

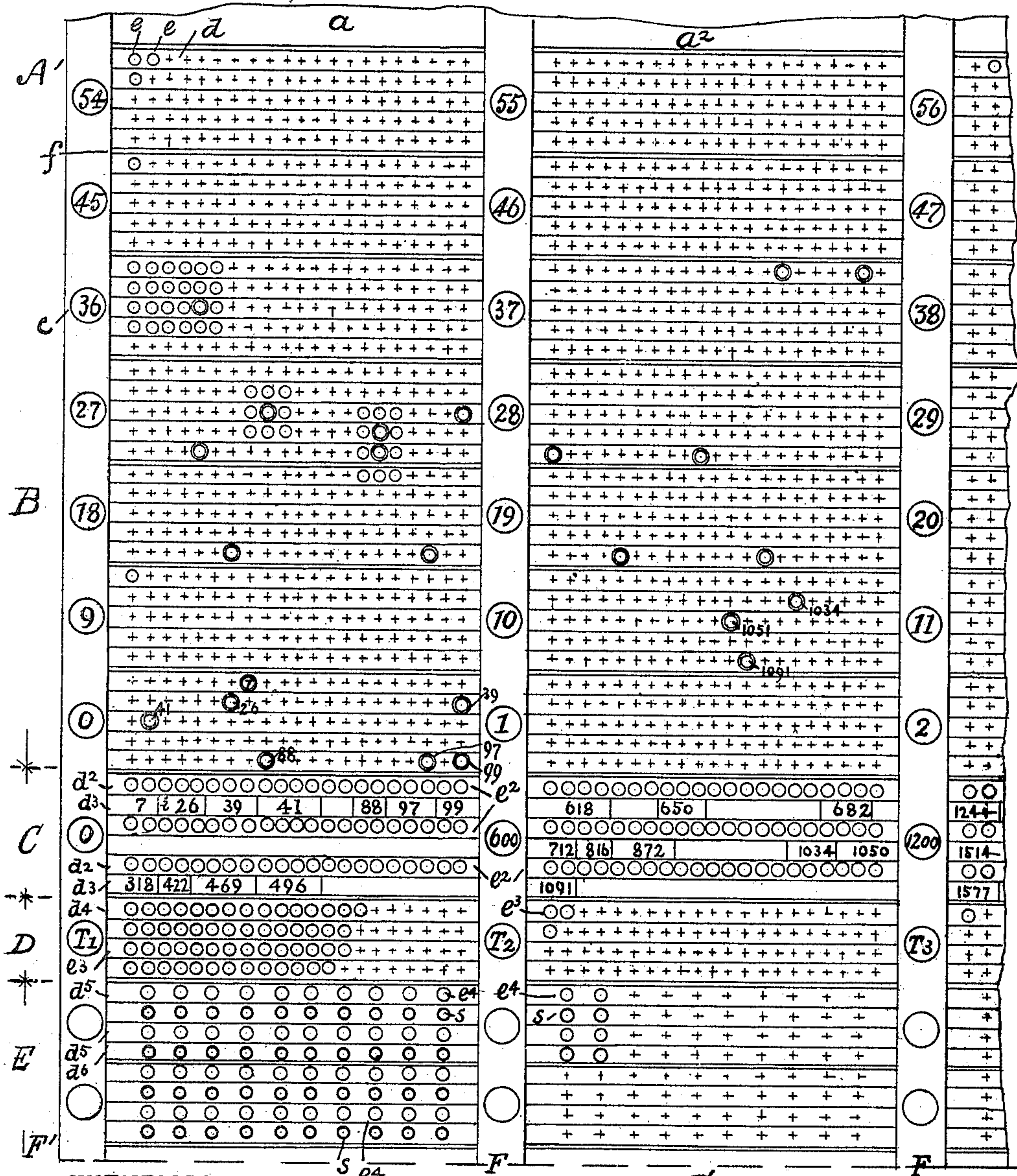
F. L. GILMAN & C. H. HERZIG.
TELEPHONE SWITCHBOARD AND CIRCUIT.

(No Model.)

(Application filed Nov. 6, 1900.)

