(No Model.)

2 Sheets—Sheet 1.

P. A. DOWD.

Electrical Switch Board.

No. 233,081. **Patented Oct. 12, 1880.**

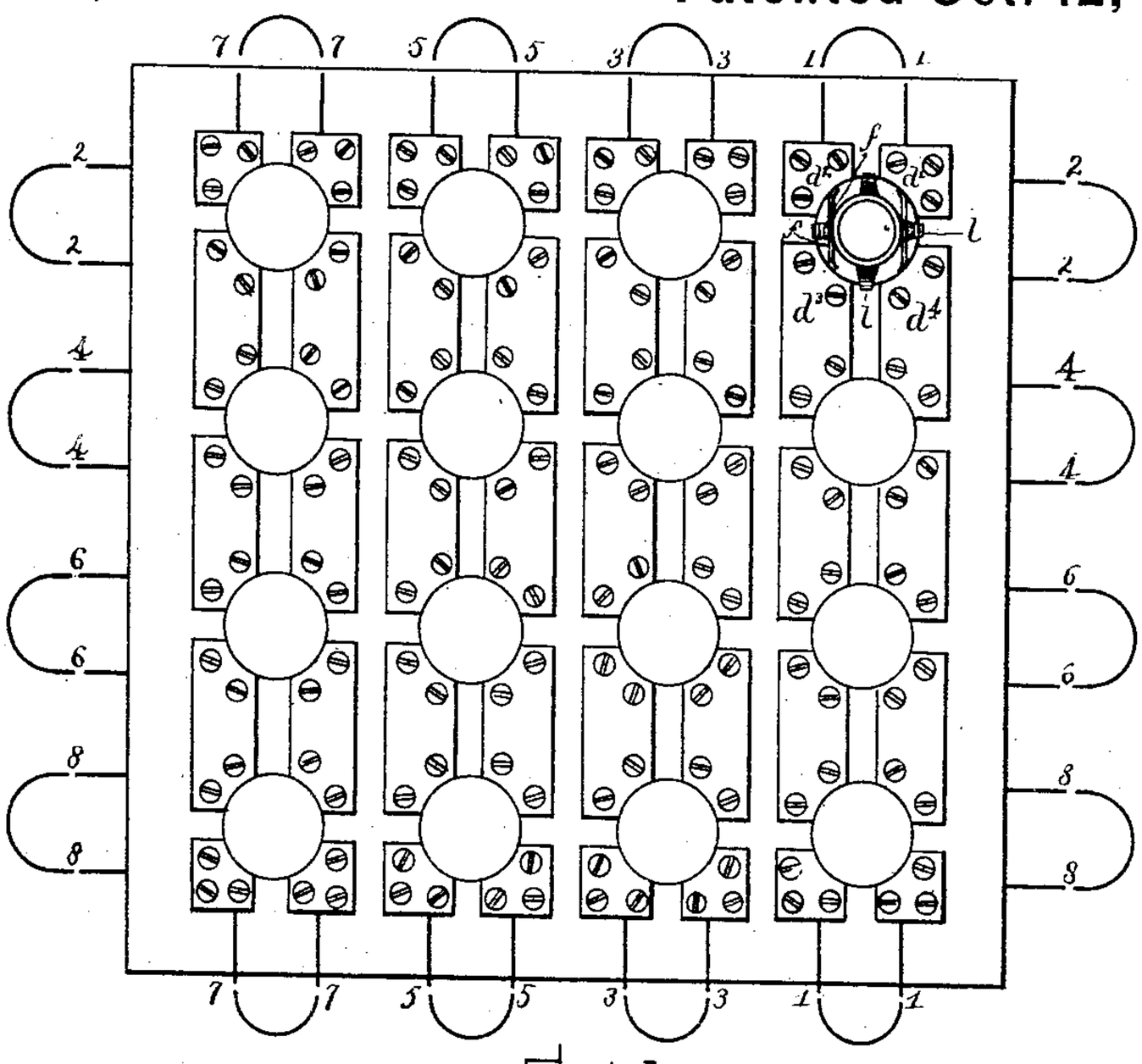

Fig. 1.

