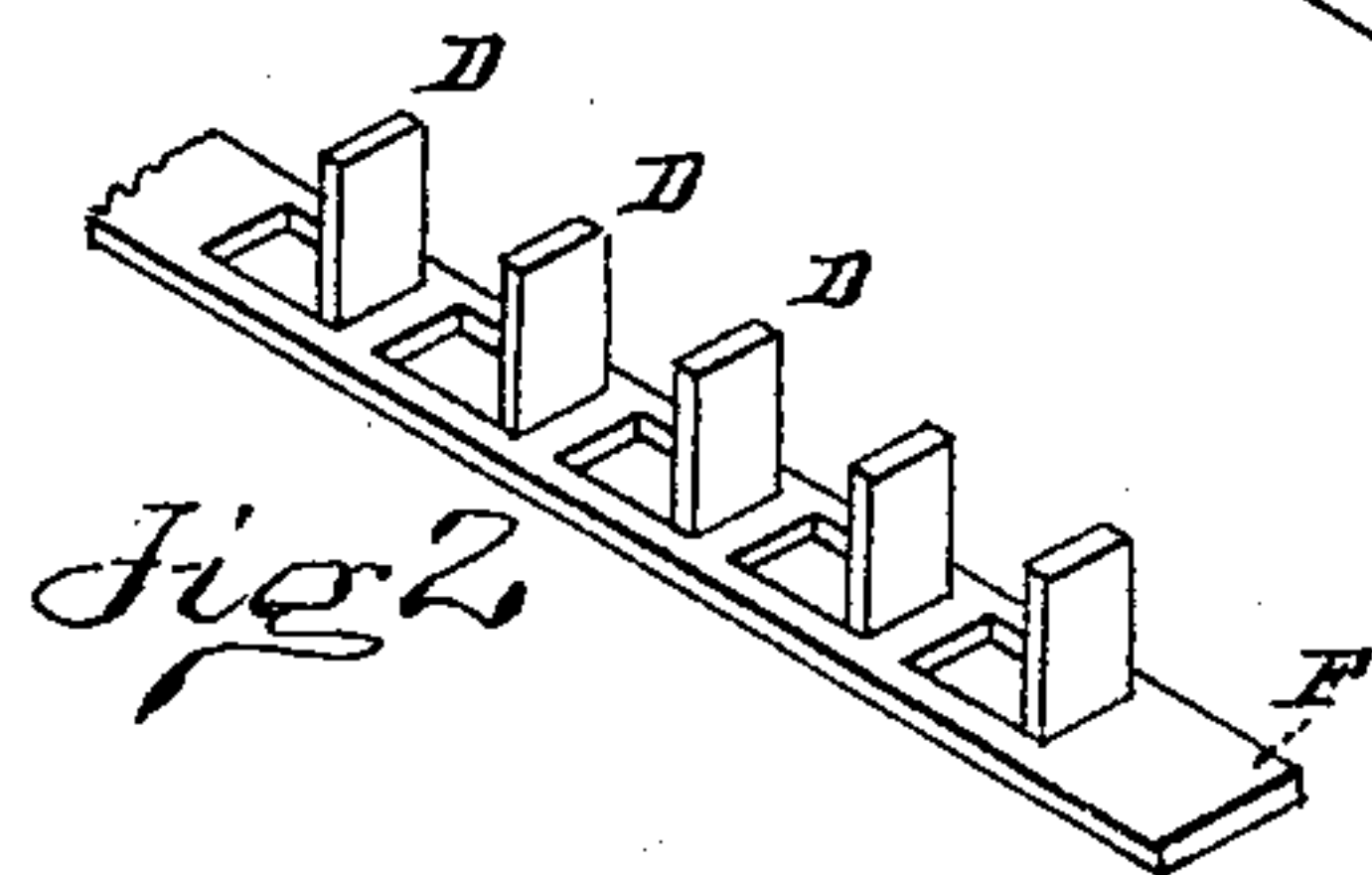
