(No Model.)

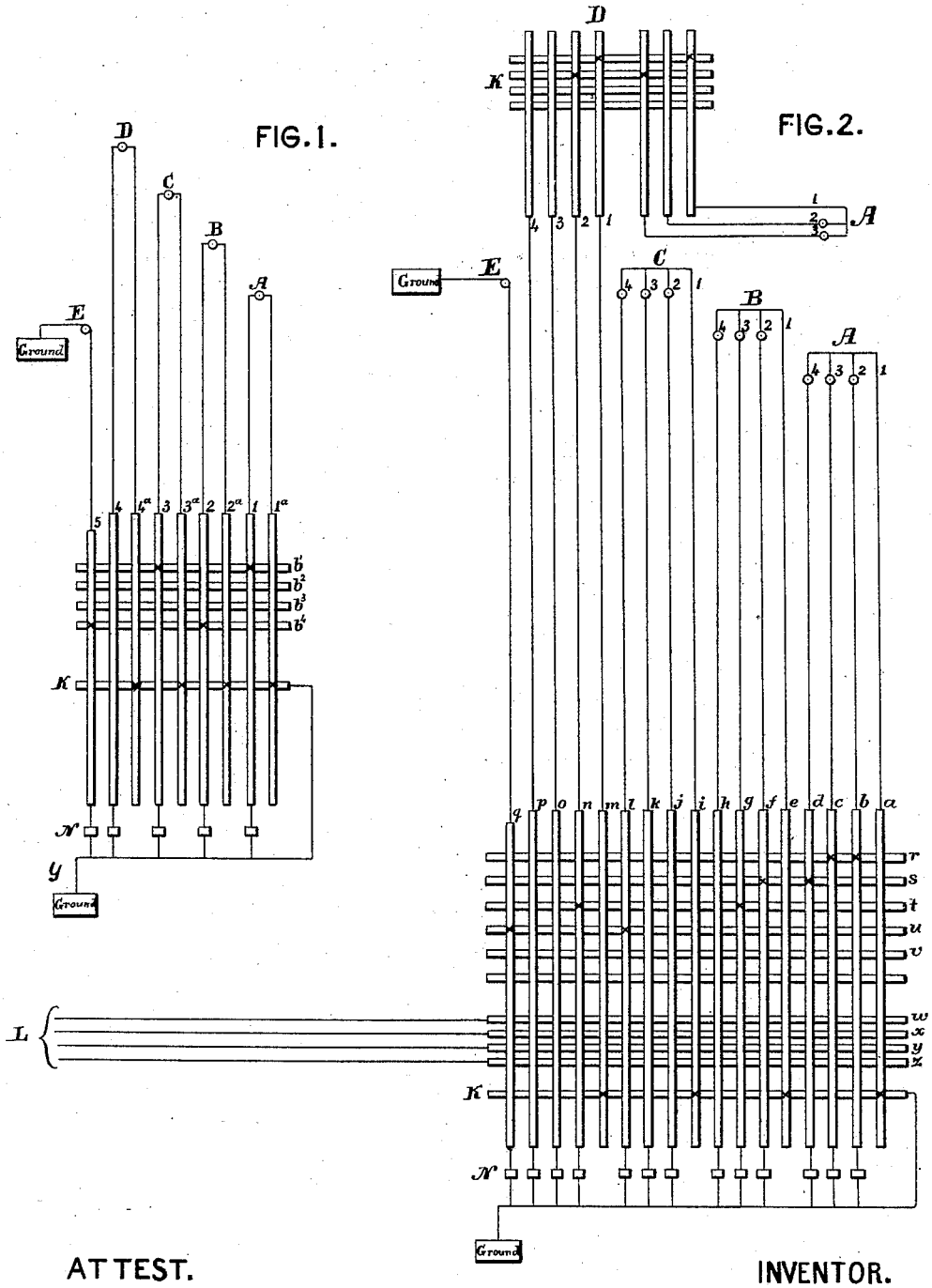
W. H. KNIGHT.

TELEPHONE EXCHANGE SYSTEM.

No. 302,344. Patented July 22, 1884.

FIG. 1.

FIG. 2.



ATTEST.

J. Henry Kaiser.
Geo. T. Smallwood.

INVENTOR.

Walter H. Knight
per Bentley & Knight
Attys.

UNITED STATES PATENT OFFICE.

WALTER H. KNIGHT, OF NEW YORK, N. Y.

TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 302,344, dated July 22, 1884.

Application filed December 15, 1883. (No model.)

To all whom it may concern:

Be it known that I, WALTER H. KNIGHT, a citizen of the United States, residing at New York city, New York, have invented certain new and useful Improvements in Telephone-Exchange Systems, which are illustrated in Figures 1 and 2 of the accompanying drawings.

