

May 30, 1944.

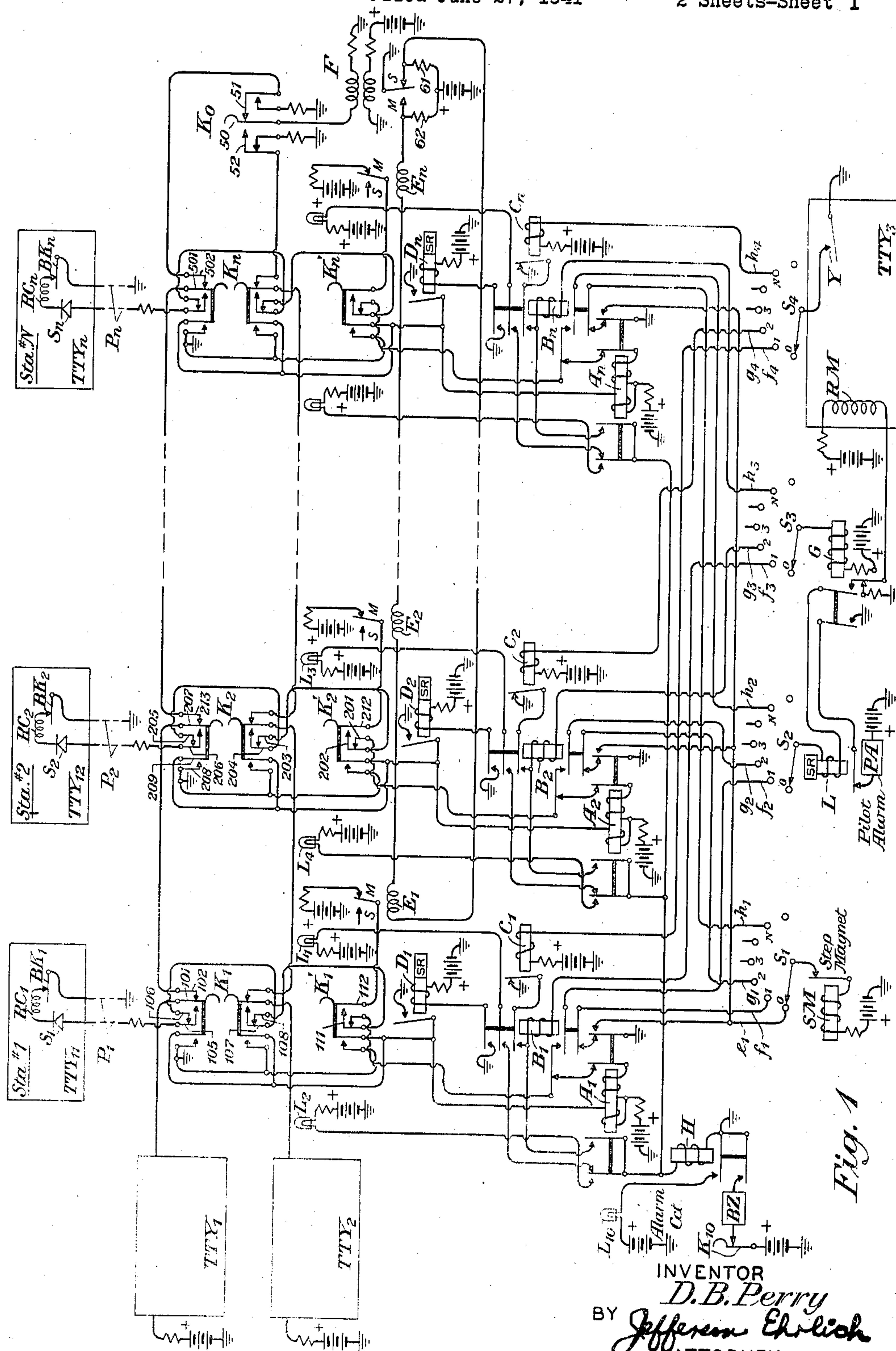
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2,350,186

