

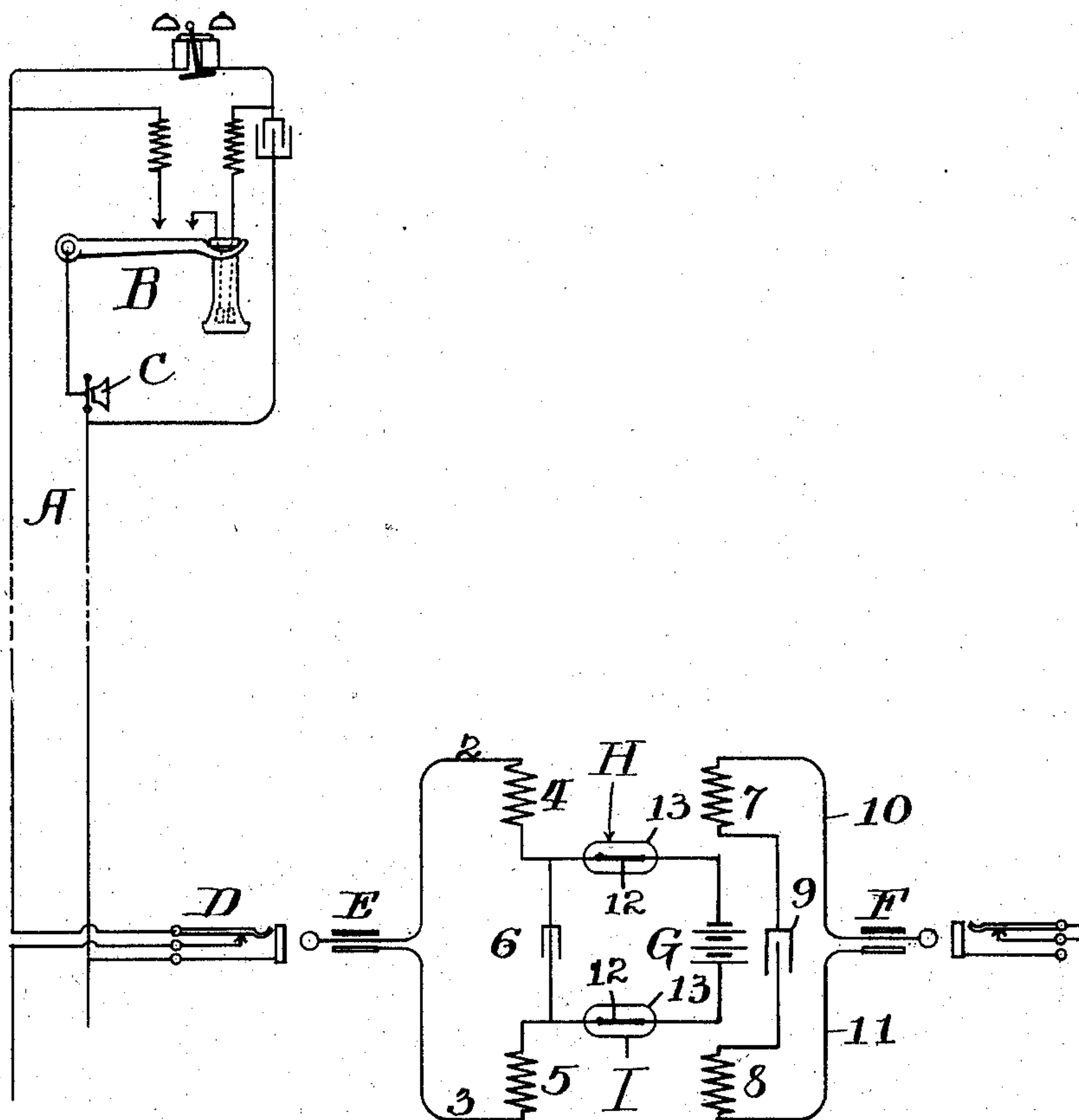
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C. D. ENOCHS.

TELEPHONE EXCHANGE APPARATUS.

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UNITED STATES PATENT OFFICE.

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TELEPHONE-EXCHANGE APPARATUS.

No. 854,203.

Specification of Letters Patent.

Patented May 21, 1907.

Application filed April 24, 1905. Serial No. 257,051.

To all whom it may concern:

Be it known that I, CLAUDE D. ENOCHS, a citizen of the United States, residing at La Crosse, in the county of La Crosse and State of Wisconsin, have invented new and useful Telephone-Exchange Apparatus, of which the following is a specification.

My invention relates to improvements in telephone exchange apparatus, of which the following is a full description, reference being had to the accompanying drawing forming part of this specification.

My invention relates more particularly to means for causing the subscriber's transmitter to operate more efficiently and effectively in the transmission of sound waves over the line circuit.

In the operation of telephone instruments connected with central station batteries, the resistances of the multitudinous subscribers' line circuits vary widely and in consequence there is a difference in transmission of current from the source of supply, and when it is found necessary to boost the central office battery to such an extent that the transmission from the station on a long subscriber's loop is effective, the transmitters at the subscribers' stations on other loops of low resistance are often destroyed or materially damaged from the heavy current which they receive.

The object of my invention is to overcome these defects in a simple and efficient manner.

In the accompanying drawing is shown a diagrammatic view of part of a simple telephone exchange system equipped with my invention.