2 Sheets—Sheet 1.

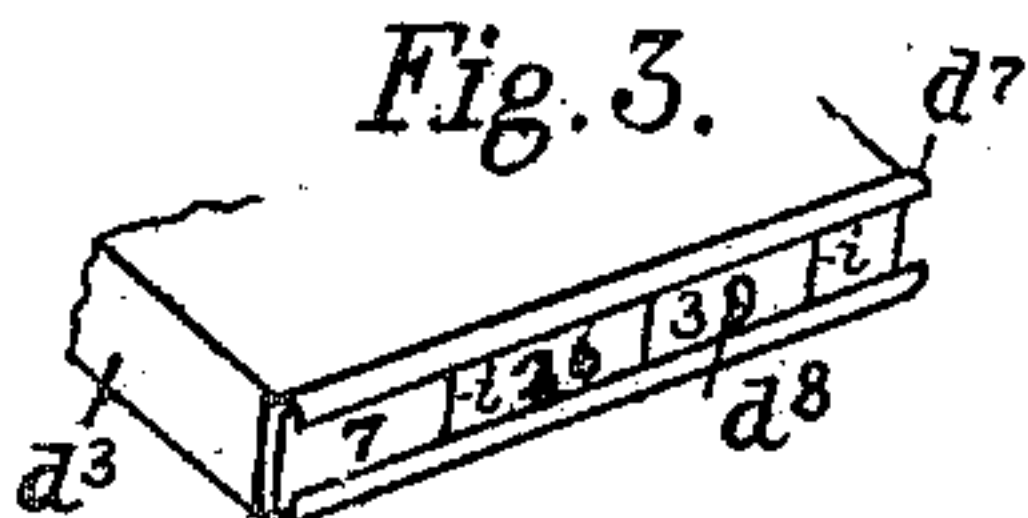
Fig. 1.



WITNESSES:

J. E. Synch.
J. E. Synch.

Fig. 3.



INVENTORS
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No. 668,044.

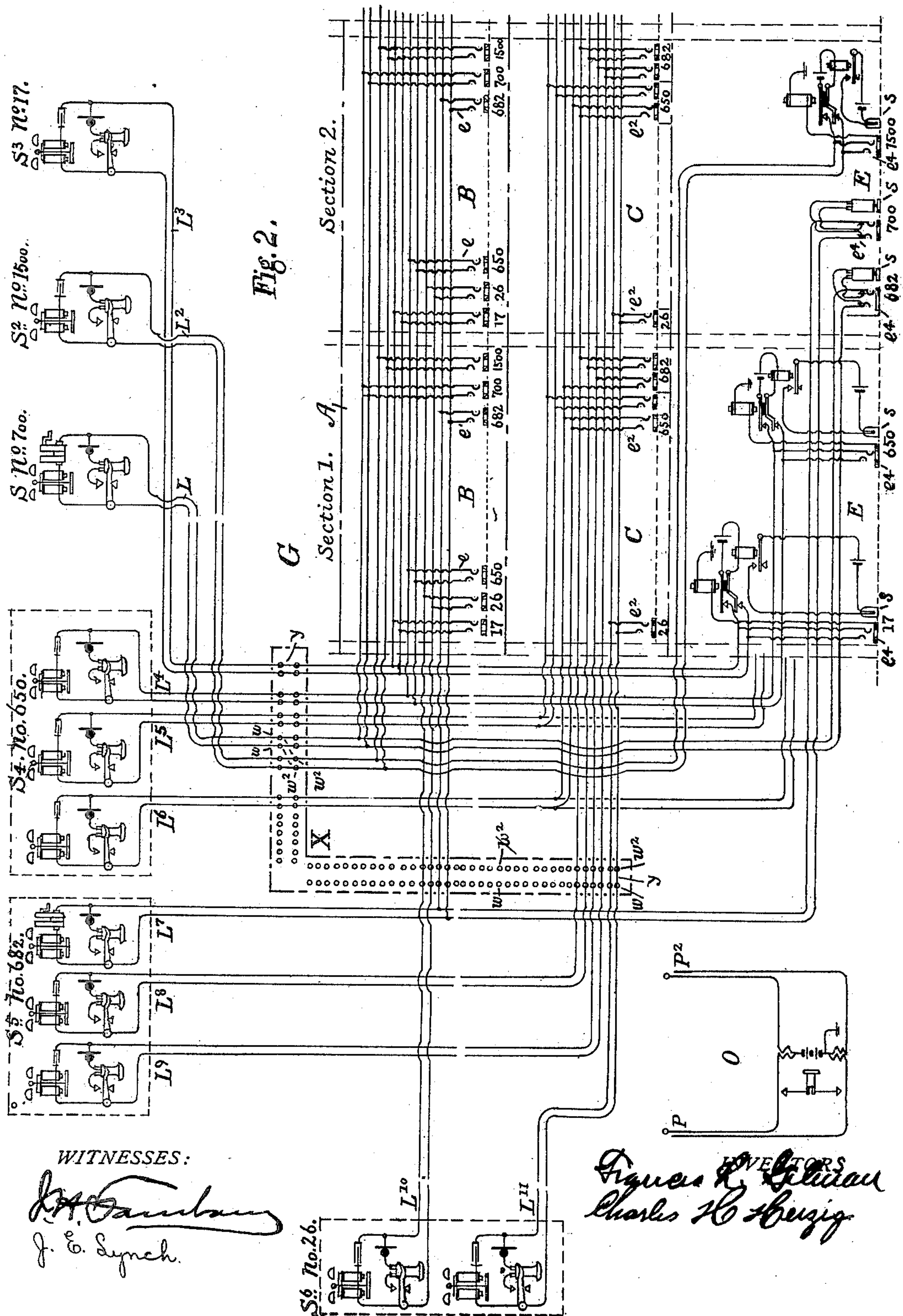
Patented Feb. 12, 1901.

