

No. 634,871.

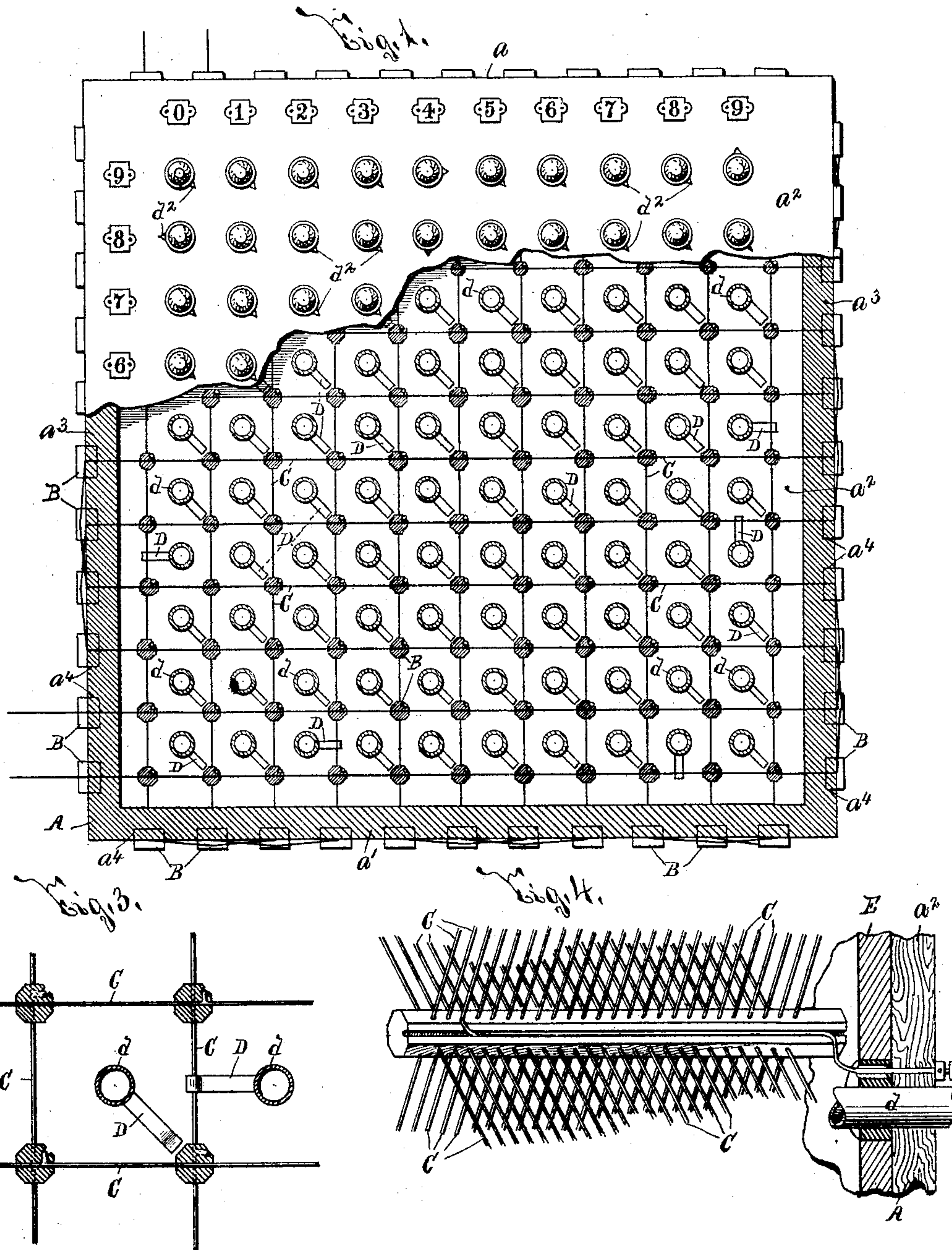
Patented Oct. 17, 1899.

A. T. BROWN.
SWITCHING APPARATUS.

(Application filed May 11, 1896.)

(No Model.)

5 Sheets—Sheet 1.



WITNESSES:

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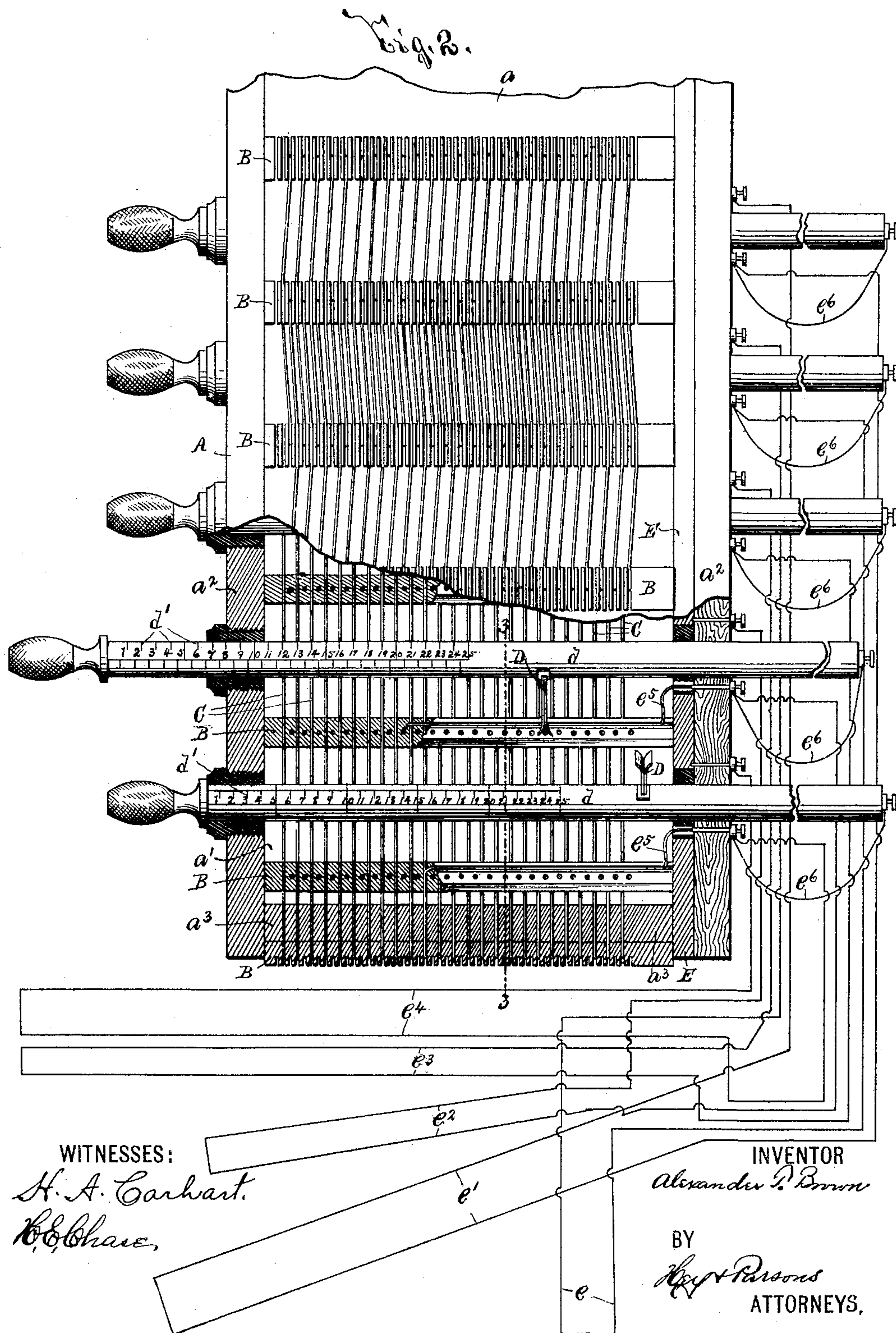
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