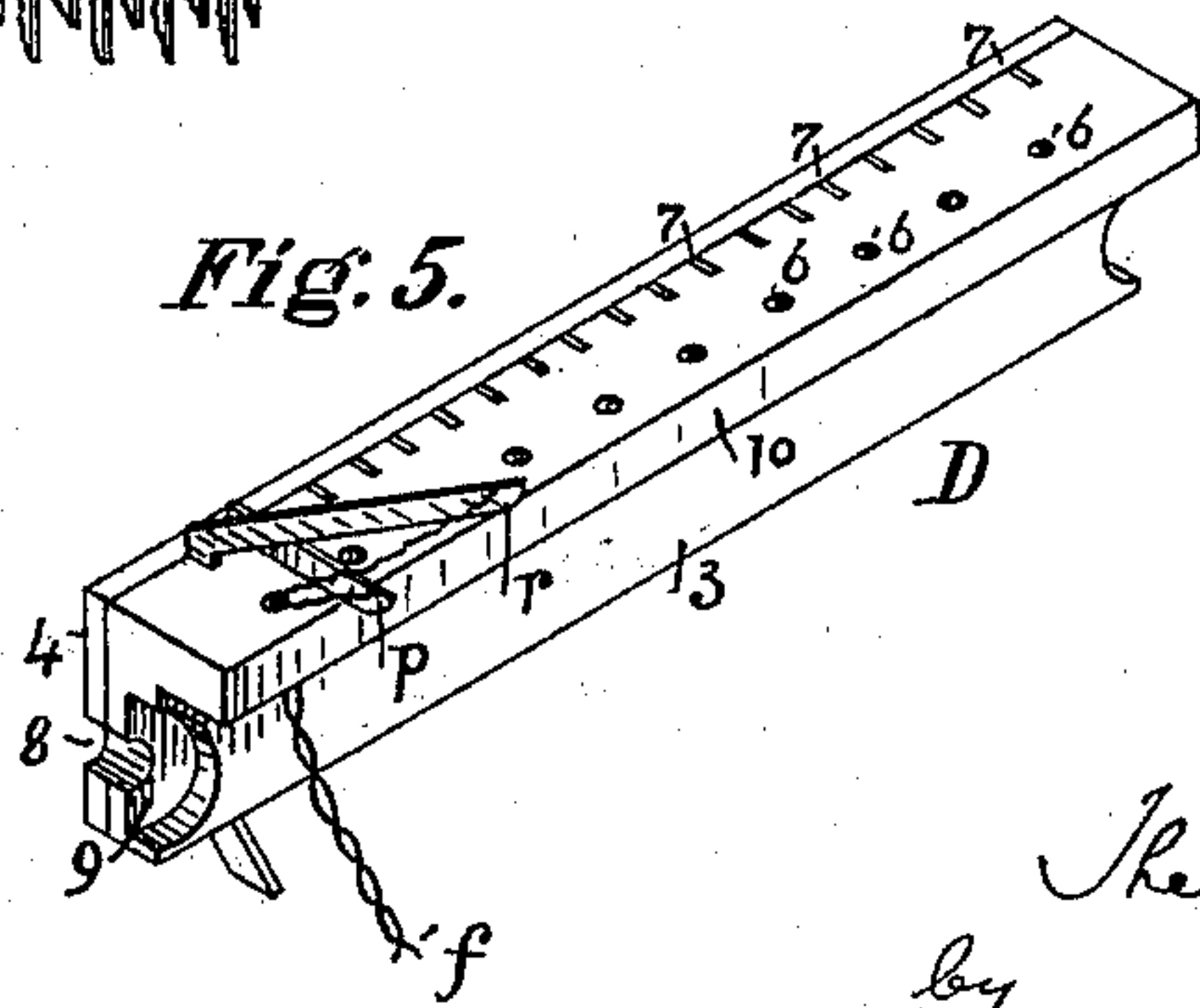