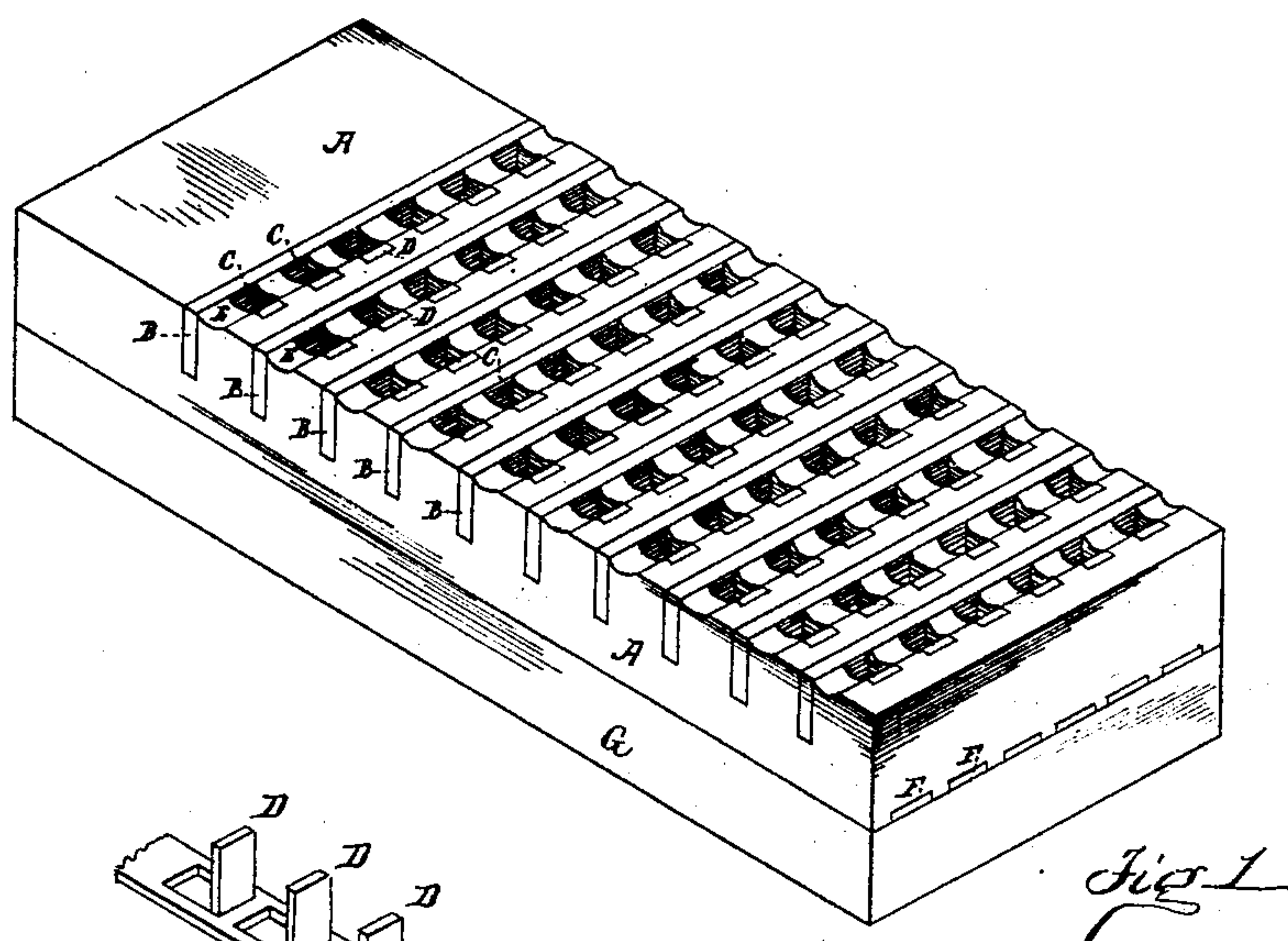