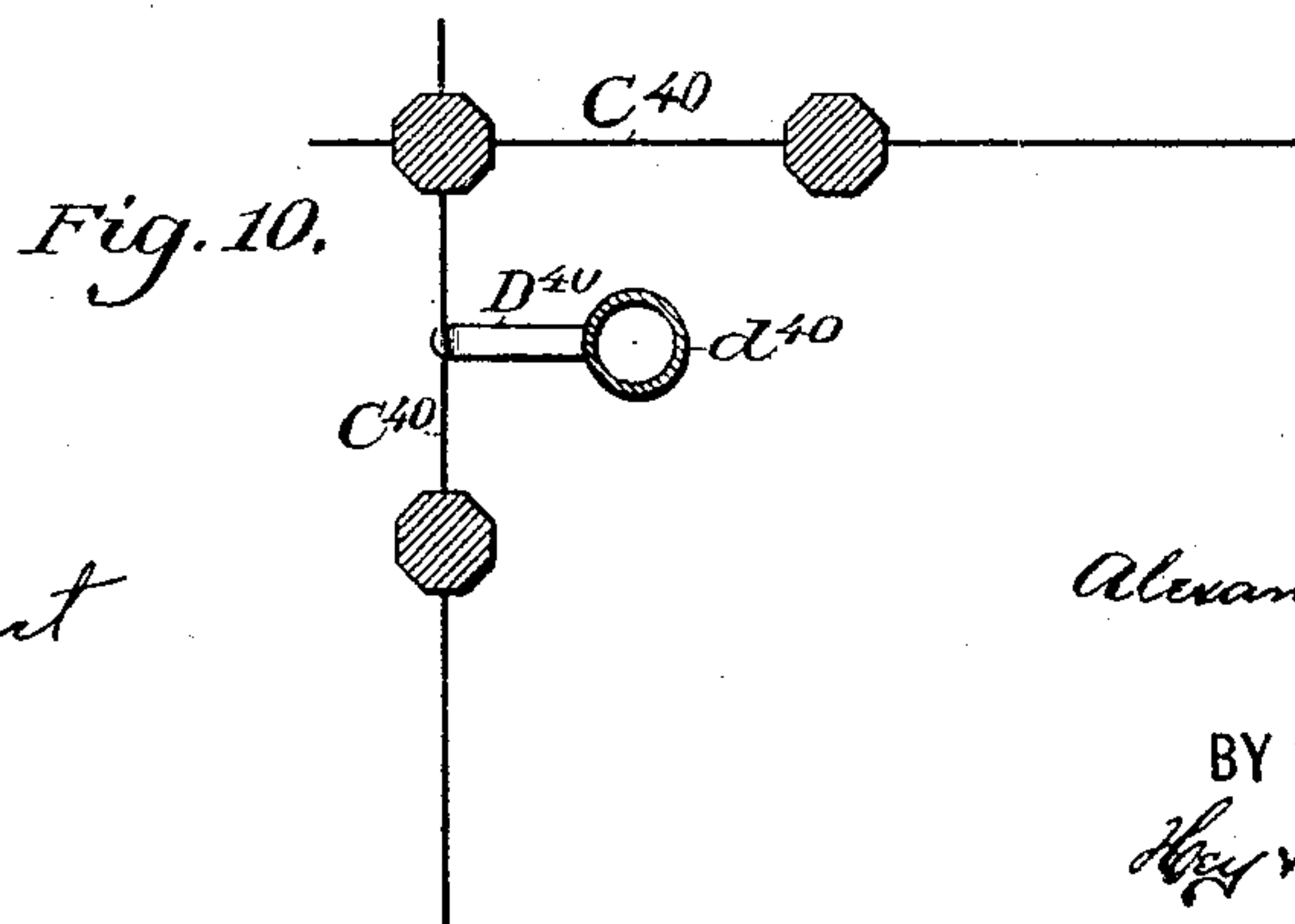
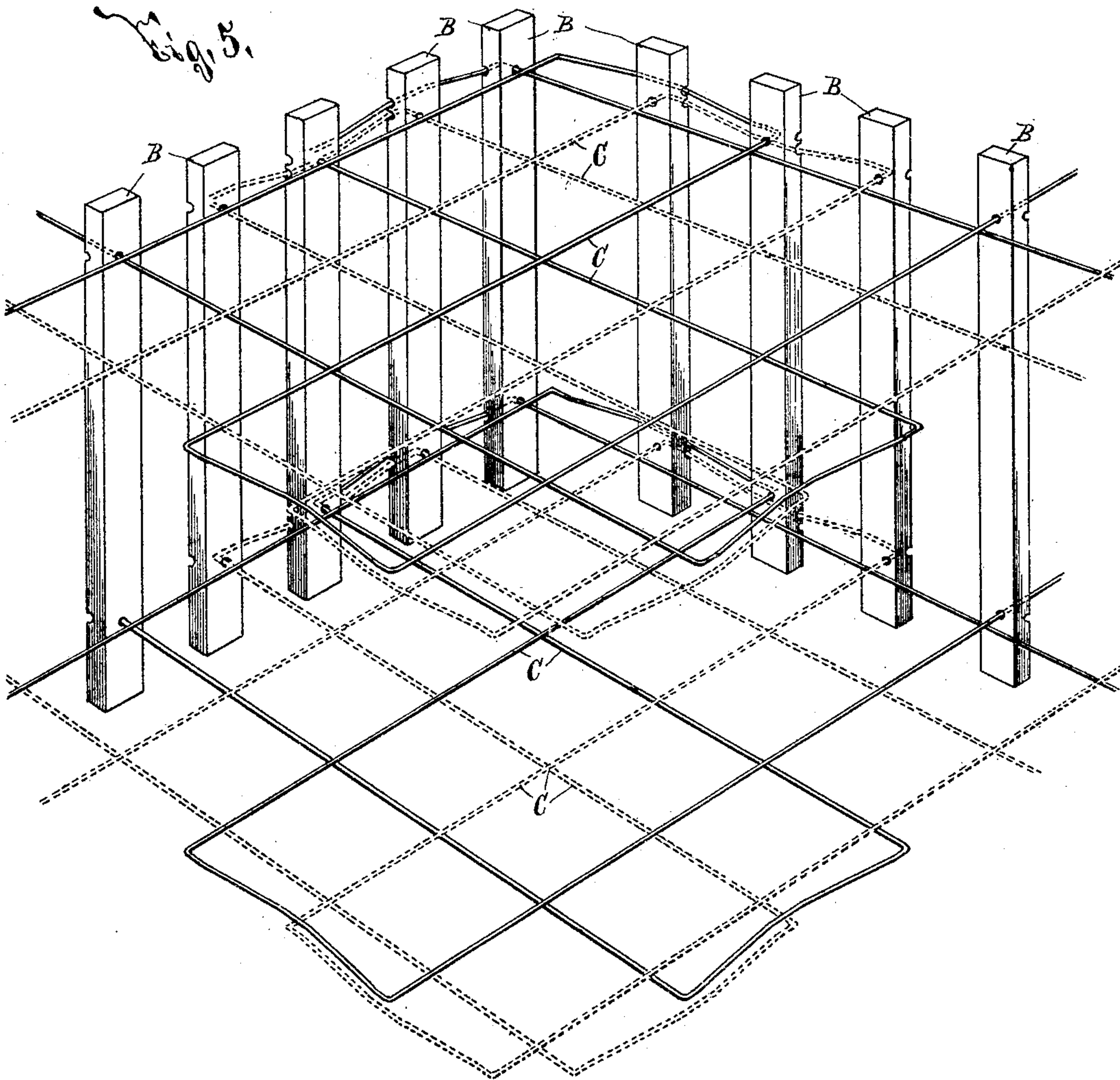
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5 Sheets—Sheet 3.