A represents the line circuit, B the subscriber's set having a transmitter C connected therewith and D the line jack at the central station, all of said parts being of ordinary construction.

At the central station are the usual answering and call plugs or cords E and F. The conductors 2 and 3 of the answering plug E are connected with windings 4 and 5 of repeating coils. The opposite terminals of said windings are connected with a battery G. A condenser 6 is bridged between the terminals of the repeating coils, and each loop between said terminals and each pole of the battery is connected in series with a steadying resist-

ance (H and I) or what I have chosen to term a "ballast," to be hereinafter more fully described. The respective co-operating windings 7 and 8 of the repeating coils are connected with a condenser 9 and in series with loops 10 and 11 of the call plug. Each ballast H and I contained in the opposite conductors of the cord plug circuit at the central office, as described, is in the form of a conductor 12, made of fine iron wire or other suitable material, inclosed in a sealed chamber 13, which may or may not contain an inert gas, as preferred. The ballast conductor decreases in conductivity as its temperature rises, and in case the line has a high true resistance the ballast receives a small amount of current and its resistance will be comparatively low and vice versa. The subscriber's transmitter in the former case will receive the highest possible current on a line of any length and produces the best possible transmission, and in the latter case the added current will increase the resistance of the ballast to such an extent that the subscriber's transmitter will not be injured by excessive current. By using a sealed chamber as described and a fine iron wire conductor therein, I have found that the heat produced by the current passing through said conductor is not materially radiated and the corrective resistance and temperature of the ballast are thereby made extremely sensitive.

In the practice of my invention it is possible to boost the central office battery to substantially any extent desired, for the ballast automatically regulates and protects the subscriber's transmitter from injury by excessive current. The ballast acts in the manner of steadying the resistance of the circuits to which it is connected, as described, and has a large positive temperature correction, which is always immediately available, and the variation of voltage in the line circuit is regulated to a nicety.

It is not always necessary to connect the ballast with the cord circuit, as above described, for it may be connected with any suitable part to effect the results stated, and in the use of my invention it is obvious that current from the battery in the cord circuit may be fed over a relay winding in place of the repeating coils (as shown) or that current

from the transmitter battery may be fed over a relay included in the line circuit without varying from the principles which I have applied.

5 While I have shown one form of ballast, it is obvious that other forms may be used without departing from the spirit of this invention to effect the results set forth, and I do not wish to be understood as confining myself to the exact materials, construction
10 and arrangement of parts described.

Having described my invention, what I claim as new and desire to protect by Letters Patent, is:—

15 1. Telephone exchange apparatus, comprising a subscriber's line circuit, a line jack connected with said circuit, a cord plug circuit co-operating with said jack, and means adapted to be included in said circuits when
20 connected to automatically steady the resistance thereof.

2. Telephone exchange apparatus, comprising a line circuit, a cord plug circuit co-operating with said line circuit, and a ballast adapted to be included in said circuits, for
25 the purposes specified.

3. Telephone exchange apparatus, comprising a line circuit, a subscriber's set having a transmitter included in said circuit, a
30 cord plug circuit at the central station adapted to co-operate with said line circuit, a source of electric current included in said cord plug circuit, and a ballast connected with said cord plug circuit, for the purposes specified.

35 4. Telephone exchange apparatus, comprising a line circuit, a subscriber's set having a transmitter included in said circuit, a line jack, a cord plug circuit adapted to co-operate with said jack at the central station, a battery included in said cord plug circuit,
40 and a ballast connected with said cord plug circuit, for the purposes specified.

45 5. Telephone exchange apparatus, comprising a line circuit, a subscriber's set having a transmitter included in said circuit, a line jack, a cord plug circuit at the central station adapted to co-operate with said jack, a battery and repeating coil included in said cord plug circuit, and a ballast connected in

series with said repeating coil and battery, 50 for the purposes specified.

6. Telephone exchange apparatus, comprising a subscriber's circuit, a line jack connected with said circuit at the central station, a cord plug circuit adapted to co-operate 55 with said line jack, a battery connected with the conductors of said cord plug circuit, and a repeating coil and ballast connected in series with each of said conductors.

7. Telephone exchange apparatus, comprising a subscriber's line circuit, a line jack connected with said circuit, a cord plug circuit adapted to co-operate with said jack at the central station, a source of current supply connected with said cord plug circuit, 65 and a ballast connected in series with each conductor of said cord plug circuit.

8. A telephone system having associated therewith line circuits of divers resistances, a telephone set for each line circuit, a cord plug 70 circuit, a common source of current supply, and a ballast adapted to be included in said circuits, for the purposes specified.

9. A telephone system, having associated therewith, line circuits of divers resistances, 75 a telephone set for each line circuit, a cord plug circuit, a common source of current supply, and a ballast adapted to be associated with said circuits, for the purposes specified.

10. Telephone exchange apparatus, comprising a subscriber's line circuit A, a subscriber's set B having a transmitter C included in said circuit, a line jack D connected with said circuit, a cord plug E at the central station adapted to co-operate with said line 85 jack, a battery G connected with the conductors of said cord plug, a repeating coil and ballast connected in series with each of said conductors, and a condenser 6 in multiple with said conductors. 90

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CLAUDE D. ENOCHS.

Witnesses:

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