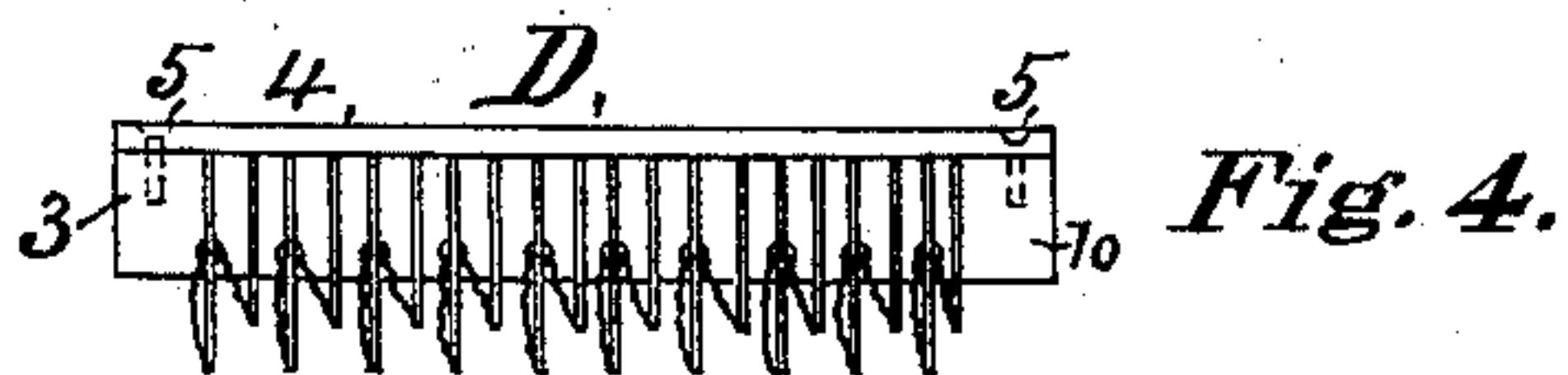
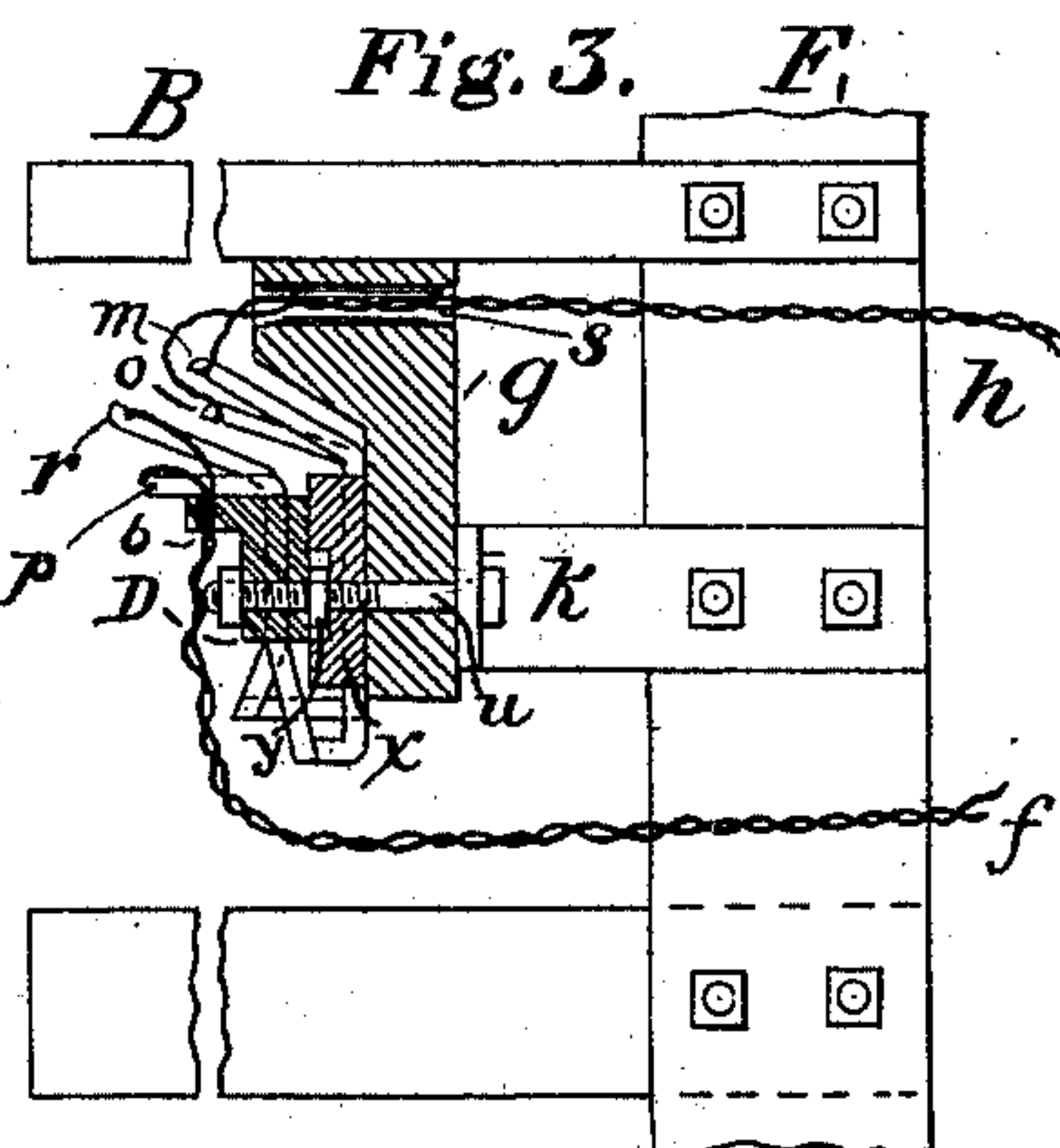