(Model.)

J. W. SEE.  
Electrical Switch Board.

No. 234,432.

Patented Nov. 16, 1880.



*Fig. 3.*

WITNESSES:

*Geo. R. Woods.*  
*Geo. P. Jangeman*

*James W. See* INVENTOR

# UNITED STATES PATENT OFFICE.

JAMES W. SEE, OF HAMILTON, OHIO, ASSIGNOR OF ONE-HALF TO JOSEPH J. McMAKEN, OF SAME PLACE.

## ELECTRICAL SWITCH-BOARD.

SPECIFICATION forming part of Letters Patent No. 234,432, dated November 16, 1880.

Application filed August 5, 1880. (Model.)

*To all whom it may concern:*

Be it known that I, JAMES W. SEE, of Hamilton, Butler county, Ohio, have invented certain new and useful Improvements in Electrical Switch-Boards and Processes for Making the Same, of which the following is a specification.

This invention pertains to switch-boards formed with series of conductors crossing each other, but insulated from each other, the switch-connections being made by means of conducting-plugs inserted in the board so as to join two conductors at their intersection.

A switch-board with one hundred vertical and one hundred horizontal conductors presents ten thousand intersections.

In the manufacture of switch-boards each intersection requires some manipulation in construction, and in the above case there would be ten thousand switch-spots to make, ten thousand spots to put in place, ten thousand spots to connect up, ten thousand nuts to screw on, ten thousand plug-holes or twenty thousand plug-holes to be accurately reamed, or ten thousand wood-screws to procure and insert, or ten thousand bendings of interlaced conductors, according to the general plan of the board's structure. Most all boards require some form of individual manipulation in the factory for each intersection. Aside from the great expense of the numerous parts, the actual erection of the parts in place is enormously expensive.

Telephonic operations are calling for switch-boards of immense proportions, and as the number of intersections increases as the square of the number of cross-conductors the expense becomes so great as to put ordinary plans of construction beyond the reach of the art.

The object of my invention is to cheapen switch-boards by reducing the number of essential manipulations in manufacture. I reduce the number of pieces and number of manipulations in construction to nearly the number of cross-conductors. I also improve the character of switch-boards.

In the accompanying drawings, Figure 1 is a perspective view of my improved switch-board; Fig. 2, a perspective view of what I will term the "vertical conductor;" and Fig.

3, a sectional view, showing the relations of the conductors.

In Fig. 1, A is a piece of mill-worked lumber pierced with as many mortises C as there are intersections of conductors. Across the face of the board are grooves, which receive and hold tightly the horizontal conducting-strips B. These strips are let in flush with the upper surface of the board, and the grooves which hold them are so located that the mortises C open into the grooves, as shown, whereby the strips B form a part of the upper wall of the mortises. The strips B may have binding-posts at their ends, so as to receive lines, or they may be used simply as cross-connectors for lines. This switch-board is to be treated and used as ordinary intersecting-boards generally are.

Upon the under side of the board are arranged vertical strips F, so located as to lie under the vertical rows of mortises C. Before being put in place these strips are run through dies which punch and throw up tongues D, as shown, so spaced and proportioned that when the strips are put in place the tongues will enter tightly into the mortises and form the lower wall of the same. The strips may have binding-posts at their ends to receive lines. Any suitable form of conducting-plug inserted in a mortise will place in communication the vertical and horizontal strips intersecting at that mortise. If desired, the board, with its strips in place, may be put under a gang-punch, and forming-pins forced down into the mortises will give to the mortises a circular shape. This, however, is not necessary, as a round or square plug can be used effectively.

It will be noticed that the surface of the board is flush; that it may be neatly painted in colors to guide the eye; that the intersections may be closely compacted, so as to keep the general dimensions down; that the material of the conductors may be cheap and thin, and that the conductors can never form contacts by displacements.