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(No Model.)

(Application filed Nov. 6, 1900.)

2 Sheets—Sheet 2.



UNITED STATES PATENT OFFICE.

FRANCIS L. GILMAN, OF NEW BEDFORD, AND CHARLES H. HERZIG, OF BOSTON, MASSACHUSETTS, ASSIGNORS TO THE NEW ENGLAND TELEPHONE AND TELEGRAPH COMPANY, OF NEW YORK.

TELEPHONE SWITCHBOARD AND CIRCUIT.

SPECIFICATION forming part of Letters Patent No. 668,044, dated February 12, 1901.

Application filed November 6, 1900. Serial No. 35,658. (No model.)

To all whom it may concern:

Be it known that we, FRANCIS L. GILMAN, residing at New Bedford, in the county of Bristol, and CHARLES H. HERZIG, residing at Boston, in the county of Suffolk, State of Massachusetts, have invented certain Improvements in Telephone Switchboards and Circuits, of which the following is a specification.

10 To meet the demands of the subscribers to telephone-exchanges for quick and reliable service, various arrangements of circuits and forms of apparatus have been devised, which have materially added to the complexity of
15 the switchboards at the central offices and increased the duties of the operators. For instance, many of the subscribers find the method of transacting business with their customers by means of the telephone to be so
20 advantageous that they have deemed it necessary to be connected to the central office by several independent circuits, each of which is supplied at the substation with a complete outfit for signaling the central station, for receiving signals therefrom, and for conversation purposes. At the central station the circuits are multiplied each to an independently-numbered switch-socket on the several sections of the switchboard and are supplied at
25 one of said sections with an answering-jack and a line-signal in the usual manner, precisely the same as though such circuit entered from a separate substation. In arranging the printed telephone directory of subscribers to a central station it has been customary to group all of the circuits belonging to one substation by their designating-numbers under the name of the firm or corporation, and when
30 a person wishes to call the firm by telephone one number after the other is given to the operator (if the first ones given are said to be busy) until a circuit is found which is free or disengaged. This is a tedious and trying operation to the person calling and also to
35 the operator, as frequently during the busy hours of the day with business places having a large number of such circuits all of their numbers may be thus called for and, perhaps, all may be reported to be busy. The oper-

ator has to make tests with the regular switch-sockets of the circuits, which are located, it may be, in different panels of the switchboard-section and at a distance from one another, precisely the same as though each circuit extended to a separate substation. This condition is due to the fact that the circuits to any one subscriber are usually added one after the other as the necessities of the business render it expedient, and consequently they are given numbers widely separated from one another and may be upon several different panels of the switchboard, all of which tends to complicate the switchboard apparatus and increase the expense of operation.

The present invention relates to improvements in switchboard circuits and apparatus, and especially to means for obviating the defects previously referred to when a plurality of telephone-circuits extend from one substation to a central-station switchboard.