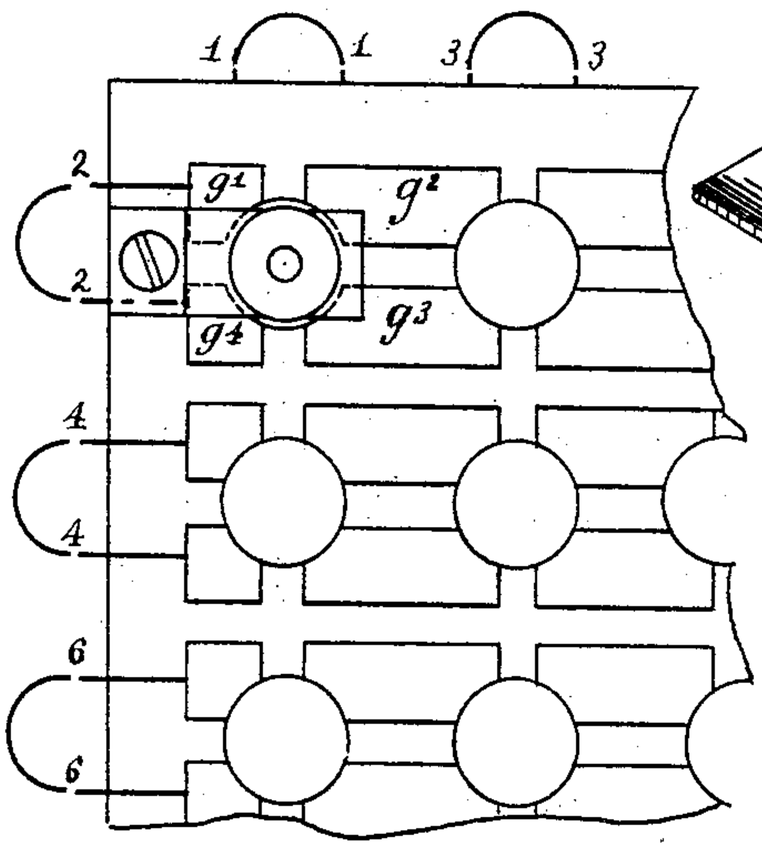

Fig. 7.