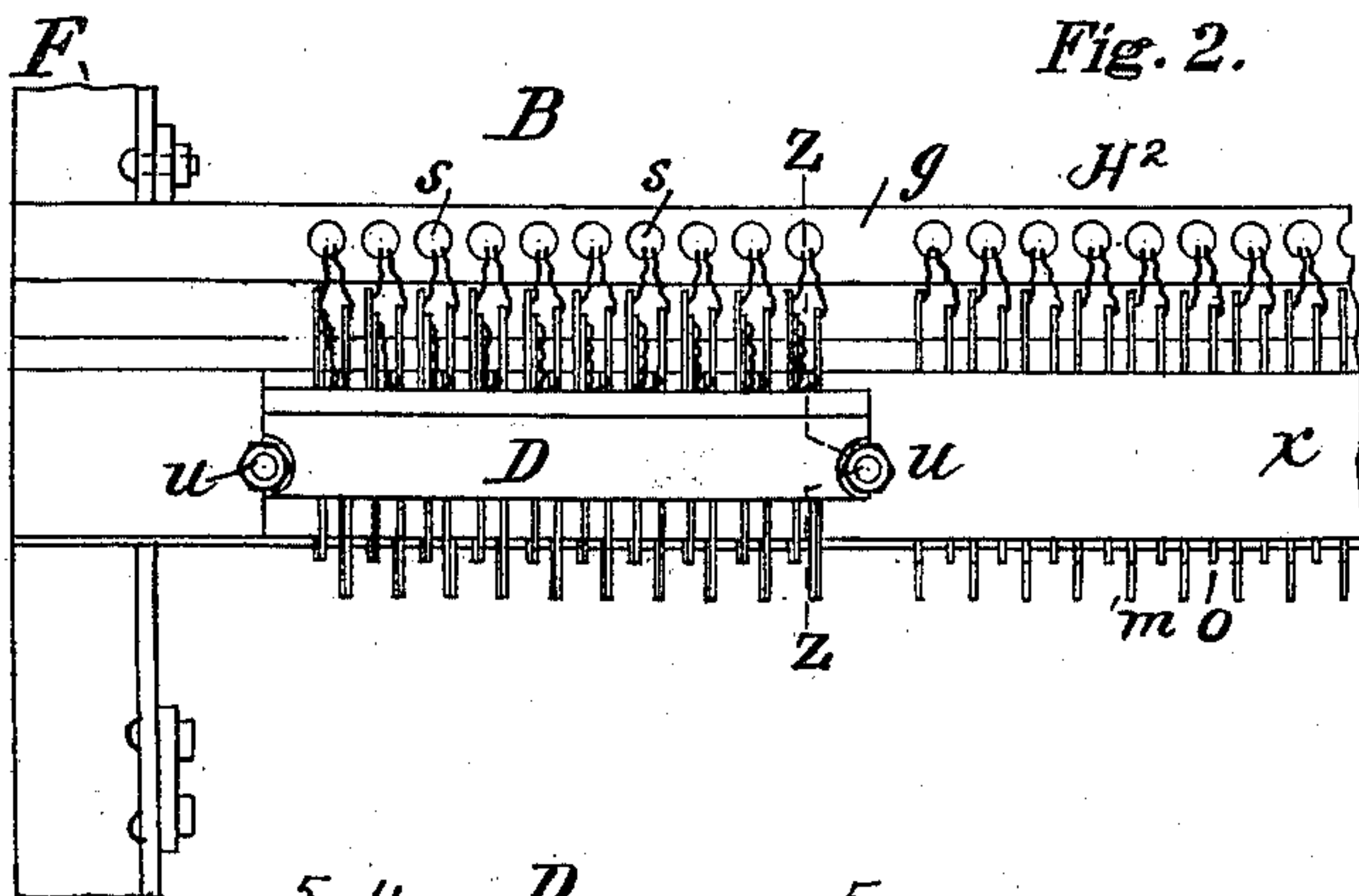
