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C. S. RHOADS

2,346,115

EMERGENCY TELEPHONE SYSTEM

Filed June 12, 1943

2 Sheets-Sheet 1

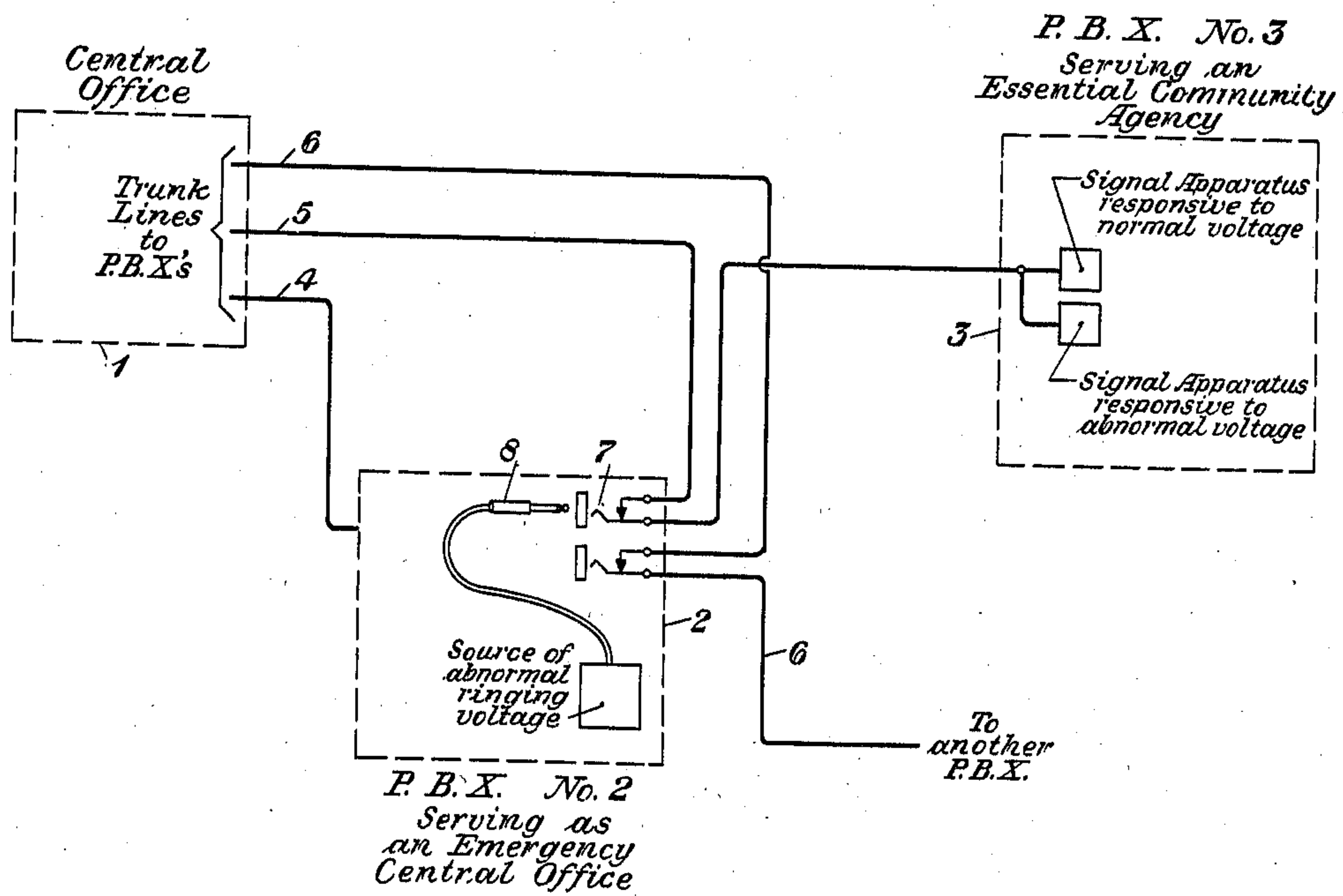


Fig. 1

INVENTOR
C. S. Rhoads
BY *John M. King*
ATTORNEY

April 4, 1944.