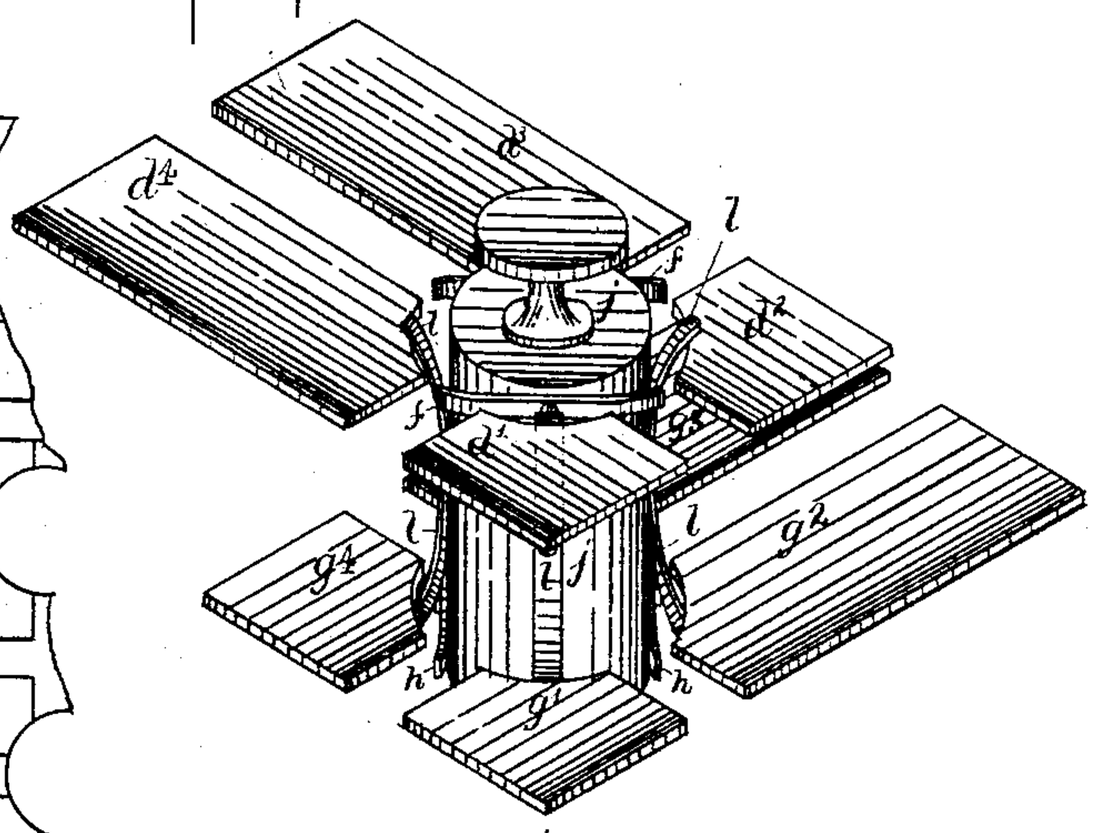

Fig. 3.

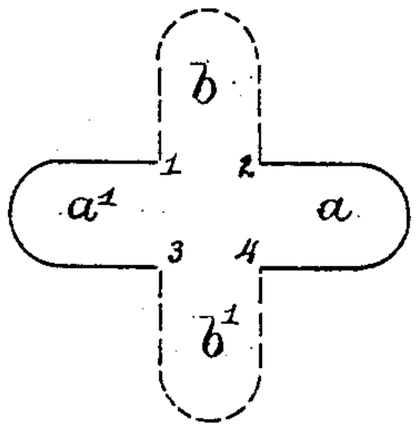

Fig. 6.

Witnesses:
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J. R. Snow.

Peter A. Dowd
by J. E. Maynadier
his Atty.

(No Model.)

2 Sheets—Sheet 2.

P. A. DOWD.

Electrical Switch Board.