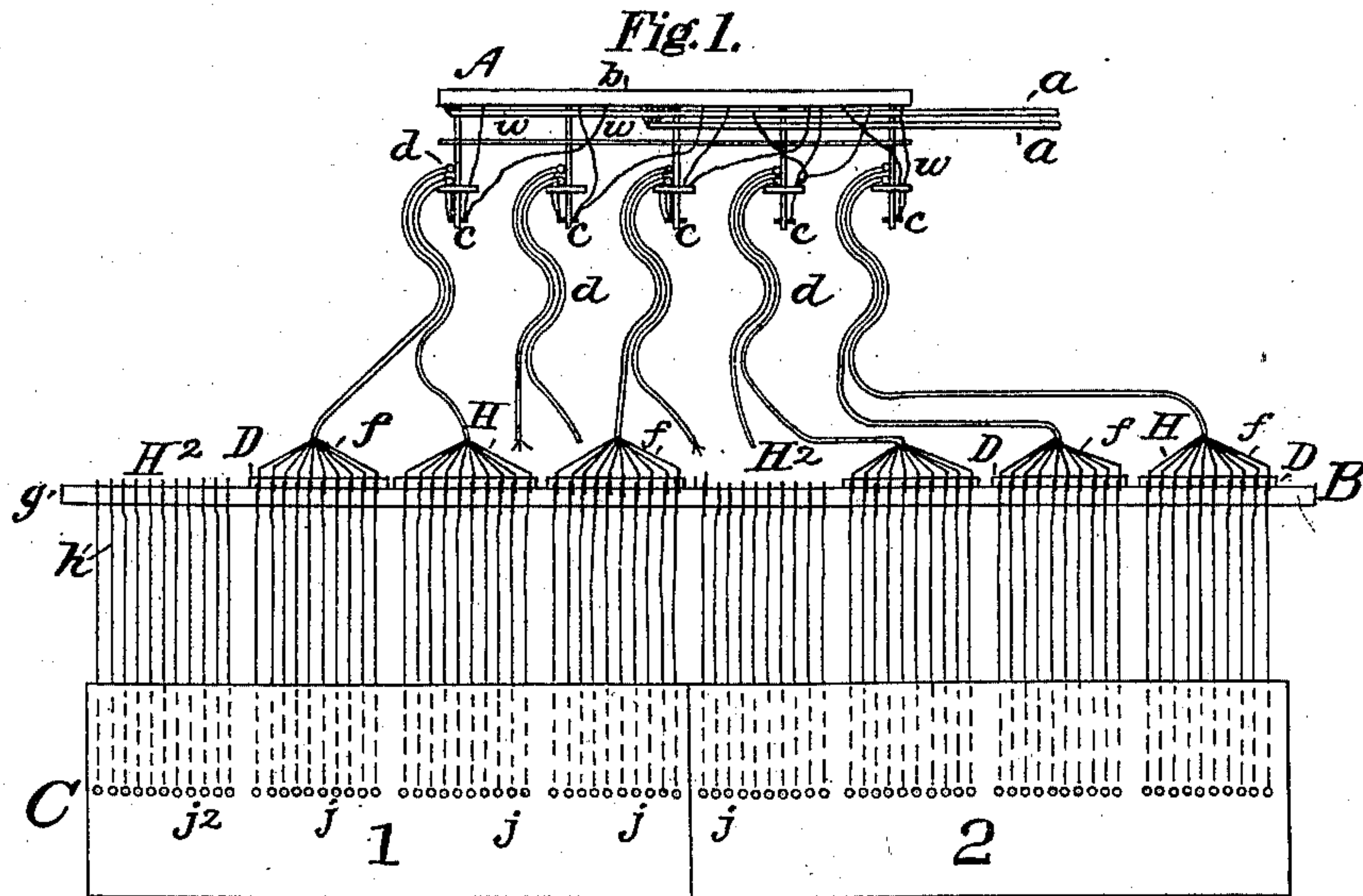