TELETYPEWRITER SYSTEM

Filed June 27, 1941

2 Sheets-Sheet 1



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TELETYPEWRITER SYSTEM

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2 Sheets-Sheet 2

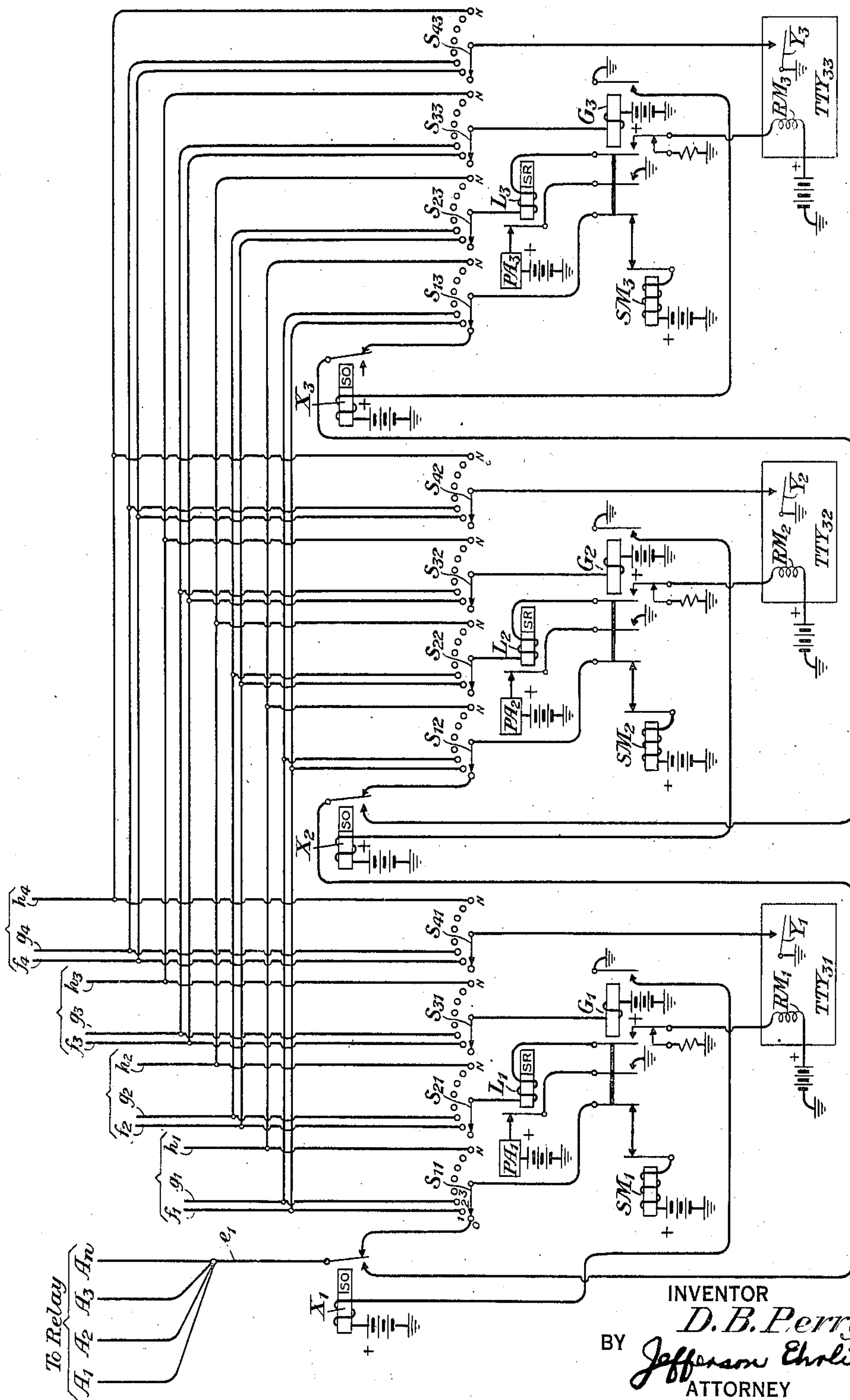


Fig. 2

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TELETYPEWRITER SYSTEM

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3 Claims. (Cl. 178—2)

This invention relates to teletypewriter systems, and more particularly to arrangements for interconnecting a central teletypewriter station with a plurality of outlying teletypewriter stations so that one or more of the outlying stations may transmit intelligence to or receive intelligence from the central station.