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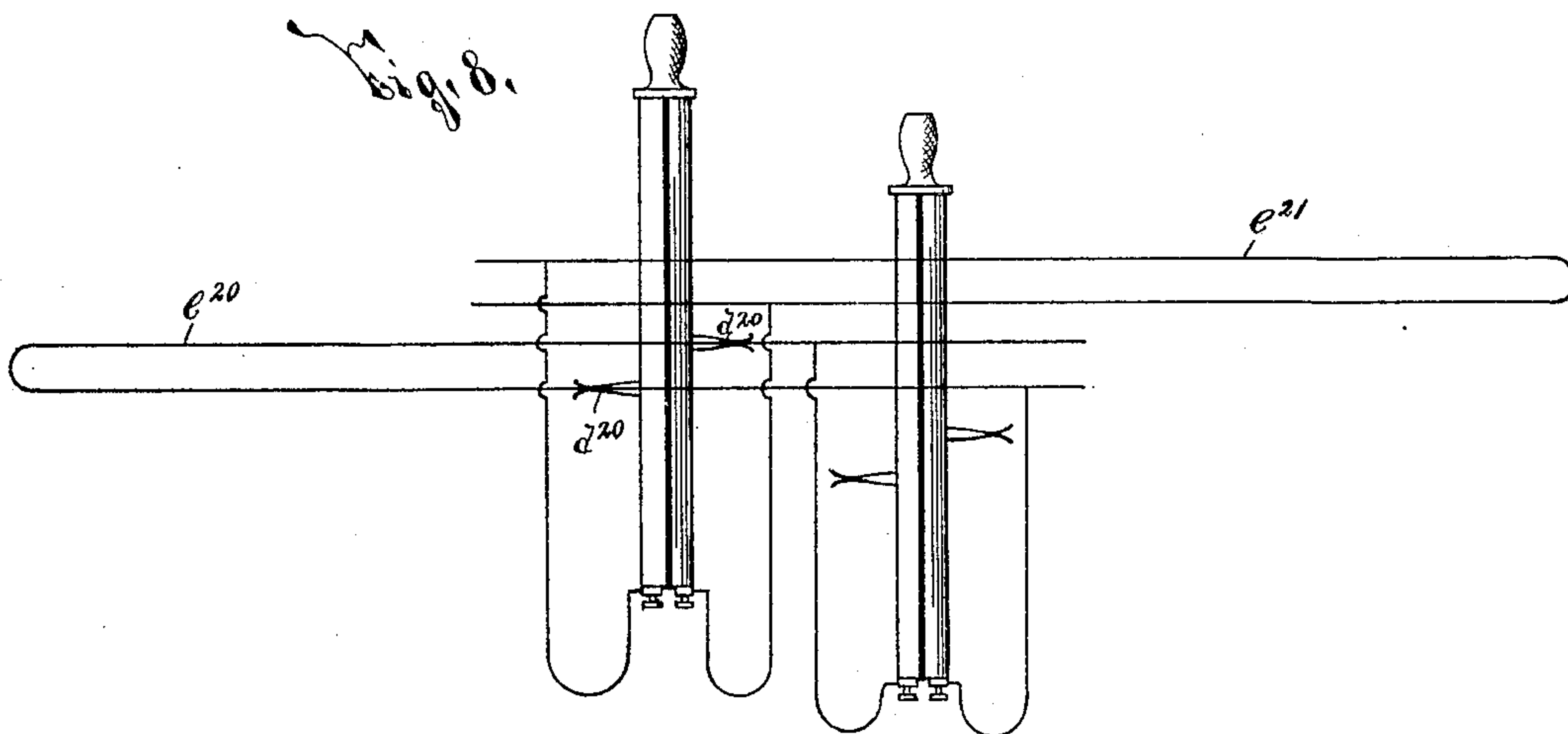
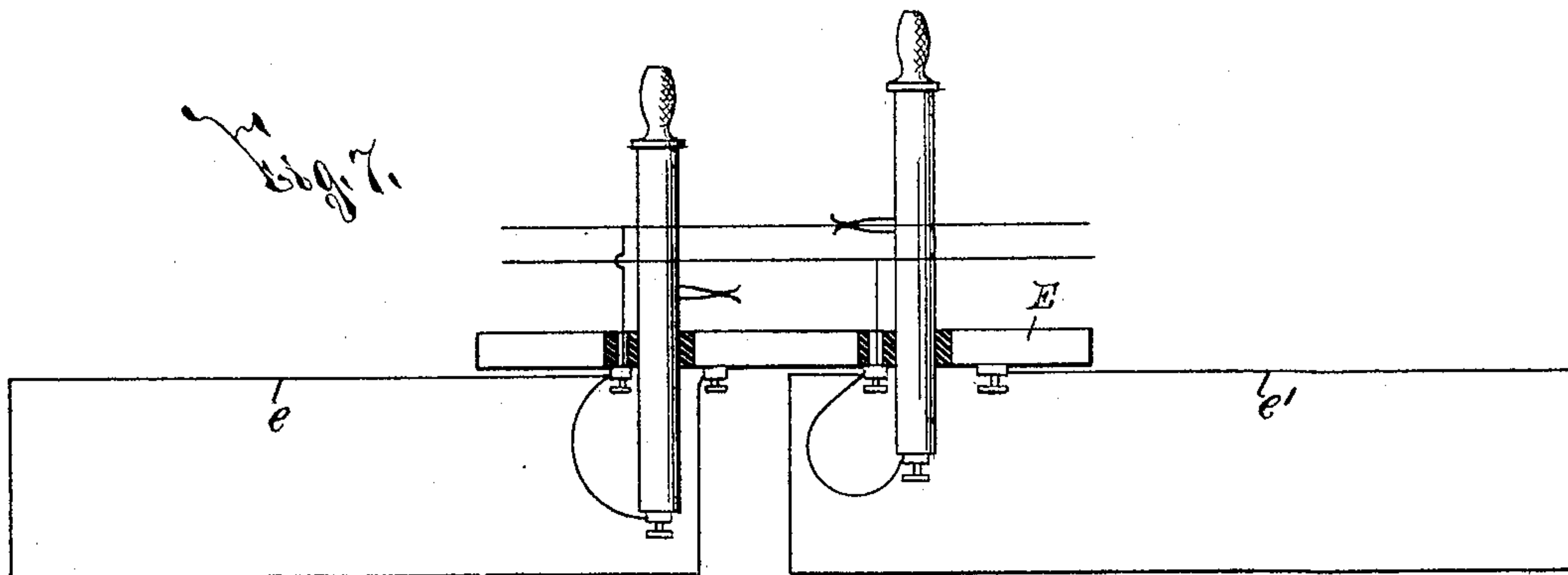