(No Model.)

T. SPENCER.  
CONDUCTOR DISTRIBUTING FRAME.

No. 540,117.

Patented May 28, 1895.



Attest.  
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H. Rees Eddelen

Inventor.  
Theodore Spencer  
by J. S. Edwards,  
his attorney.



# UNITED STATES PATENT OFFICE.

THEODORE SPENCER, OF CAMBRIDGE, ASSIGNOR TO THE AMERICAN BELL TELEPHONE COMPANY, OF BOSTON, MASSACHUSETTS.

## CONDUCTOR-DISTRIBUTING FRAME.

SPECIFICATION forming part of Letters Patent No. 540,117, dated May 28, 1895.

Application filed January 24, 1895. Serial No. 536,083. (No model.)

*To all whom it may concern:*

Be it known that I, THEODORE SPENCER, residing at Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Conductor-Distributing Frames, of which the following is a specification.

The present invention relates to the distribution of electric conductors at any place where a plurality of conductors enter and pass or terminate, such as a telephone central office, or exchange.

In all switchboard systems in use, a certain number of substation circuits are allotted to each section thereof such number being based upon the maximum number of connections, called for by the substations, but owing to the increase of calls in certain sections of the board, it is necessary to provide means for reducing the number of circuits connected to such sections, and to redistribute them among sections which are not so busy. In a telephone exchange provided with a modern multiple switchboard, the conductors bunched into cables provided with a protecting sheath come from the conduits in the streets to a distributing frame, located in some part of the exchange to one side of which the conductors (usually in pairs twisted together) terminate. The conductor terminals are connected by connecting, or bridle wires to the terminals on the opposite side of the said frame to which the switchboard conductors are permanently connected. The switchboard conductors terminate in spring jacks upon the switchboard, and usually have what is termed an intermediate distribution, or cross connection board interposed between the main distributing frame and the spring jacks. Such a method of distribution, or cross connection has been found to suit the conditions of a multiple switchboard and to be satisfactory in its workings; but it is not applicable to divided or transfer switchboards, in which a certain number of individual circuits terminate upon each operator's section where a number of distributing operators connect them to separate answering operators; or where the answering operators are located on one side of a horizontal table with the trunk operators on the other side; or where the trunk operators are