No. 233,081. **Patented Oct. 12, 1880.**

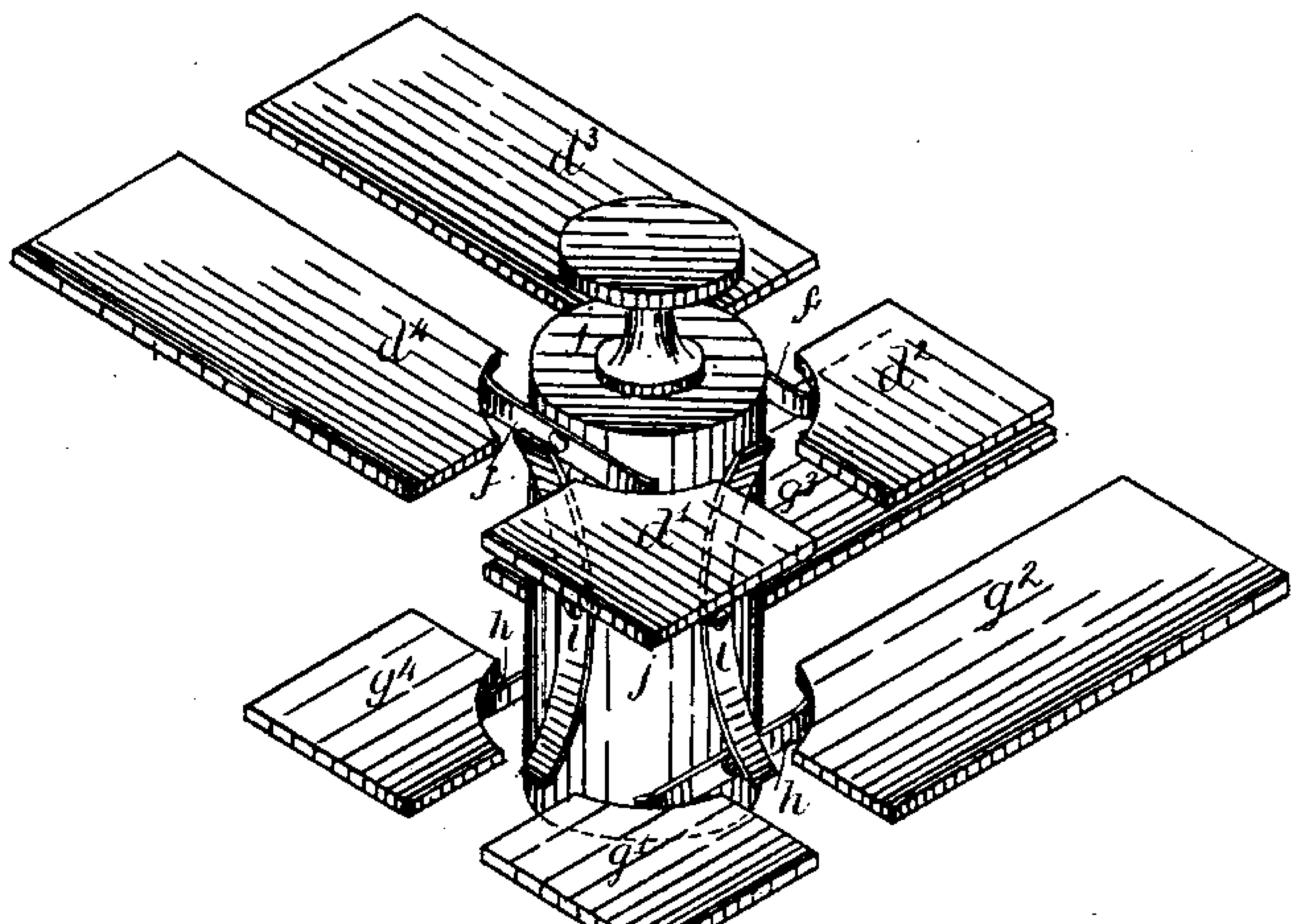

Fig. 2.