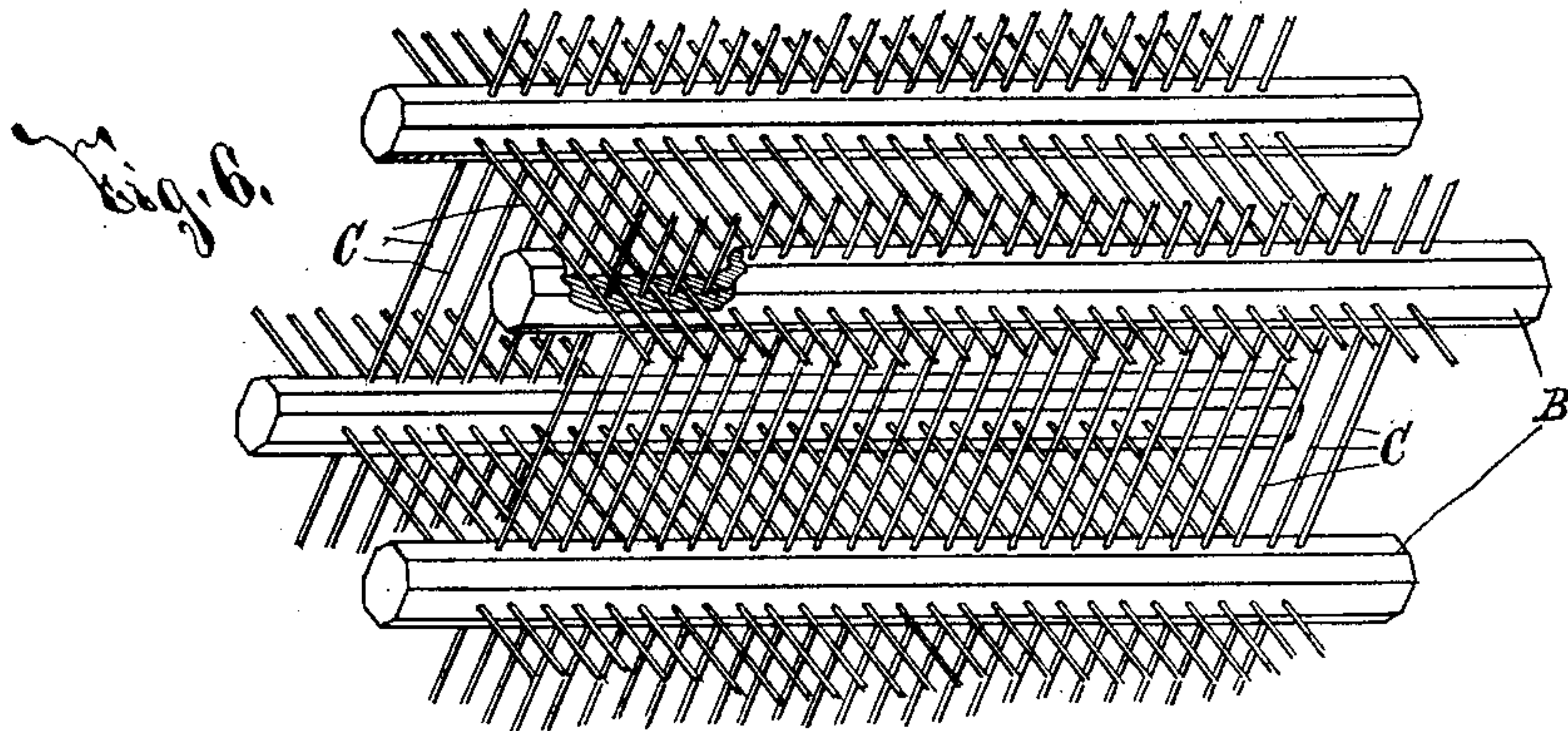
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5 Sheets—Sheet 4.