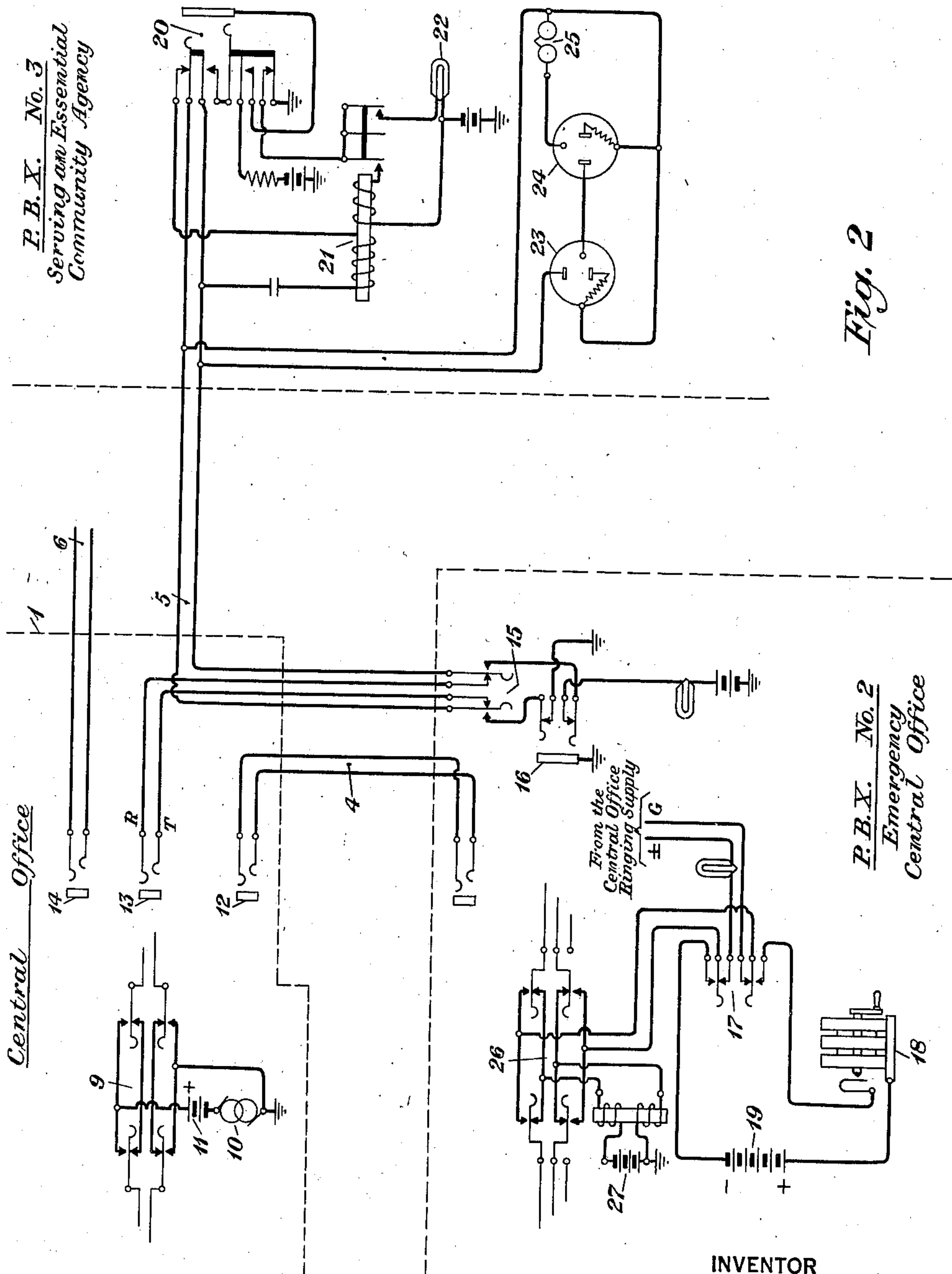
C. S. RHODS

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2 Sheets-Sheet 2



INVENTOR
C. S. Rhoads
BY *John M. Harg*
ATTORNEY

UNITED STATES PATENT OFFICE

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EMERGENCY TELEPHONE SYSTEM

Charles Stanley Rhoads, Albany, N. Y., assignor
to American Telephone and Telegraph Com-
pany, a corporation of New York

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6 Claims. (Cl. 179—42)

This invention relates to a telephone system in which a plurality of private branch exchanges are connected to a central office, and particularly to means, in such a system, by which communication may be established between one private branch exchange and the others in the event of the destruction of the normal signaling means between the central office and the private branch exchanges.