placed at a separate multiple board. This invention provides the requisite flexibility in the class of switchboards mentioned, and discloses a method whereby the number of substation circuits, assigned to any section of the board, may be quickly added to, or reduced, or whereby groups of such circuits upon different sections of the board may exchange places.

In carrying out the invention, the substation circuits enter the exchange and terminate at one side of a distribution frame, and are connected by bridle wires to the switchboard terminals upon its opposite side which includes the lightning arresters, as fully shown in the United States Patent No. 507,424, granted to William S. Ford and Bertram A. Lenfest. From the said switchboard terminals, the conductors extend preferably in bunched groups, or cables of ten pairs or twenty conductors and are permanently connected to metal terminals fixed in a movable or portable terminal strip of insulating material. The cables are attached to the walls or ceiling of the building, or to any suitable frame and are arranged in sinuous curves in order that there may be slack to utilize in extending the cable in a horizontal direction within specified limits. The metal terminals on each movable terminal strip are designed to make connection with the same number of fixed terminals located upon a bar of insulating material, to which the conductors from the switchboard jacks are permanently connected. The said jacks are arranged preferably in rows or groups of ten, and their fixed terminals are also arranged in rows or groups of ten upon the said bar. As in the case of multiple switchboards, a specified number of pairs of conductors are allotted to each switchboard section, all of which are preferably in multiples of ten and in addition to the spring jacks forming the terminals of each pair of conductors, a specified number of spare or idle jacks and conductors are allotted each section and these occupy the same relative grouped position on each section as do their unoccupied permanent terminals upon the said bar. When it is desired to reduce the number of substation lines terminating upon any section of the board, the terminals of the said lines which



may be associated with any one of the movable terminal strips, are disconnected from the fixed terminals on the bar of the intermediate frame, and the said strip is carried bodily to the part of the same bar or any other similar bar where are located the idle fixed terminals, connected to the switches or jacks upon the switchboard section to which said substation lines are to be transferred, and are connected to the said idle terminals, as will now be fully described and set forth in the appended claims.

Figure 1 of the drawings is a diagram illustrative of the invention. Figs. 2, 3, and 4 are enlarged detailed views of the intermediate transfer-board, Fig. 2 being a front view, Fig. 3 being a section on the irregular line *z-z*, and Fig. 4 a top view of the movable terminal-strip; and Fig. 5 is a perspective view of the movable terminal-strip.

A represents a distributing frame, described in detail in the patent hereinbefore referred to, to which reference is made, to which the street cables *a a* extend, the pairs of conductors thereof being fanned out to fixed terminals upon the bars *b* of the frame, from which they extend by connecting wires *w* to the lightning arresters *c* and terminals upon the opposite side of the frame, and from them they are extended in cables *d* of ten pairs of conductors *f* to, and make connection with, one end of metallic terminals *p r* in groups *H*, fixed in the strips *D* of insulating material; the opposite end of the terminals being connected with one end of metallic terminals *m o* fixed in a long bar *g* of insulating material, the opposite end of these terminals having connected therewith the pairs of conductors represented by the single lines *h* which terminate in switches or jacks *j* upon the sections 1, 2 of the switchboard *C*. The cables *d* are shown as arranged in sinuous curves, and may be in loops or in any way to provide for their being extensible.

In connection with each section of the switchboard is shown one group of ten idle jacks, *j<sup>2</sup>*, with their conductors *h*, and group *H<sup>2</sup>* of fixed terminals *m o*; and three groups of jacks *j* connected to the substations through the movable terminal strips *D* and their connections. Fig. 1 is merely illustrative and does not indicate the practical number of jacks allotted to a section for constant use, or of idle jacks.