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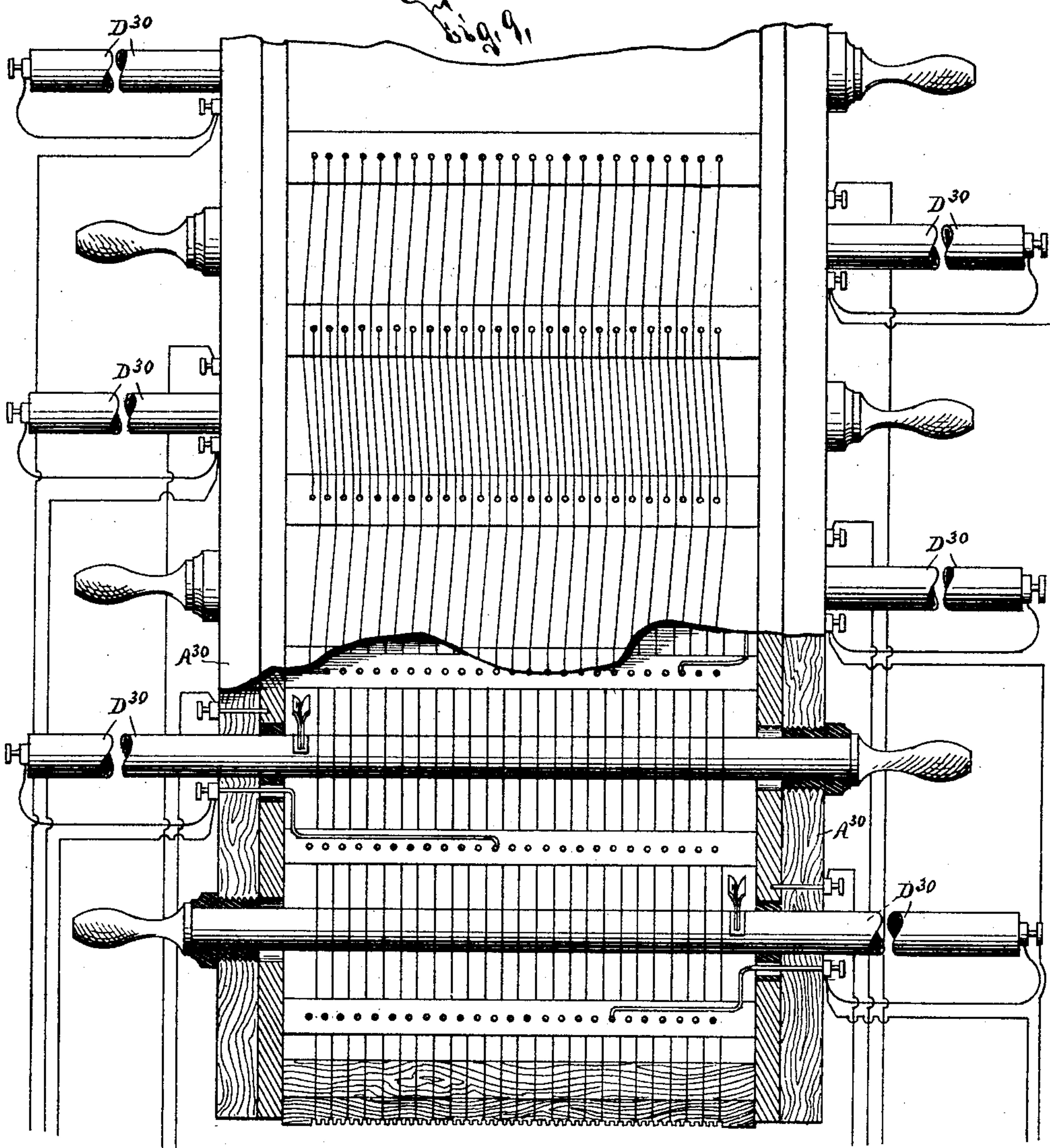
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5 Sheets—Sheet 5.



