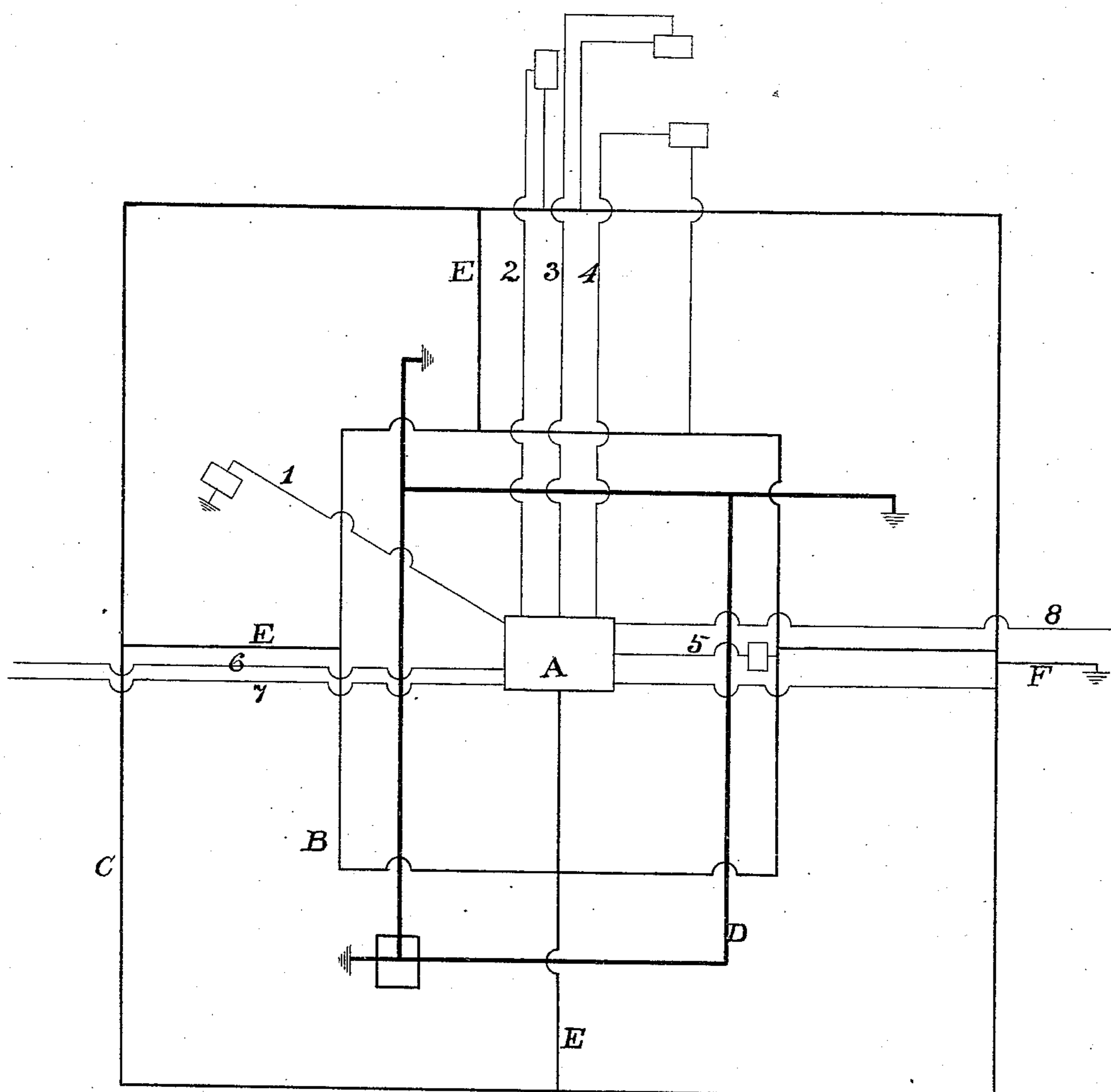


(No Model.)

E. M. BENTLEY.
TELEPHONE EXCHANGE SYSTEM.

No. 437,010.

Patented Sept. 23, 1890.



Witnesses.

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UNITED STATES PATENT OFFICE.

EDWARD M. BENTLEY, OF BOSTON, MASSACHUSETTS.

TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 437,010, dated September 23, 1890.

Application filed November 2, 1889. Serial No. 329,098. (No model.)