It is one of the objects of this invention to provide a teletypewriter system including a central station and a plurality of outlying stations so that intelligence may be communicated from the central station to one or more of the outlying stations over radial circuits at the same time.

It is another object of this invention to provide a teletypewriter system including a central station having, for example, two teletypewriter sets, and a plurality of outlying stations each having an individual teletypewriter set, the system being so arranged that one of the sets at the central station may be connected to one or more of the outlying teletypewriter sets, and the other set at the central station connected to another one or more of the other outlying remaining teletypewriter sets at the same time.

It is another object of this invention to provide a teletypewriter system having a central station at which may be located attended teletypewriter sets and an unattended teletypewriter set so that one or more teletypewriter sets at outlying points may be connected automatically over radial loop circuits to the central station for simultaneously transmitting intelligence to the central station to operate either the attended or the unattended sets at the central station.

The arrangement of this invention comprises a radial teletypewriter network with a number of outlying teletypewriter points and a fewer number of teletypewriters at the central point. According to one aspect of the invention, calls originating at outlying points may be automatically picked up at a "receiving-only" teletypewriter which may be unattended at the central point. According to another aspect of this invention, a call originating at the central point may be made manually by operating a key at the central point which automatically starts the motor at the outlying point or points. The outlying station or stations may be attended or unattended when the call is received from the central station.

These and other objects of this invention will be apparent from the following description of the invention when considered in connection with the accompanying drawings in which Figure 1 shows one embodiment of the invention merely for the purpose of illustration, and Fig. 2 illus-

trates a modification of part of the circuit of Fig. 1 to accommodate a plurality of receiving-only teletypewriter sets.

Referring to Fig. 1 of the drawings, there are shown two teletypewriter sets designated TTY₁ and TTY₂ and a third teletypewriter set TTY₃, all of which may be located at a central station. There may be attendants at the central station to control the operation of the teletypewriter sets TTY₁ and TTY₂, but the teletypewriter set TTY₃ is an unattended set capable only of receiving messages. The sets TTY₁ and TTY₂ may be those known in the art as teletypewriters Nos. 14, 15, 19 or 26. The set TTY₃ may be of any well-known type, as teletypewriters Nos. 14, 15 or 26. The central station is connected to a plurality of outlying stations each of which is supplied with an individual teletypewriter set, the set TTY₁₁ at station No. 1 being connected to the central station by a loop circuit P₁, the set TTY₁₂ at station No. 2 being connected to the central station by a loop circuit P₂, and still other stations, such, for example, as station No. N having a set TTY_N connected to the central office by a loop circuit P_N. The outlying teletypewriter sets TTY₁₁, TTY₁₂ . . . TTY_N may also be of a type such as Nos. 14, 15, 19 or 26, page or tape teletypewriters of well-known construction.

At the central office there are keys K₁ and K'₁ associated with the outlying station No. 1, keys K₂ and K'₂ associated with the outlying station No. 2, and keys K_N and K'_N associated with the station No. N. The key K₀ is common to all of the central office apparatus and may be used, for example, for connecting either one of the teletypewriter sets TTY₁ and TTY₂ to broadcast to two or more of the outlying teletypewriter sets TTY₁₁, TTY₁₂ . . . TTY_N. There are two lamps L₁ and L₂ at the central office common to each outlying station, the lamp L₁ being used to indicate a busy condition at the set TTY₁₁ at station No. 1, and the lamp L₂ that a call is waiting, as will be explained hereinafter. Likewise the lamps L₃ and L₄ are used for similar purposes in regard to another of the outlying teletypewriters, such as TTY₁₂ at station No. 2, etc.