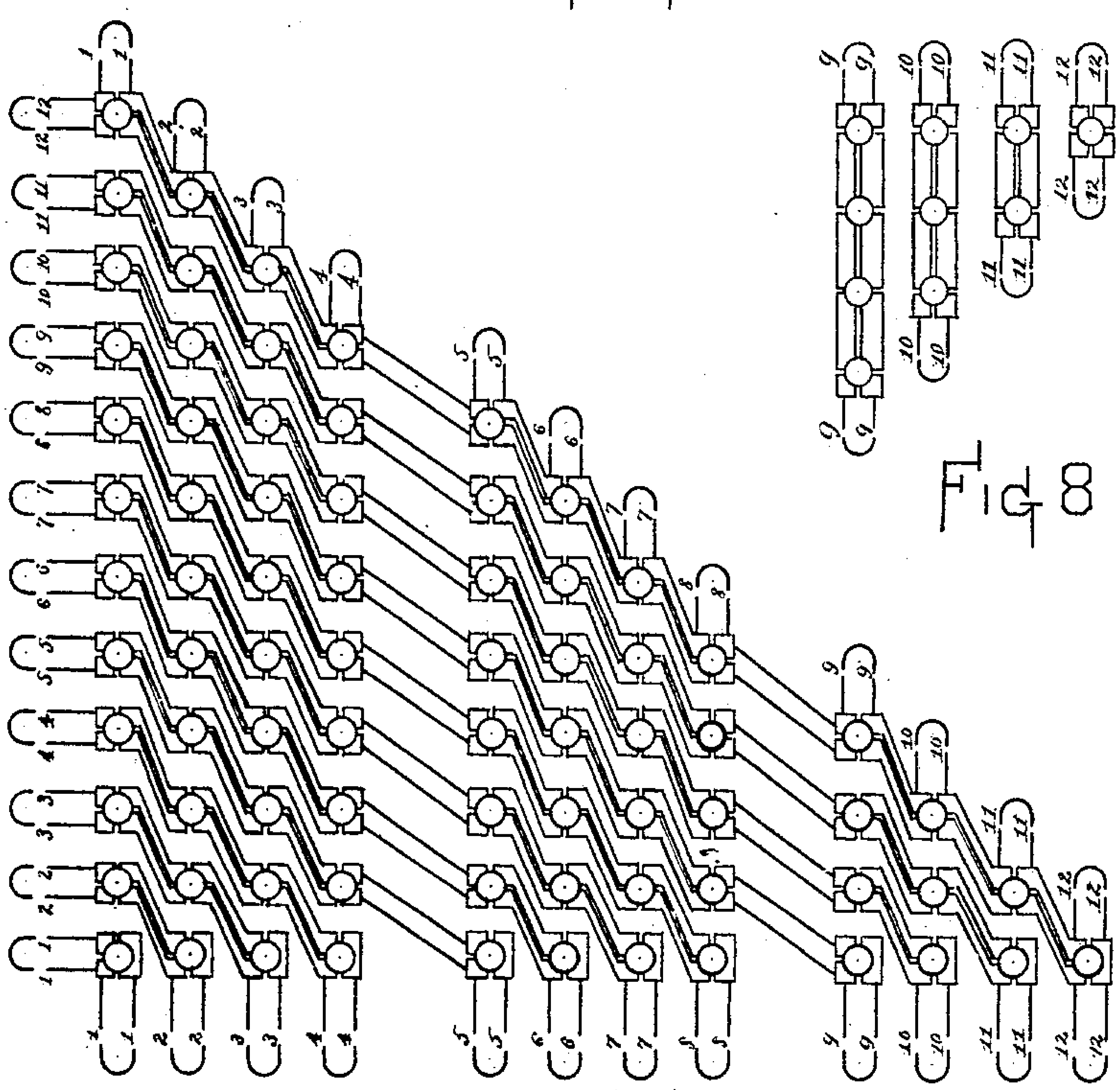

Fig. 8

Fig. 4

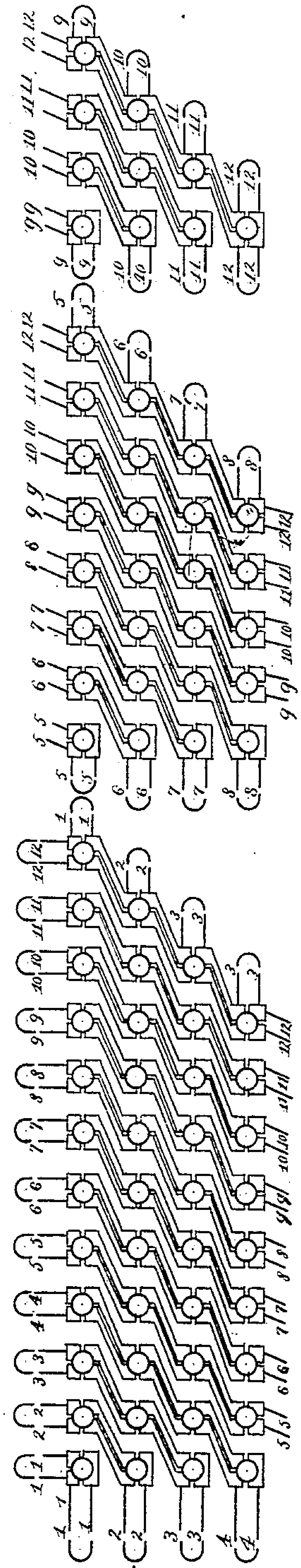

Fig. 5

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N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

PETER A. DOWD, OF BOSTON, MASSACHUSETTS.

ELECTRICAL SWITCH-BOARD.

SPECIFICATION forming part of Letters Patent No. 233,081, dated October 12, 1880.

Application filed April 26, 1880. (No model.)

To all whom it may concern:

Be it known that I, PETER A. DOWD, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new Switch-Board for connecting together any of a large number of electric circuits, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, making a part hereof, in which—

Figure 1 is a plan of one form of my new switch-board. Fig. 2 is a detailed view on a larger scale than Fig. 1, showing one crossing of two circuits, with the plug in the usual condition. Fig. 3 is like Fig. 2, except that the plug is turned one-quarter of a circle in order to connect two circuits. Figs. 4 and 5 illustrate one form of my switch-board by which an indefinite number of circuits can be each connected with any or all of the others. Fig. 6 is a diagram for illustration. Fig. 7 is the under side of Fig. 1 broken away, and Fig. 8 is the under side of Fig. 4.

My switch-board is designed especially for use at the central office of a telephone company, but is applicable, of course, wherever a number of circuits are used and it is desirable to connect them together.