In carrying out the invention one of a plurality of circuits to one substation terminates at the switchboard in all respects as is usual. Its regular switch-socket is located according to its number, and its conductors are multiplied to switch-sockets on the several sections, and the circuit is provided on one section with an answering-jack and a line-signal; but each regular multiplied switch-socket of the circuit is provided with some visible designating configuration, color, or character upon the end thereof seen upon the front of the switchboard, which signifies to the operator that it is different from other regular switch-sockets and is special to substations having more than one independent circuit to the switchboard.

Upon some part of the switchboard, preferably in a space extending the length of the switchboard between the banks of trunk or toll line switch-sockets and the banks of the regular substation switch-sockets, are arranged strips of sockets alternating with blank strips adapted to hold a number-card. This space we denominate the "special space" and the switch-sockets the "special switch-sockets." The remaining circuits of the plurality of circuits from the substation are not

represented by switch-sockets upon the regular switch-socket space of the switchboard, but the conductors thereof are connected and multiplied to special sockets on the special space, all of the said circuits being connected to sockets in proximity to each other in the same insulating-strip, and beneath the said switch-sockets upon the card on the blank strip is placed the same number that is given to the regular circuit referred to as located in a strip in the regular switch-socket space. Thus all of the circuits belonging to one substation have the same and identical number, one of them having its switch-sockets multiplied with the regular or single substation-circuits in the banks at the upper part of the switchboard with an answering socket and signal, with the groups of such sockets and signals at the lower part of the switchboard, as usual, while the remainder of the circuits are multiplied in the special space mentioned and may or not be provided with answering switch-sockets or with line-signals. Means are also provided whereby additional special switch-sockets representing other circuits to the substation can be added to those already located together in the special strip of such sockets and be embraced or included under the same common or identical number.

These improvements may be applied to the ordinary magneto substation-circuits or to the common battery substation-circuits and are so described herein, all of which we will now more particularly point out.

In the drawings which illustrate the invention, Figure 1 is an elevation of two panels of a switchboard. Fig. 2 is a diagram representing a plurality of substation-circuits connected to two sections of a switchboard, and Fig. 3 is a perspective view of a part of the switchboard.

In the ordinary construction of a telephone multiple switchboard there is, first, an upright part or frame divided into panels a^2 , and, second, a low flat front part termed the "operator's table." (Not shown in the drawings.) In the rear of the upright part are the line conductors or the continuations of the several substation-circuits bunched into small cables, and in each panel is a space B to be filled with a series of insulating-strips d , each provided with switch-sockets e , having spring-terminals connected to the line conductors at the back of the switchboard, and usually between every five such strips, which constitute a bank of strips, are separating-strips f . Each bank or division b will contain one hundred switch-sockets if there are twenty in each strip, and at the left-hand side of each division is a plate bearing a number to indicate to the attending operator the respective hundreds to which the adjacent division belongs, the numbering commencing at the extreme left-hand panel of the switchboard with the upper strip of the lower bank or division b and proceeding through the five strips of the bank and then commencing with the

upper strip of the lower bank or division of the panel to the right, and so on to the lower division in every panel of the switchboard to and including, say, the ninth panel and returning to the extreme left panel again and to the upper strip of the second bank or division b , and so on to the ninth panel again until all of the switch-sockets have been numbered. By this system, where nine panels are used for a section of the switchboard, three operators may be employed, each having charge of three panels, and as the substation-circuits are represented upon each section by one switch-socket each operator has before her the switch-sockets of one-third of the circuits connected to the switchboard, and these switch-sockets are all located in the upper part or space B of the switchboard and may be called the "regular multiplied switch-sockets."

In addition to the regular multiple switchboard-sockets each substation-circuit is supplied with an answering switch-socket and a line-signal, which are located upon the several panels of the switchboard in groups in a space E, extending the length of the switchboard, the switch-sockets being in an insulating-strip d^5 and the corresponding line-signals in a strip d^6 , directly under the former strip, being thus in alternate strips, and as each operator may have the care of, say, one hundred answering-sockets and line-signals as many sections or multiples of the switch-sockets are provided as results from the total number of the substation-circuits divided by three hundred.

Ordinarily between the spaces B and E is a space D, in which are multiplied the insulating-strips of the trunk or toll line switch-sockets d^4 to be accessible to the operator in making trunk or toll connections.