To all whom it may concern:

Be it known that I, EDWARD M. BENTLEY, of Boston, Suffolk county, State of Massachusetts, have invented a new and useful Telephone-Exchange System, of which the following is a specification.

My invention relates to telephone-exchange systems; and it consists in an arrangement for avoiding disturbances on the telephone-wires arising from leakage and induction from neighboring wires.

In a patent granted me May 1, 1883, No. 276,954, I have set forth a method of avoiding interference between wires of different classes. In that method the trunk telegraph-wires coming into a city were provided with a common return-line which ran parallel with the direct lines to avoid inductive effects and was then grounded outside the city at a point beyond the area of disturbance. The local lines, however, were all provided with complete metallic circuits. My present invention consists in adapting these two arrangements to a local telephone system, utilizing the distinctive features of each not so much for the purpose of avoiding induction as to prevent leakage to the telephone-wires from the grounded electric-power systems which have come extensively into use since the date of the above-mentioned patent. With this object in view I provide the radiating exchange-lines with a complete metallic circuit independent of the ground, so far as the city or district liable to disturbance is concerned; but I connect this metallic system to ground at a point some miles, if necessary, outside the city beyond the area of possible leakage from the grounded power-lines. I accomplish this by extending throughout the district a series of belt-lines concentric with the central station and at successive distances therefrom. These belt-lines are of low resistance and are preferably connected together. They form a common return or "artificial ground" as it might be termed, that is completely of metal and independent of the earth so far as the city is concerned; but to make the system universal in its application and capable of use with trunk-lines or lines grounded at a distance, I make a ground-connection for my

common return at a point several miles, if necessary, outside the city and beyond the limit of possible leakage from the power-lines.

In the accompanying drawings, illustrating my invention, A represents a central station. 1, 2, 3, 4, and 5 are service-lines radiating therefrom.

6, 7, and 8 are trunk-lines to distant points.

B and C are concentric belt-lines of low resistance at successive distances from the station and connected by wires E.

D is a power-circuit—as, for example, a railway grounded at various places throughout the district and liable to affect all telephone-circuits that may be grounded in the vicinity.

F is a ground-connection for the common return at a point several miles, if necessary, beyond the area of leakage disturbance.

By means of the two concentric ground-lines I can make connection with either one, as may be convenient, while it is always possible to bring a subscriber's line back in a direction parallel to the outgoing wire, and thus obviate induction as well as leakage.

I am aware that it is not new to provide a common return for telephone-lines and have it connected to ground, such an arrangement being shown in patent of W. H. Knight, No. 302,344, dated July 22, 1884; but in such cases the ground-connection has always been made at the central station or at various points exposed to the leakage from other grounded circuits. In my system there will be of course a connection from the common return to the central station for signaling, and it is also practicable to make the ground-connection for the common return of less capacity than the return itself, as the bulk of the transmission will be on the metallic system without passing over the ground.

While I have shown in this instance a common return-wire concentric with the central station, it is evident that the said wire may without departing from the spirit of my invention assume any desired route by which it may reach any desired number of subscribers whose lines extend from the central station.

What I claim as new, and of my invention, is—

1. A local telephone-exchange having a series of radiating lines, with a common return-line connected to their outer ends, the said return-line having a ground-connection at a point outside the area of leakage disturbance.

2. A local telephone-exchange having a series of radiating lines, with a common return-line connected to their outer ends and extending through the district to be served, the said return-line having a ground-connection at a point outside the area of leakage disturbance.

3. A local telephone-exchange having a series of radiating lines, with two or more common return-lines therefor extending through the district to be served and connected to the radiating lines at successive distances from the central station.

4. A local telephone-exchange having a series of radiating lines, with a common return-line therefor connected to their outer ends, grounded at a point outside the area of leak-

age disturbance, combined with a grounded trunk-line extending to a distant exchange.

5. A telephone-exchange system having a series of radiating lines exposed to leakage and inductive disturbances, each of the disturbed lines having a parallel individual return for avoiding induction, connected to a common line extending through the district and grounded at a point outside the area of leakage disturbances.

6. A telephone-exchange system having a common return-line extending through the district to be served and surrounding the central station, and one or more subscribers' stations outside the said return-line, provided each with a parallel individual return brought back and connected to the common return.

EDWARD M. BENTLEY.

Witnesses:

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N. D. ATWOOD.