In a normal telephone system comprising a central office and a plurality of private branch exchanges (hereinafter referred to as P. B. X's) the ringing current for signaling between the P. B. X and a central office or stations is supplied by a source at the central office. In the event of the destruction of such a central office or the destruction of the circuit over which such current is supplied to the P. B. X's, a P. B. X would be unable to communicate with other central offices or other stations. If the P. B. X thus affected is one that furnishes communication to a community agency that is vitally necessary for the defense or welfare of a community, such as the fire department or the police department of such community, the matter of providing emergency service is of the greatest importance.

The present invention resides in an arrangement of a telephone system by which, in the event of the destruction of the source of ringing current, upon which the various P. B. X's depend for their signaling current, communication may be established between one of the P. B. X's acting as an emergency central office and certain P. B. X's that are associated with the vitally important agencies of the community in which they are located.

This invention will be clearly understood from the following description when read in connection with the attached drawings of which Figure 1 shows schematically the manner in which a telephone system embodying this invention is arranged, and Fig. 2 shows in detail the circuit arrangements and apparatus for carrying out the invention.

Fig. 1 shows a system in which the central office 1 is connected by trunk lines to the P. B. X's 2 and 3 and to other P. B. X's similar to 3. The connection between the central office and P. B. X 2 is effected by the trunk 4 which terminates at the office and at the P. B. X in a jack which is equipped in the usual manner. The trunk 5 that connects the central office to the P. B. X 3 is looped through a jack 7 in P. B. X 2 and terminates at P. B. X 3 in a jack, not shown in this figure. The trunk is equipped at the latter

P. B. X with two types of signal apparatus, one of which is responsive to normal signaling voltage, and the other signaling apparatus responsive to an abnormal voltage, the latter being essential in the event of the loss of the battery supply by which the normal signaling apparatus is operated at that P. B. X. At the P. B. X 2, in addition to the apparatus normally included in a standard P. B. X, there is included a source of abnormal ringing voltage which may be applied to all lines that are looped through that P. B. X when an emergency arises that makes such action necessary. For example, if the central office 1 were destroyed, or the lines leading therefrom were severed, the operator at the P. B. X 2, upon becoming aware of such failure, could apply the abnormal voltage of her ringing generator to that portion of the trunk line 5 extending to the P. B. X 3 by inserting the plug 8 in the jack 7. That abnormal voltage would cause the operation of the signal apparatus at P. B. X 3, which is responsive to the abnormal voltage, and enable communication to be established between two P. B. X's in a manner that will be fully described hereinafter. In such a system the P. B. X 2 serves as an emergency central office through which loop the trunks, such as 5 and 6 that serve P. B. X's, such as 3, and others which afford communication to the vital agencies of the community.

The detailed arrangement for carrying out this invention is shown more clearly in Fig. 2. In that figure the central office 1, which would be a typical central office, is represented by a plurality of jacks 12, 13 and 14 with which any of a plurality of cord circuits such as the circuit 9 is designed to co-act. Associated with that cord circuit is a source of alternating voltage 10 which, for example, may be of 105 volts and 20 cycles superimposed upon the direct voltage of the battery 11. The jack 13 serves to terminate the trunk 5 that extends from the central office to the P. B. X 3, which trunk is looped through the emergency key 15 in the P. B. X 2. When that key is in its normal position the trunk circuit is continuous between the central office and the P. B. X 3, but when the key is operated, such continuity is broken, and that portion of the trunk 5 between P. B. X 2 and P. B. X 3 will be terminated upon the springs of the jack 16 at P. B. X 2. The cord circuits at P. B. X 2, one of which is shown schematically by 26, are connected to two sources of ringing current through a key such as 17. The inner contacts of that key are connected by a trunk to a source of ringing

current of the normal voltage located in the central office. The outer contacts of key 17 are connected to a circuit containing a magneto 18 and source of direct voltage 19 which may, for example, be of 45 or 90 volts, the peak voltage of which is substantially greater than that provided by the source at the central office.