While the special switch-sockets to which this invention relates may be placed in any convenient space upon the switchboard, it has been found in practice desirable to locate them in the space C between the regular multiplied switch-sockets in the space B and the multiplied trunk or toll switch-sockets in the space D, as shown in Fig. 1, the special sockets being in the insulating-strips d^2 , between which are placed the plain strips d^3 , to the faces of which are removably secured paper strips or cards bearing numerals and separation lines or marks.

Fig. 3 shows a perspective view of the strip or card d^3 , which has a metal plate d^7 secured to its front edge, with curving top and bottom edges adapted to hold a paper strip or card d^8 , upon which the numbers and division-marks i are inscribed. The card can be readily removed from the plate d^7 .

Referring to Fig. 2, which is a diagrammatic representation of the invention, A represents two sections 1 and 2 of a multiple switchboard, and B is the space containing the regular connecting or multiplied switch-sockets e , and E is the space in which are located the answering switch-sockets and line-signals c^4

and *s*. As the trunk or toll lines form no part of the invention, they are not represented in this figure. C is the special space devoted to the insulating-strips inclosing the special multiplied switch-sockets about to be described.

The ends of these sockets are rendered conspicuous by a special color or configuration to attract attention and bear a number, as do all of the switch-sockets in all the spaces of the switchboard. In the present instance the sockets are designated by a double ring.

To illustrate the invention, we have shown several varieties of substation-circuits as connected to the switchboard A, of which S, S², and S³, numbered, respectively "700," "1500," and "17," are each provided with one circuit L, L², and L³, respectively, the circuit L being of the magneto type and the circuits L² and L³ of the common battery type, and are each provided with the regular terminal switch-sockets *e e e* upon sections 1 and 2 of the space B of the switchboard, and each socket is marked by its substation-number, and the said circuits have extensions to the space E, at which they are provided with answering switch-sockets *e*⁴ and line-signals *s* upon one of the sections 1 and 2 of the switchboard, all in the usual manner. Substation S⁴ has three circuits L⁴, L⁵, and L⁶, extending to the central station G, and is numbered "650." All of the circuits are of the common battery type. The circuit L⁴ is represented upon the sections 1 and 2 of the switchboard by the regular switch-sockets *e e* upon the space B and is provided with an answering switch-socket *e*⁴ and line-signal *s* upon section 1 of the switchboard-space E, while the circuits L⁵ and L⁶ have special terminal switch-sockets *e*² upon sections 1 and 2 of the special space C of the switchboard and are represented by the common number "650," both of the switch-sockets being located side by side in one strip *d*², and the number "650" is placed directly under the said sockets on the strip *d*³, marks *i* being made on said strip *d*³ on each side of the number to indicate how many in the group of special contiguous switch-sockets are embraced or included with said number. These circuits L⁵ and L⁶ have extensions to the space E and are supposed to be represented there, as shown of circuit L⁴, by separate answering switch-sockets and line-signals, which, however, are not shown in the drawings for the sake of clearness. Substation S⁵, which is numbered "682," is provided with three circuits to the central station L⁷, L⁸, and L⁹, the former circuit having a magneto calling-generator, and its conductors are multiplied by the regular switch-sockets *e e* on the two sections of the switchboard in the space B, and has an extension to the space E and is provided upon the second section of the switchboard with the answering switch-socket *e*⁴ and the electromagnetic line-signal *s*, the latter adapted to be operated by the said generator. The other circuits L⁸ and L⁹ have common

battery substation apparatus, and their conductors are multiplied to the sections 1 and 2 of the special space C of the switchboard by the switch-sockets *e*², which are identified with the substation-number "682," and the substation S⁶, having the number "26," has two circuits L¹⁰ and L¹¹, both provided with common battery substation apparatus connecting with the central station, the former circuit L¹⁰ being represented upon the two sections of the space B by the regular switch-sockets *e e*. This circuit represents a certain variety of telephone-circuits provided with a regular switch-socket upon the space B and adapted to be called from the central station, but cannot call the central station, as it is not provided with a line-signal or an answering switch-socket, and the second circuit L¹¹ is represented upon the special space C upon the sections 1 and 2 of the switchboard by the special switch-sockets *e*² *e*², but has no extension to the answering-space E and is in the same category as the circuit L¹⁰. Its call-bell may be rung from the central station; but no call can be made to the central station.