A bottom board, G, held against the top board, A, by a few wood-screws, serves to hold the strips F in place. There need be no drilling or screwing about the conductors, though, if desired, the bottom board may be



omitted, and a few screws in each vertical strip will serve to hold them. The bottom board may be perforated, so as to allow dust, &c., to fall from the mortises C.

5 It should be noticed that the conductors are formed from flat material without waste, and that the formation of the tongues D upon the strips F is a simple and cheap matter of machine-work, which does not add very much to  
10 the cost of the plain strip.

With a closely-crowded switch-board there is some difficulty experienced, even by the most expert, in following the lines of intersections so as to make proper connections. To aid in  
15 this matter I groove the face of the board, as shown at E, the grooves forming channels passing over each mortise in a horizontal row. The plug, being set in the proper groove, may be rapidly passed to the proper mortise. Similar  
20 guide-grooves may be arranged vertically in an obvious manner. In such case the conductors, instead of being flush with the face of the board, may be sunken the depth of the grooves, or the grooves may channel through them in  
25 case it is desired to keep them flush.

While the wood-work of this board is constructed of cheap mill-worked lumber, and while the conductors are of simple and cheap machine-made forms, I still reduce the expense  
30 of construction by dispensing with the necessity of fixing parts upon each other.

When an exceedingly economical construction is desired, instead of forming the non-conductor and the conducting-strips as individuals to be assembled and united, I form the non-  
35 conducting board, combine it with any suitable mold, and then form the conductors by one or more pourings of some fusible conducting material. Any alloy of suitable conducting-  
40 power and of such low fusing-point as not to burn the non-conducting board may be used. The construction of a proper mold will come within the well-known state of the casting arts. The board itself forms much of the mold, and  
45 upon the withdrawal of such supplemental mold-pieces as may be used the switch-board may be complete.

Instead of pouring the conductors in a liquid form into the non-conductor as a part of the  
50 mold, the conductors may be formed of metal and placed in a suitable mold, after which the mold is filled with any suitable non-conductor capable of being poured or forced into molds. For this purpose I propose to use artificial  
55 wood, shellac compositions, papier-maché, or any suitable clay or other composition.

The expense of my improved switch-board

constructed in the usual manner or by my improved process will be trifling compared with common switch-boards.

In the execution of the process of molding switch-boards it is not necessary that the exact arrangement of conductors shown should be adhered to. Their form and arrangement may be considerably modified without interfering with their adaptability to be formed by  
60 this process.

I claim as my invention—

1. In an electrical switch-board, the combination, with a non-conducting board having  
70 one or more series of mortises for receiving a connecting-plug and one or more conducting-strips seated edgewise in grooves in the face of said board and adapted to form part of one wall of said mortises, as set forth, of one or  
75 more conducting-strips attached to the back of said board and provided with tongues adapted to fit within and form one wall of said mortises, substantially as set forth.

2. In an electrical switch-board, the combination, with a non-conducting board having  
80 one or more series of mortises, of one or more conducting-strips having tongues, as set forth, formed of punched and thrown-up portions of the metal of said strips, substantially as set  
85 forth.

3. In an electrical switch-board, the combination, with a perforated front board and one or more conducting back strips having tongues to enter said perforations, of a back board  
90 adapted to attach to said front board and act as a clamping retainer for said back strips, substantially as set forth.

4. In an electrical switch-board, the combination, with one or more series of mortises  
95 adapted to receive a connecting-plug, of one or more guide channels or grooves in the face of said board, adapted to form a path for a plug as it is moved from one mortise to another mortise in the same series, substantially  
100 as set forth.

5. The improved process of making electrical switch-boards formed with crossed conductors fixed in a non-conducting board, which consists in placing a properly-prepared non-  
105 conducting board in a properly-prepared mold and then pouring into said mold and board a proper melted metal or alloy adapted to form said conductors, substantially as set forth.

JAMES W. SEE.

Witnesses:

JNO. R. WOODS,  
GEO. P. TANGEMAN.