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UNITED STATES PATENT OFFICE.

ALEXANDER T. BROWN, OF SYRACUSE, NEW YORK, ASSIGNOR TO WILBERT L. SMITH, TRUSTEE.

SWITCHING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 634,871, dated October 17, 1899.

Application filed May 11, 1896. Serial No. 590,987. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER T. BROWN, of Syracuse, in the county of Onondaga, in the State of New York, have invented new and useful Improvements in Switching Apparatus, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to a switching apparatus for use in telephony, telegraphy, &c., and has for its object the production of a switching apparatus for connecting electric circuits and an arrangement of wiring therefor which occupies a minimum amount of space, is particularly simple in construction, is readily operated, and is highly efficient; and to this end the invention consists, essentially, in a switching apparatus provided with fixed and movable terminals connected to a series of circuits, said fixed terminals being formed with engaging surfaces arranged to entirely or partially surround the movable terminals, as hereinafter more particularly described, and pointed out in the claims.

In describing this invention reference is had to the accompanying drawings, forming a part of this specification, in which like letters indicate corresponding parts in all the views.

Figure 1 is a side elevation, partly in section, of a switching apparatus embodying my invention. Fig. 2 is an enlarged top plan, partly in section, of a portion of said switching apparatus, a number of subscribers' circuits being operatively connected thereto. Fig. 3 is a vertical section taken on line 3 3, Fig. 2. Fig. 4 is an isometric view of one of the terminal supports, adjacent portions of the fixed terminals secured to said support, and adjacent parts of the supporting-frame. Fig. 5 is an isometric view showing portions of the top and bottom fixed terminals and a number of the supports therefor, a part of said terminals being illustrated by dotted lines. Fig. 6 is an isometric view of the supports and the adjacent portions of the fixed terminals for forming one of the pockets or inclosures of my switching apparatus. Fig. 7 is a diagrammatic view illustrating two subscribers' circuits and the fixed and movable terminals connected thereto. Fig. 8 is a dia-

grammatic view similar to Fig. 7, illustrating devices for connecting together both limbs or conductors of metallic circuits. Fig. 9 is a top plan view, partly broken away, of a construction of my switching apparatus provided with oppositely-arranged movable terminal supports; and Fig. 10 is a transverse section of a modified construction of my switching apparatus in which the pockets or inclosures are open longitudinally.

A represents a supporting-frame, B suitable supports, C fixed terminals mounted on said supports, and D movable terminals for engaging the former terminals, all of which parts may be of suitable form and size.

The supporting-frame A is preferably composed of top and bottom pieces and side and end walls a a' a^2 a^2 a^3 a^3 .

The supports B are generally formed of non-electrical conducting material and are usually arranged parallel with each other and the end walls a^3 a^3 , and, as clearly seen in Fig. 1, a number of said supports may be arranged in grooves a^4 in the top and bottom pieces and the end walls of the supporting-frame, and an additional number of said supports may be located at the points where the fixed terminals C cross each other. Said supports B are usually provided with suitable perforations and grooves through which the fixed terminals C are passed, as best seen in Figs. 1, 2, 3, 5, and 6.

The fixed terminals C are preferably supported in planes, one in advance of the other, and are each usually provided with substantially parallel electrically-connected branches or arms, which are generally connected so as to form substantially U-shaped loops. The branches or arms of a number of the fixed terminals C and the loops formed by said branches or arms are usually arranged so as to cross the branches or arms of other fixed terminals C, and the branches or arms of any one of the terminals C are usually alternated with the branches or arms of the next adjacent terminal C, provided with branches or arms arranged substantially parallel with the branches or arms of said one of the terminals C. As preferably constructed the fixed terminals C consist of continuous strips, which extend from end to end

and from top to bottom of the switching apparatus and are passed through the opposite end walls and the top and bottom pieces of the frame A. In order that this arrangement of the fixed terminals C may be effected without liability of undue engagement of said fixed terminals at the points where they cross each other, certain portions of a number of the terminals C are raised above or depressed beneath the adjacent portions of other terminals C, as best seen in Figs. 2 and 3.

When the fixed terminals C are arranged as described they form parallelogrammatic pockets or inclosures in which the terminals D are movable. The portions of the fixed terminals forming said pockets or inclosures are provided with engaging surfaces for making contact with the terminals D, and, as clearly seen in Figs. 1, 2, 5, and 6, the engaging surfaces of some of the terminals C are arranged at opposite sides of the terminals D and at an angle with the adjacent engaging surfaces of other terminals C. In the preferable construction of this switching apparatus the terminals C are arranged so that each bounds one of the sides of all of the pockets or inclosures formed by the terminals C for the movable terminals D. Each of the terminals C may thus be engaged by each of the terminals D, and consequently each circuit may be connected by the corresponding movable terminal to every other circuit leading to the fixed terminals.

The movable terminals D are preferably mounted upon reciprocating supports d and usually consist of yielding clamping-arms, which extend laterally from said supports and are formed with engaging ends adapted to make contact with the engaging surfaces of the fixed terminals bounding the pockets or inclosures in which said terminals D are movable. I have shown but one terminal upon each support d ; but it is apparent that a number of terminals may be secured to each terminal support, if desired. The supports d are guided in any suitable manner and are preferably insulated from each other and a common conductor E, presently described. The supports d are also preferably capable of revoluble movement, in order that when provided with but a single terminal D they may engage said terminal with the angularly-arranged engaging surfaces of the fixed terminals C. Suitable graduations d' , indicators d^2 , and any other desirable means may be provided upon the supports d for permitting the operator to quickly determine the position of the movable terminals D, and it will be understood that each support may be provided with a separate series of graduations for the terminal engaging faces at each side of the pocket or inclosure through which said support is movable.

e e' e^2 e^3 e^4 are a series of subscribers' circuits connected to my switching apparatus, and, as best seen in Fig. 2, corresponding wires of said circuits are connected by local

branches e^5 to corresponding fixed terminals C and are also connected by flexible branches e^6 to the terminal supports d . The other wires of said circuits are preferably connected to a common conductor E, previously mentioned. In Fig. 7 I have illustrated, diagrammatically, two subscribers' circuits e e' and the corresponding fixed and movable terminals for said circuits, the movable terminal for the circuit e' being engaged with the fixed terminal for the circuit e . A current will then be free to flow over one of the wires of the circuit e' to the movable terminal connected to said wire, along the fixed terminal connected to the opposite wire of the circuit e , the other wire of said circuit e , and the common conductor E to the opposite wire of the circuit e' . The common conductor E is, however, not necessarily an essential feature of my invention, since, as illustrated, diagrammatically, in Fig. 8, each wire of the subscribers' circuits leading to my switching apparatus, as the circuits e^{20} e^{21} , may be connected to a separate fixed terminal, and each connecting device for the respective circuits may be provided with separated insulated movable terminals d^{20} . It will be apparent that this modification of my invention merely necessitates the use of more fixed and movable terminals than the previously-described construction of said invention and dispenses with a common terminal for uniting corresponding wires of all of the circuits.