In the foregoing description it has been our intention to show the adaptability of our invention to the various kinds of circuits and various types of substation service which are in use at the present time and to illustrate how various types of circuits may be combined in one substation in order that its feasibility may be demonstrated, as it is common in many switchboards to have magneto and common battery substation-circuits centering thereto.

In the operation of the invention whenever an operator receives a call for connection with a substation—say for substation No. 650—to ascertain whether the circuit wanted is engaged or not she touches with the calling-plug P² of the cord-circuit being used the ring or end of the regular switch-socket of No. 650 in the space B, and if the circuit tests "not busy" inserts the plug into the socket; but if the test shows the circuit to be engaged instead of informing the calling subscriber of the fact, as is customary when but one line connects with the wanted substation, she, noticing the indicating color or configuration about the end of the switch-socket, knows that there are one or more other circuits to the same substation having special switch-sockets in the special space C of the switchboard, and therefore looks into the said special space for the same number that the regular socket bears and makes a test with the ring of the socket immediately over and included by said number and if not busy inserts the plug in said socket. If there are more than one switch-socket included by the substation-number and the first one proves to be engaged, the remaining sockets are tested until one is found disengaged, unless, indeed, all are found to be engaged, when the fact will be announced to the calling sub-

scriber. The operator is assisted in finding a number in the special space C by the plates c^2 to the left of each bank of the strips. In Fig. 1 the panels are each shown as inclosing special switch-sockets in multiples of six hundred. As all of the special switch-sockets in the space C belonging to one substation are in the same strip and close to each other, by this method of connection the operator has all the means of connection with a substation in a condensed space and can proceed with her work with confidence and make the tests and connection in the easiest and most expeditious manner.

In each special space C are one or more strips of unoccupied or unconnected switch-sockets, and numeral-strips are left for the expansion of the service—*i. e.*, in order that new circuits added to an existing substation may have their special switch-sockets together in the same strip in the said space and that new special circuits may be provided with switch-sockets.

A special feature of the invention is that numbered multiplied switch-sockets can be transferred from one panel of a section of the switchboard to another without changing the number. This cannot be done with the multiplied switch-sockets in the regular space B, as the arrangement of the numbers is fixed in relation to the switch-sockets. The same thing can, of course, be done with switch-sockets in the answering groups in the space E; but these switch-sockets are not multiplied. A great advantage is thus provided for, as the multiplied number can be transferred to other panels of the section when one panel becomes crowded or when a large number of circuits are allotted to one substation and it becomes advisable to rearrange the switch-sockets in any panel. X in Fig. 1 represents the distributing-board, provided with connectors x x^2 , to one side of which, x , the conductors of the substation-circuits are permanently connected, while to the other side x^2 are permanently connected the conductors extending to the switch-sockets on the switchboard, and between the connectors x and x^2 are the bridle-wires 4. It will be seen that if substation S was to be represented by multiplied switch-sockets upon another part of the switchboard in the regular space B—say to the sockets now connected with substation S^2 —its number would be changed by such transfer from No. 700 to No. 1,500, and the change would be made at the distributing-board X by connecting the bridle-wires y y from the connectors w w of circuit L with the connectors w^2 w^2 , as shown in dotted lines, to which are connected the conductors extending to switch-sockets No. 1,500; but if any of the switch-sockets in the special space C were to be transferred to another panel there would be no change in the number. Say that sockets e^2 , representing circuits L^5 and L^6 from substation S^4 , having the common number "650," were to be moved from their present location

or any of the circuits represented in said space were to be represented upon another panel of the section. The transfer would be made at the distributing-board, as usual; but the old number can be carried to the sockets in the new location and placed upon the paper strip in proximity thereto, so that the sockets in the space C may, in the sense referred to, be denominated "movable" sockets, and the changes made without changing the number or numeral of the substation.

We claim as our invention—

1. In a telephonic central-station switching system, regular switch-sockets for a portion of the substation-circuits in a certain horizontal space on the upper part of each section of the switchboard, and additional or answering switch-sockets for said circuits in groups in the lower part of said sections, and line-signals for said circuits associated with said answering switch-sockets; with special switch-sockets for another portion of the substation-circuits in a special horizontal space on the switchboard between the regular switch-sockets and the answering-sockets and line-signals, as set forth.