F represents the upright iron standards to which are bolted, by means of angle irons *k* and bolts *u*, the bars *g* of wood or other insulating material, the upper part being thicker than the lower and perforated with holes *s* in groups of ten. To the face of the lower part of the bar *g* is bolted the continuous insulating band *x*, having in its rear side groups of ten parallel slots in which are inserted the metal terminals *m o*, having their ends bent over in the same direction, the upper ends being connected to the conductors *h*, extending to jacks *j*.

The movable and portable terminals *D*, are made of short strips of hard rubber 3 and 4, secured to each other by screws 5 5, the piece 3 having ten parallel slots 7, cut in its rear side in which are placed the metal terminals *p* and *r* alternately; the piece 4 then being secured to it. The projecting part 10 of the piece 3 has ten holes 6 bored therein through which the conductors *f* extend to be connected to the upper ends of the terminals *p r*.

At each end of the movable terminal are the counter-sunk holes 8 and 9 in which the outer end of the bolts *u* and their nuts rest when the block is secured to the face of the band *x*, and when it is so secured the lower end of terminals *m* are soldered to the lower end of terminals *r*, and the terminals *o* are soldered to the terminals *p*.

The bars *g* may be of any required length, and there may be any number secured to the frame *F*, one above another.

When it is desired to remove ten or more substation lines from section 1 to section 2, or to any other section, the nuts of the bolts *u* are removed (the inner nuts *y* holding the band *x* in place) and a hot iron is placed upon the lower ends of the metal terminals to melt the solder, and the movable portable terminal *D* removed from place and carried to the unoccupied group *H<sup>2</sup>* and secured thereto, thus effecting the transfer of a group of substation conductors, the slack in the convoluted cable *d* permitting its extension. A group of substation conductors having their jacks upon one section of the switch-board may be transferred to another section of the board and take the place of a second group already connected there which group may be transferred to the section of the first group in a manner well understood from the previous description.

Having now fully described my invention, I claim—

1. The combination in a distributing or cross-connecting apparatus for telephone circuits, of two or more groups of fixed metallic terminals, a group or series of extensible conductors constituting the terminals of main lines, an insulated portable supporting strip, a series of metallic terminals arranged along said strip, each terminal projecting there-through at its extremities and to one end of which the extensible conductors are respectively connected, and means for removably securing the portable strip in proximity to the other ends of the metallic terminals carried thereby making contact with—the fixed metallic terminals, all arranged and combined, substantially as described.

2. The combination in a distributing or cross-connecting apparatus for telephone circuits placed between a switchboard and the incoming lines, of two or more groups or series of fixed contact pieces mounted in a non-conducting support and each connected with and forming the terminal of a loop or branch of the several lines extending to the switchboard appliances of the several lines; and a



group or series of corresponding contact pieces mounted together on a movable or portable non-conducting support, and representing and forming the terminals of main lines, 5 to which they are respectively united by flexible and extensible conductors, the contacts of the said movable support being thereby adapted to be placed in association with the fixed contact pieces of any of the said groups 10 and to register therewith whereby the line conductors may be transferred between the groups of switchboard appliances, substantially as described.

3. The combination in a distributing or 15 cross-connecting apparatus for telephone circuits placed between a switchboard and the incoming lines, of a series of fixed contacts arranged in groups along and each projecting at its ends from an insulating fixed support, each contact representing and forming 20

the terminal of a loop or branch of the respective lines extending to the switch-board appliances, portable insulating strips, metallic contacts arranged in groups along said strips, extensible conductors constituting the 25 terminals of incoming lines, and connected with the metallic contacts and means for removably securing the portable strips in proximity to the fixed support bringing the other or free ends of their respective contacts into 30 electrical connection, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 14th day of 35 January, 1895.

THEODORE SPENCER.

Witnesses:

F. J. HALLAHAN,  
A. P. RUTHERFORD.