The principle of my invention consists in making two breaks in each of the two circuits to be connected, thus leaving four ends to each circuit, as illustrated by the diagram, Fig. 6, where the full lines *a a'* show one circuit and the dotted lines *b b'* show a second circuit, and from which diagram it will be clear that to complete the circuit *a a'* the end 1 of *a'* should be in metallic contact with the end 2 of *a* and the end 3 of *a'* with the end 4 of *a*, and also clear that if the end 1 of *a'* be in metallic contact with the end 1 of *b*, the end 2 of *b* with the end 2 of *a*, the end 4 of *a* with the end 4 of *b'*, and the end 3 of *b'* with the end 3 of *a'*, then *a'*, *b*, *a*, and *b'* will make one complete metallic circuit.

In Fig. 1 the odd-numbered circuits 1, 3, &c., are shown as connected to the metal pieces *d'*, &c., along the upper edge of the upper surface of the board, and these circuits are completed from top to bottom of the upper surface of the board by metal connections *f* between the pieces *d*, as more fully shown in Fig. 2. The even-numbered circuits 2, 4, &c., are shown as connected to the metal pieces *g'*, &c., along one side of the lower surface of the board, and these circuits are completed from side to side of the lower surface of the board by metal connections *h* between the pieces *g'*, &c., as more fully shown in Fig 2.

When the metal connections *f* and *h* are as shown in Fig. 2 each circuit is complete in itself, and neither is connected with any of the others; but if the metal connections *f* and *h* are removed, as shown in Fig. 3, at the crossing of any two circuits, each of these circuits will be broken, leaving four ends to each, as illustrated in the diagram, Fig. 6; but if the piece d' of Fig. 3 be connected by a metal strip with the piece g', the piece d^2 with the piece g^2, the piece d^3 with g^3, and d^4 with g^4, then the two circuits shown in Fig. 3 will become one circuit.

It will now be clear that any odd-numbered circuit can be connected with any even-numbered circuit by the switch-board shown in Fig. 1, and also that any odd-numbered circuit can be connected with any other odd-numbered circuit shown in that figure by connecting them both with any even-numbered circuit, and also that any two even-numbered circuits can be connected together by connecting them both with any odd-numbered circuit.

The metal connecting-pieces *f* and *h* are attached to a plug, *j*, and are, of course, insulated each from all the others. The up and down connecting-pieces *l* are also attached to the plug *j* and insulated. These pieces and the carrying-plug are best arranged so that when the plug is in one position the pieces *f* and *h* act as connections on the upper and lower surfaces of the board, (or front and back surfaces if the board be vertical,) and so that a movement of the plug on its axis through a quarter of a circle will take *f* and *h* out of contact and bring *l* into contact with the metal pieces on the surfaces of the board.

When the number of circuits is large and likely to be constantly increased, one set of circuits—those running crosswise, for example—may be mere connecting-circuits, and all the telephone-circuits may be parallel with each other on the switch-board. For example, suppose the circuits 2, 4, &c., in Fig. 1 be

mere connecting-circuits, and the circuits 1, 3, &c., be the working-circuits, then if it be desired to connect, say, 1 and 3, the plug at the crossing of 1 and 2 is turned one-quarter of a circle, and so is the plug at the crossing of 2 and 3, and circuits 1, 2, and 3 are thereby brought into one circuit.

The number of connecting-circuits will, of course, depend upon the number of working-circuits and the frequency with which they are used, for it is not ordinarily desirable in telephone-circuits to connect more than two working-circuits together. This arrangement has also the objection that two plugs must be handled to connect any two circuits.

Figs. 4 and 5 show another form of my switch-board, by which each circuit is made to cross all the others in order that any circuit may be connected with any or all the others. Here the plugs are arranged in the form of a triangle. This triangle will, of course, be an undesirable shape with a great number of circuits; but it may readily be made in sections, which may be arranged in a desirable shape, as illustrated by Fig. 5, suitable connections being made between the sections, as indicated in Fig. 5.

What I claim as my invention is—

The switch-board above described, composed of a series of insulated metal pieces, $d' g'$, and a series of plugs, j, carrying the insulated connecting-pieces f, h, and l, whereby the crossing circuits can be broken so as to leave four ends, and these four ends can be joined together to unite the circuits, substantially as set forth.

P. A. DOWD.

Witnesses:

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J. E. MAYNADIER.