2. In a telephonic central-station switching system, regular switch-sockets for a portion of the substation-circuits in a certain horizontal space on the upper part of a certain horizontal space on each section of the switchboard; and additional or answering switch-sockets for said circuits in groups in the lower part of said sections, with line-signals for said circuits associated with said answering switch-sockets; with special switch-sockets for another portion of the substation-circuits in a special horizontal space on the switchboard, between the regular switch-sockets and the said answering switch-sockets and said line-signals, and additional or answering switch-sockets for the said circuits in the said groups in said sections with line-signals for said circuits associated with said answering switch-sockets, as set forth.

3. In a telephonic central-station switching system, regular multiple switch-sockets for a portion of the substation-circuits in a certain space on each section of the switchboard, some of the said switch-sockets being distinguished from others by a certain color or configuration; and additional or answering switch-sockets for said circuits in groups in said sections, with line-signals for said circuits associated with said answering switch-sockets; with special multiple switch-sockets for another portion of the substation-circuits in a special space on the switchboard, between the regular switch-sockets and the said answering switch-sockets and said line-signals, one or more of the special multiple switch-sockets having a common or identical number with one of said distinguished regular multiple switch-sockets, as set forth.

4. In a telephonic central-station switching system, regular multiple switch-sockets for a portion of the substation-circuits in a certain

space on each section of the switchboard, some of said switch-sockets being distinguished from others by a certain color or configuration; and additional or answering switch-sockets for said circuits in groups in said sections, with line-signals for said circuits associated with said answering switch-sockets; with special multiple switch-sockets for another portion of the substation-circuits in a special space on the switchboard, between the regular switch-sockets and the said answering switch-sockets and said line-signals, one or more of the said special multiple switch-sockets having a common or identical number with one of said distinguished regular multiple switch-sockets, and additional answering switch-sockets for the second portion of substation-circuits in the said groups in said sections, with line-signals associated therewith, as set forth.

5. In a telephonic circuit and switching system, two or more independent circuits extending from a substation to a central station, each of the circuits provided at the substation with calling and telephone apparatus, one of said circuits having switch-sockets specially distinguished by color or configuration from other switch-sockets upon the regular switch-socket space of the switchboard, and with an answering switch-socket and a line-signal in a group of such sockets and signals upon a certain space of the switchboard; while the other circuit or circuits are each provided with special switch-sockets contiguous to each other upon a special space of the switchboard, the said specially-distinguished switch-sockets and the special contiguous switch-sockets having an identical or common number, as set forth.

6. In a telephone circuit and switching system, two or more independent circuits extending from a substation to a central station, each of the circuits provided at the substation with call-sending and call-receiving apparatus, one of said circuits having switch-sockets specially distinguished by color or configuration from the other switch-sockets upon the regular switch-socket space of the switchboard, and with an answering switch-socket and a line-signal in a group of such sockets and signals upon a certain space of the switchboard; while the other circuit or circuits are each provided with special switch-sockets contiguous to each other upon a special space of the switchboard, and may be provided with an answering switch-socket and a line-signal in one of said groups, the specially-distinguished switch-sockets and the special contiguous switch-sockets having an identical or common number, as set forth.

7. In a telephone central-station switching system, regular multiple switch-sockets connected to a portion of the substation-circuits, in a certain space on each section of the switchboard, some of the said switch-sockets being distinguished from others by a certain color or configuration; and additional or answering

switch-sockets for said circuits in groups in said sections, with line-signals for said circuits associated with said answering switch-sockets; with special multiple switch-sockets connected to another portion of the substation-circuits in a special space on the switchboard, between the regular switch-sockets and the said answering switch-sockets, and said line-signals, one or more of the special contiguous multiple switch-sockets having a common or identical number with one of the said distinguished regular multiple switch-sockets; and unconnected special switch-sockets in said special space adapted for connection with substation-circuits, whereby additional sockets may be added to any group of contiguous switch-sockets already associated with a designating numeral or number without disadvantage to or interference with other groups of contiguous switch-sockets associated under other designating numerals or numbers, and whereby the operator is enabled to perform the testing of the several circuits in each group associated under the numeral or number of any substation, with great facility and celerity, as set forth.