As best seen in Fig. 2, all of the terminal supports of the previously-described construction of my invention are similarly arranged and the operator or operators of the switching apparatus sit at one side of the supporting-frame. This also is, however, not an essential feature of the arrangement of my invention, and in Fig. 9 I have shown oppositely-arranged terminal supports D^{30} having their engaging ends projecting beyond the opposite side walls of the supporting-frame A^{30} .

As previously stated, the fixed terminals C are usually arranged so as to form parallelogrammatic pockets or inclosures; but it will be apparent that this also is not an essential feature of construction of my invention, and in Fig. 10 I have shown fixed terminals C^{40} arranged at substantially right angles to each other and forming longitudinally-open pockets or inclosures, in which are movable the terminal supports d^{40} , provided with the movable terminals D^{40} . The necessary annunciators, busy tests, and calling and communicating devices may be connected in the usual manner to the various circuits leading to my switching apparatus; but since said devices form no part of my invention I have not considered it necessary to herein illustrate and describe the same.

It will be noted that a switching apparatus of the described construction is particularly compact and occupies but a minimum amount of space and that the number of subscribers' circuits which can be connected thereto is

practically unlimited. Moreover, an operator can take charge of a maximum number of circuits, owing to the simplicity in construction and operation of my switching apparatus, and can connect any of the circuits in his charge to any other circuit leading to the switching apparatus.

The operation of my invention will now be readily understood upon reference to the foregoing description and the accompanying drawings, and it will be particularly noted that I do not herein limit myself to the exact construction and arrangement of the component parts of my switching apparatus.

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

1. A switching apparatus provided with terminals formed with a series of substantially U-shaped loops, the loops of one terminal crossing the loops of another terminal at an angle, substantially as and for the purpose described.

2. A switching apparatus comprising fixed terminals each formed with a series of electrically-connected branches or arms, additional fixed terminals each formed with a series of electrically-connected branches or arms crossing the former branches or arms, circuits connected to the fixed terminals, and terminals normally connected to the circuits and movable between the electrically-connected branches or arms of the fixed terminals, substantially as and for the purpose specified.

3. A switching apparatus provided with terminals formed with a series of loops, loops of one terminal crossing loops of another terminal at an angle, the loops of said terminals forming a series of pockets or inclosures, and each of the terminals forming a portion of one of the sides of each of the pockets or inclosures, substantially as and for the purpose set forth.

4. A switching apparatus comprising fixed terminals formed with a series of loops, loops of one terminal crossing loops of another terminal at an angle and said loops forming pockets or inclosures, circuits connected to the fixed terminals, and additional terminals connected to the circuits and movable in the pockets or inclosures for engaging the fixed terminals, substantially as and for the purpose described.

5. A switching apparatus comprising fixed terminals formed with a series of loops, a com-

mon conductor, metallic circuits having corresponding limbs or conductors connected to the fixed terminals and their other limbs or conductors connected to the common conductor, and additional terminals movable into connection with the branches or arms of the loops of the fixed terminals and connected to the circuits, substantially as and for the purpose specified.

6. A switching apparatus comprising fixed terminals formed with a series of loops, loops of one terminal crossing loops of another terminal and said loops forming pockets or inclosures, circuits connected to the fixed terminals, additional terminals connected to the circuits and movable in the pockets or inclosures for engaging the fixed terminals, and supports for the additional terminals provided with indicating means, substantially as and for the purpose set forth.

7. In a switching apparatus, the combination of a plurality of movable terminals, and a plurality of fixed terminals provided with engaging surfaces, a number of the fixed terminals having engaging surfaces arranged at an angle with engaging surfaces of other fixed terminals for partially surrounding the movable terminals, and the engaging surfaces of one of the fixed terminals being arranged in position to be contacted by all of the movable terminals, substantially as and for the purpose described.

8. In a switching apparatus, the combination of a plurality of movable terminals, and a plurality of fixed terminals provided with engaging surfaces, a number of the fixed terminals having engaging surfaces arranged at one side of one of the movable terminals, and other fixed terminals having engaging surfaces arranged at the opposite side of said one of the movable terminals for partially surrounding said movable terminal, and circuits normally connected to said movable and fixed terminals, substantially as and for the purpose specified.

In testimony whereof I have hereunto signed my name, in the presence of two attesting witnesses, at Syracuse, in the county of Onondaga, in the State of New York, this 9th day of May, 1896.

ALEXANDER T. BROWN.

Witnesses:

E. A. WEISBURG,
ARTHUR E. PARSONS.