At P. B. X 3 the trunk 5 terminates in a jack 20 which constitutes the regular trunk appearance at that P. B. X. Connected between one side of the trunk and the uppermost contact of the jack is one of the windings of the relay 21. This relay has associated with it another winding and a lamp 22, the function of all of which will be later apparent. Also connected across the trunk 5 is a circuit containing the cold cathode tubes 23 and 24 and an emergency ringer 25, which tubes and ringer constitute the signal apparatus responsive to the abnormal voltage produced by the magneto 18 and battery 19 associated with P. B. X 2.

The manner in which those circuits operate under normal and under emergency conditions is as follows: signaling between the central office and the P. B. X 3 will normally be carried on by inserting the plug of a cord in the jack 13 and operating the ringing key. Since the key 15 at P. B. X 2 is in its normal unoperated position, the ringing current will pass over the trunk to P. B. X 3 and, flowing through the left-hand winding of relay 21, would cause the operation of that relay, closing the locking path through the right hand winding, and in turn causing the lighting of the lamp 22. Upon the receipt of that signal the operator would insert the plug of a cord in the jack 20, which would open the circuits of both windings and would extinguish the lamp. The connection between the trunk and the desired station of the P. B. X would be made in the usual manner.

Signaling between the central office and P. B. X 2 would be accomplished in a similar manner by inserting a plug of a cord such as 9 in the jack 12 and by applying ringing current to the trunk 4 which would operate the normal signaling apparatus in P. B. X 2 similar to that just described in connection with P. B. X 3. Ringing current of normal voltage to enable P. B. X 3 to signal its own stations would be supplied to that P. B. X by a trunk, not shown, but similar to that by which ringing current is supplied to P. B. X 2.

If the source of ringing current is cut off from the P. B. X's by the destruction of the central office or of the trunk lines over which such ringing current is fed to the P. B. X's, the operator at P. B. X 2 would communicate in the following manner with those P. B. X's whose trunk lines loop through P. B. X 2. For example, in order to establish communication with P. B. X 3, the operator at P. B. X 2 would operate the key 15, and thereby would connect to the jack 16 that portion of the trunk line 5 that lies between P. B. X 2 and P. B. X 3. She would then insert the plug of a cord circuit, such as 26, into jack 16 and would operate key 17 so as to connect across the cord circuit the emergency ringing circuit containing the magneto 18 and the battery 19. That ringing circuit provides a voltage in excess of the normal voltage, the abnormal voltage being sufficient to break down and to cause a flow of current through the cold cathode tubes 23 and 24, which, in turn, will cause the operation of the ringer 25 at the P. B. X 3.

Upon receiving that signal, the operator at P. B. X 3 would insert one of the plugs of her

cord circuit into the jack 20. Since the current for her transmitter is sent from the central office 1 over a special trunk to P. B. X 3, her transmitter would not function in the event of the destruction of the central office or of the trunk circuit over which the transmitter current is supplied, which is the situation that has been assumed in describing the system with which the present invention is concerned. In order to talk to the operator at P. B. X 2 the operator at P. B. X 3 would then insert the other plug of the aforesaid cord circuit into a jack connected to one of the extension stations of P. B. X 3 and would then go to that station and use the transmitter at that station to talk to the operator at P. B. X 2. Such communication is possible because the transmitter at the extension station receives its current from the battery 27 of the cord circuit 26 which battery is kept charged either by a connection to the central office or a local power plant. The current from battery 27 is not effective for the operation of the operator's transmitter at P. B. X 3 because the circuit of that transmitter is so arranged as to be energized only by the current transmitted by a special trunk from the central office 1, as mentioned hereinbefore.

If the operator at P. B. X 3 wanted to talk to the operator at another P. B. X associated with another essential emergency agency, the operator at P. B. X 2 would plug the other cord of the pair connected to the trunk from P. B. X 3 into a jack associated with the trunk to the other P. B. X and would ring over the trunk line extending to the other P. B. X, as for example, that represented by 6 of Fig. 1. That would cause the operation of a ringer similar to 25 at the said other P. B. X, and would thereby bring the operator at that P. B. X into communication with the operator at P. B. X 3.