8. In a telephone circuit and switching system, two or more independent circuits extending from a substation to a central station, each of the circuits provided at the substation with call-sending and call-receiving apparatus, one of said circuits connected to switch-sockets specially distinguished by color or configuration from the other switch-sockets upon the regular switch-socket space of the switchboard, and connected also with an answering switch-socket and a line-signal in a group of such sockets and signals upon a certain space of the switchboard; while the other circuit or circuits are each connected with special switch-sockets contiguous to each other upon a special space of the switchboard, the said specially-distinguished switch-sockets and the special contiguous switch-sockets having a common or identical number; and unconnected special sockets in said special space adapted for connection with additional circuits from the said substation, whereby additional sockets may be added to the group of contiguous switch-sockets associated with the designating numeral or number of the said substation without disadvantage to or interference with other groups of contiguous switch-sockets associated under the designating numerals or numbers of the other substations, as set forth.

9. In a telephone central-station switching system, regular switch-sockets for a portion of the substation-circuits in a certain space on one part of each section of the switchboard each designated by a certain number or numeral; with special switch-sockets for another portion of the substation-circuits in a special space on the switchboard, one or more of said switch-sockets contiguous to one another having the same and identical number with one of the said regular switch-sockets, the circuits

of the said contiguous switch-sockets and that of the regular switch-sockets terminating in the same substation, as and for the purposes set forth.

5 10. In a telephone central-station switching system, regular switch-sockets for a portion of the substation-circuits in a certain space on one part of each section of the switchboard, and additional or answering switch-sockets
10 for said circuits in groups in another part of said sections, one of each of said regular switch-sockets and answering-sockets being designated by a certain number or numeral, and line signals for said circuits associated
15 with said answering switch-sockets; and special switch-sockets for another portion of the substation-circuits in a special space on the switchboard, one or more of said switch-sockets contiguous to one another having the
20 same and identical number with one of the said regular switch-sockets, as and for the purposes set forth.

11. In a telephone central-station switching system, regular switch-sockets for a portion
25 of the substation-circuits in a certain space on one part of each section of the switchboard, each designated by a certain fixed number or numeral; with special switch-sockets for another portion of the substation-circuits in a
30 special space on the switchboard, one or more of the said special switch-sockets contiguous to one another, having the same and identical number or numeral with one of said regular switch-sockets, which number or numeral is
35 adapted to be movable from one or more specified special switch-sockets to other specified special switch-sockets in the said special space, combined with means for transferring the substation circuit or circuits connected
40 with any such specified special switch-sockets to other special switch-sockets upon the same switchboard-section, the circuits of the said contiguous switch-sockets and that of the said regular switch-socket terminating at the same
45 substation, as set forth.

12. In a telephone central-station switching system, the combination of regular switch-sockets constituting the terminals of telephone-circuits each having a fixed permanent

number or numeral; with special switch-sock- 50
ets normally without numbers or numerals adapted to constitute the terminals of other telephone-circuits, with means for designat-
ing one or more such special switch-sockets 55
with the fixed number of one of said regular switch-sockets when they are connected with circuits which terminate at the same substation with the circuit of said regular switch-socket; whereby contiguous special switch-sockets may be added to the said number or 60
numeral, or, all of the circuits represented by the said special switch-sockets may be changed to other special switch-sockets and have the same designating-number, as set forth. 65

13. In a telephone central-station switching system, regular switch-sockets for a portion of the substation-circuits in a certain space on one part of each section of the switchboard, each designated by a certain fixed number or 70
numeral; with special switch-sockets for another portion of the substation-circuits in a special space on the switchboard, one or more of said special switch-sockets contiguous to one another having the same and identical 75
number or numeral with one of said regular switch-sockets, which number or numeral is adapted to correlate any one or more contiguous specified special switch-sockets in the said special space, with any specified regular 80
switch-sockets; combined with means for transferring the substation circuit or circuits connected with any such specified special switch-sockets to other special switch-sockets upon the same switchboard-section, the cir- 85
cuits of the said contiguous switch-sockets and that of the said regular switch-socket terminating at the same substation, as set forth.

In testimony whereof we have signed our names to this specification, in the presence of 90
two subscribing witnesses, this 20th day of October, 1900.

FRANCIS L. GILMAN.
CHARLES H. HERZIG.

Witnesses:

I. H. FARNHAM,
J. E. LYNCH.