My invention relates to switch-boards for double lines.

In Fig. 1 of the drawings, A, B, C, and D represent subscribers' stations, each having a double non-induction line, the two branches being equally distant from any other line, running to the central-office switch-board, and connected to the vertical strips 1 1^a 2 2^a, &c. One end of every double line is normally plugged or otherwise connected to a common conductor, as shown by the cross at the junction of bar K with strips 1^a 2^a, &c. The other ends are left free to be connected to any of the cross-bars b' b^2 b^3, &c., at will. They preferably terminate in conductors passing through annunciators N, and then passing on to bar K. As the one set of ends are all connected, it is apparent that the free ends may be treated like the ordinary single lines running to the switch-boards now in use, and connected with one another in the manner now employed for single lines. Thus to connect subscribers A and C, their free ends 1 and 3 are plugged to a cross-bar, b', as indicated by the crosses. A and C are now connected through lines 1 and 3 and intermediate bar b', while they are also permanently connected by lines 1^a and 3^a and intermediate bar K. They are therefore on a complete metallic circuit, both lines of which pass from the subscriber to the central office and out to the second subscriber. Calling is done in the ordinary manner. When it is desired to connect a subscriber having a single line, as E, with one having a double line, the single-line strip 5 is plugged to the bar b^4, and the free end of a double line, as B, is plugged to the same bar. It is necessary in this case that K have a ground-connection at Y, which will not interfere with its function as a common connector for double lines. The circuit is then from ground at subscriber E to strip 5, to b^4, to strip 2, to B, and back to central office by line 2^a, to bar K, to ground.

Fig. 2 shows the system applied to the distribution system, where a common return-wire is used for a number of direct lines, as is set forth in Patent No. 276,954, granted to E. M. Bently May 1, 1883. A, B, and C are groups of direct lines, each group provided with a common return, each direct and the common return being equally distant from any external line. D is a group of trunk-lines running to a second exchange, and also provided with a common return-wire. The common returns are all normally plugged to a common conductor, K, while the direct lines are left free for individual connections. Any two subscribers in the same group can be connected by simply plugging their lines to the same bar, as 2 and 3 A to bar *r*. Subscribers 4 A and 2 B are shown plugged to bar S. Subscriber 3 B and trunk-line 2 D are plugged to bar *t*. At the second exchange trunk-line 2 is plugged to subscriber 3 A, their common returns being connected, so that 3 A at second exchange and 3 B at first exchange are in communication. Subscriber 4 C is connected to single-line subscriber E. It will thus be seen that any desired connection can be made, as with the present switch-boards, and yet the double-line system completely preserved. In Fig. 2 the trunk-lines can come to cross-bars, as do lines L, if desired. It is not necessary that the return-lines should be strips with a place on the switch-board. They may be connected in any place and way at the central office.

I do not lay claim to some of the details shown in Fig. 2, nor to the method of trunk-line connection.

What I claim herein is—

1. Two or more double anti-inductive circuits, each having its two ends terminating in a central office, and having one of said ends there connected normally to a common conductor, in combination with devices for connecting together the other ends of the circuits at will, said common conductor and said connecting devices both forming parts of the conversing-circuit.

2. In combination, a switch-board, double anti-inductive circuits between switch-board and subscribers, one end of each subscriber's circuit normally connected to a common conductor at the switch-board, and means for con-

necting the other ends at will, so as to form a complete metallic circuit between subscribers, including said common conductor.

3. Two subscribers' circuits terminating in a central office and means at said office of connecting them, the outer terminals of said circuits being connected for conversation by an inductively-neutralizing conductor permanently continuous, extending back through said central office.

4. The combination of two or more subscribers' lines connected to a common switch-board, each line being accompanied throughout by its return-line, and said return-lines being permanently connected together at the central office.

5. The combination of two or more subscribers' lines provided with annunciators and parallel return-lines therefor normally connected to a common conductor at the central office.

6. The combination of a subscriber's single line grounded at its extremity and a subscriber's double anti-inductive line having one end permanently grounded at the central office.

7. The combination of a series of two or more groups of subscribers' lines, each group being provided with a common return-line for neutralizing induction, the common return-lines being normally connected to a common conductor at the central office, and the individual lines being free for desired connections.

8. The combination of a subscriber's line terminating at the central office, a return-line therefor, the direct and return being equally distant from any other line, and the return being permanently connected to a common conductor at the central office.

WALTER H. KNIGHT.

Witnesses:
ALBERT E. LYNCH,
W. E. DONNELLY.