Since the cold cathode tubes 23 and 24 require a higher breakdown voltage than that normally transmitted by the ringing apparatus at the central office, they would not respond to the normal ringing signals transmitted from the central office. Under such condition only the relay 21 and its associated lamp would be operated. The emergency signal at the P. B. X's will respond only to the abnormal voltage transmitted from P. B. X 1 which serves as the emergency central office to establish connections between certain pre-selected essential P. B. X's during the time in which those P. B. X's are cut off from their source of ringing current of normal voltage. It should be understood that the two cold cathode tubes could be replaced by a single tube provided it has the same breakdown voltage as the two tubes, and is, therefore, capable of preventing the operation of the emergency ringer by the normal ringing currents of lower voltage.

While this invention has been disclosed as embodied in a particular form and arrangement of parts, it is capable of embodiment in other and different forms without departing from the spirit and scope of the appended claims.

What is claimed is:

1. In an emergency telephone system the combination with a central office of a P. B. X connected by a trunk to said central office, a second P. B. X also connected by a second trunk to said central office, the latter trunk being looped into said first mentioned P. B. X, a ringer at said second P. B. X, a cold cathode tube connected to said second trunk and said ringer to prevent the operation of the ringer by the normal ringing voltages applied to the said trunk at the central of-

office, means at the first mentioned P. B. X to split the second trunk looped therein, and means thereat to apply an abnormal ringing voltage to that portion of the second trunk extending to the said second P. B. X, the magnitude of the said abnormal voltage being such as to cause the flow of current through the said cold cathode tube whereby the said ringer may be operated.

2. In an emergency telephone system the combination with a central office having thereat a battery and also a source of normal ringing current, a P. B. X located at a distance from the said central office, a second P. B. X also located at a distance from said central office, a trunk connecting said second P. B. X and said central office and having connected thereto at the said second P. B. X normal signaling apparatus responsive to the said normal ringing current, and emergency signaling apparatus responsive to a voltage greater than that of the said ringing current, the said trunk being looped through the said first P. B. X, and means at the said first P. B. X to apply to the portion of the trunk between the first and second P. B. X's a ringing current of greater voltage than the normal ringing current to operate the said emergency signaling apparatus.

3. In an emergency telephone system, the combination with a central office of two P. B. X's normally supplied with ringing current of normal voltage from the central office, each P. B. X being connected by a trunk to the said central office, the trunk from one P. B. X to the central office being looped through the other P. B. X, and means at the said other P. B. X to apply a ringing-current of abnormal voltage to that portion of the looped trunk that extends between the two P. B. X's to break down a voltage-limiting device and to operate the ringer at the said one P. B. X whenever the connection to the normal ringing-current source at the said central office is interrupted.

4. In a telephone system comprising a central office and a plurality of P. B. X's, one of which is to become the emergency switching center in

the event of the destruction of the central office and the cutting off of the ringing-current normally supplied by the central office to the P. B. X's, and the trunks between the other P. B. X's and the central office being looped through the P. B. X constituting the emergency switching center, the said trunks being equipped at each of the other P. B. X's with signaling apparatus responsive to the normal signal voltage from the central office and also emergency signaling apparatus responsive only to an abnormal signal voltage, and a source of abnormal signal voltage at the P. B. X constituting the emergency switching center to signal the other P. B. X's and thereby establish communication when the source of normal ringing current at the central office fails.

5. In a telephone system, the combination with a central office of a plurality of P. B. X's, each normally connected by a trunk to the central office, one of said P. B. X's being intended and arranged to become the emergency switching center in the event of the failure of the central office to perform that function, each trunk being equipped at its P. B. X terminal with signaling apparatus responsive to the normal voltage of the central office ringing-current, and also equipped with signaling apparatus responsive only to a voltage higher than the normal voltage, and all of said trunks looping into the P. B. X constituting the emergency switching center, and a source of the said higher voltage at the P. B. X constituting the said emergency switching center whereby communication may be established between the emergency central office and each P. B. X whenever the central office supply fails.

6. A system of the type defined by claim 5 characterized by the use of a cold cathode tube in series with a ringer at the P. B. X end of the trunk which will be responsive only to a ringing voltage higher than normal applied at the emergency switching center to the end of the trunk from another P. B. X looping into the said switching center.

CHARLES STANLEY RHOADS.