon might, if desired, consist of the wires arranged in the same plane and held in such relative position in any way. In fact the wires may be connected in any suitable manner so long as they are substantially in the same plane and form in effect a flat web or ribbon; hence in using these terms I do not confine myself to the particular construction shown.

Fig. 6 will give a clear illustration as to the method of connecting the conductors of the web or ribbon E with the terminals of the switches, and showing how such web or ribbon is electrically connected throughout the entire switch board so far as connecting similar switches on different boards is concerned.

It will be apparent that while the preferable construction is one in which the webs of conductors hang vertically beyond the switch sections, they may be arranged horizontally if so desired, for instance, as would be illustrated by turning Fig. 2 on one side so as to bring what was before the surface of the table of the switch board, into a vertical position.

In Fig. 2 the central portion of the switch board consists of series of tubes T, the function of which is to support the weights of the contact plugs used in the most popular switchboards, and which by suitable circuits may be employed to couple one subscriber with another. Any wire in these webs or ribbons may be readily traced and defects can thus be easily and quickly located. While I prefer the construction shown, I do not limit myself to the details thereof as the invention may be modified in various ways without departing from the spirit of my invention.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a telephonic switch board, the combination of two or more switches for each of different operators, with two or more connecting wires arranged between the terminals of said switches and connected between the switches to form a flat web or ribbon.

2. In a telephonic switch board, the combination of two or more series of switches for each of two or more operators, with connecting conductors between the corresponding terminals of corresponding series of switches of each operator and in which the conductors between two corresponding series of switches are arranged in substantially the same plane, and secured together so as to be movable as a unit and form a flat web.

3. In a telephonic switch board, the combination of two or more series of switches for each of two or more operators, with connecting conductors between the corresponding terminals of corresponding series of switches of each operator and in which the conductors between the corresponding series of switches are arranged in substantially the same plane and interwoven with a flexible weft thread.

4. In a telephonic switch board, the combination of two or more series of switches for each of two or more operators, with connecting conductors between the corresponding terminals and in which the conductors between two corresponding series of switches are arranged in substantially the same plane, and secured together so as to be movable as a unit forming a flat web and have their ends bent upward so as to support the horizontal portions of the conductors to the switches at a short distance below the terminals thereof.

5. In a telephonic switch board, the combination of two or more series of switches for each of two or more operators, with connecting conductors between the corresponding terminals of corresponding series of switches

of each operator and in which the conductors between the corresponding series of switches are arranged in substantially the same plane, the said conductors being formed into a flat web or ribbon and supported at a distance below the switches to the terminals of which they are connected equal to at least the depth of the switches.

6. In a telephonic switch board, the combination of two or more series of switches for each of two or more operators, with connecting conductors between the corresponding terminals or corresponding series of switches of each operator and in which the conductors between the corresponding series of switches are arranged in substantially the same plane, and connected one to the other so as to form a compact web or ribbon of conductors with their ends bent over the body of the web or ribbon and extending toward the terminals of the switches.

7. In a telephonic switch board, a series of sections of board adapted for a series of operators, a corresponding series of removable switch sections for each section of board, a series of connecting conductors for connecting the corresponding switch sections of different sections of switch board and which conductors are arranged in the same or substantially the same plane, forming a flat web.

8. In a telephonic switch board, a series of sections of board adapted for a series of operators, a corresponding series of removable switch sections for each section of board, a series of connecting conductors for connecting the corresponding contacts of corresponding switch sections of different sections of switch boards, which conductors are arranged in the same or substantially the same plane and have their ends bent at substantially right angles and united to the switch terminals, and also having their parts between the bent portions united or tied together to form a flat web or ribbon.

9. In a switch board for telephonic purposes the combination of two or more switch sections having connecting conductors of insulated wires secured together into a flat web or ribbon.

10. In a switch board for telephonic purposes the combination of two or more removable switch sections having connecting conductors of insulated wires secured together into a flat web or ribbon equal in length to substantially the distance between the sections plus the length of a section, and movable in a plane of the switch sections.

11. In a telephonic switch board, a series of distantly located and removable switch sections, and a frame work having a boxed compartment under the sections, in combination with a series of longitudinal parallel flat webs or ribbons composed of conductors uniting the corresponding distantly located switches and contained within the compartment to the rear of the switches.

12. The combination, with a multiple switch board, of the wires which connect a series of sockets in any given row of the switch board united into a web or band.

5 13. The combination, in a multiple switch board of a series of operators' sections each of which is formed of a plurality of rows of sockets or switches, with wires which connect the similar sockets or switches of the same

row of the several sections united into a web or band.

In testimony of which invention I have hereunto set my hand.

UPTON H. BALSLEY.

Witnesses:

R. M. HUNTER,

ERNEST HOWARD HUNTER.