Assume that the attendant at one of the outlying stations such as station No. 2 wishes to send to the central station. The attendant at station No. 2 will then operate his break key BK₂ momentarily. This will cause the central office relay A₂, which is associated with station No. 2, to be released. It will be observed that the main winding of relay A₂, which is at its right and connected to a positive battery, extends to

the teletypewriter set TTY₁₂ over a circuit which includes the front armature and make contact at the right of relay A₂, the make-before-break contact of relay B₂, the contacts 201 and 202 of key K'₂, contacts 203 and 204 of key K₂, additional contacts 205 and 206 of key K₂ and the loop P₂. Upon the release of relay A₂ the lamp L₄ will be lit, the circuit for lamp L₄ including the positive battery connected thereto, the armature at the extreme left of relay A₂ and its back contact, the winding of relay H and ground. The illumination of lamp L₄ will indicate at the central station that a call from the outlying station No. 2 is waiting or is automatically being picked up.

The release of relay A₂ is accompanied by the operation of the stepping magnet SM, the winding of which is connected at one side to a positive battery, and at the other side through its armature and back contact and the arm of selector S₁ and its contact O to the grounded armature at the extreme right of relay A₂ and its back contact. The stepping magnet SM simultaneously actuates all of the selector arms S₁, S₂, S₃ and S₄. With the energization of the stepping magnet SM its own circuit is opened and as it releases the arms of the various selectors will advance one step to point 1. On reaching point 1 the stepping magnet SM will be re-energized, current flowing from its associated battery through the winding of the stepping magnet SM and over a circuit which includes its armature and back contact, the arm of selector S₁ and its contact 1, the lowermost armature of relay B₁ and its back contact and the grounded armature at the extreme right of relay A₁ and its make contact. This will cause the stepping magnet SM to break its own circuit and cause the selector to step and to advance the arms of the selectors S₁ to S₄ another step to point 2. Here the stepping magnet SM will find its circuit open at the make contact of the armature at the extreme right of relay A₂, the interconnected circuit including the selector arm S₁ and its contact 2, the lowermost armature and back contact of relay B₂ and the make contact of the armature at the extreme right of relay A₂, which is open because of the prior release of relay A₂. Thus it will be seen that the selector arm S₁ will advance until it reaches a contact such as point 2 corresponding to one of the A relays, such as relay A₂, which has been released by the break signal from the corresponding station No. 2.

The closure of contact 2 by the arm of the selector S₃ will cause relays G, B₂ and H to operate, the interconnected circuit including the winding of relay G, the arm of selector S₃ and its contact No. 2, the winding of relay B₂, the inner left armature of relay A₂ and its back contact, the winding of relay H and ground. The operation of relay B₂ will complete a second or locking circuit for this relay, the locking circuit including the inner upper armature and make contact of relay B₂ and the armature and back contact of relay C₂. The operation of relay B₂ will also cause relay D₂ to become operated, the circuit including the battery connected to the winding of relay D₂, the uppermost armature of relay B₂ and its make contact which is grounded.

The receiving magnet RM of the unattended teletypewriter set TTY₃ will be closed through selector S₂ by completion of a circuit which includes the positive battery connected to one side

of receiving magnet RM and the receiving magnet itself; the inner armature and make contact of relay G, the winding of relay L, the arm of selector S₂ and its contact No. 2, the lower inner armature of relay B₂ and its make contact and the line circuit to the outlying teletypewriter set TTY₁₂, which includes contacts 201 and 202 of key K'₂, contacts 203, 204, 205 and 206 of key K₂ and the loop circuit P₂. The completion of this circuit to station No. 2 will start the motor (not shown) of the teletypewriter TTY₁₂, which is of the "start-after-break" type of well-known construction. Thus after a break signal is received from station No. 2 the receiving magnet RM of the teletypewriter TTY₃ will be connected over the loop circuit P₂ to the teletypewriter TTY₁₂, starting the motor at the latter set and, therefore, permitting the attendant at station No. 2 to send to the central station in a well-known manner.

Upon the operation of relay D₂ the relay A₂ will then become re-operated, the circuit for operating relay A₂ including the positive battery connected to its windings, the secondary (or left) winding of relay A₂ and the armature and make contact of relay D₂. The re-operation of relay A₂ will cause the lamp L₄ to become extinguished by opening its circuit extending to the back contact of the armature at the extreme left of relay A₂. At the same time the busy lamp L₃ will be lit. The circuit for lamp L₃ includes the battery connected to its left-hand terminal, the middle upper armature and make contact of relay B₂, the armature at the extreme left of relay A₂ and its make contact, the winding of relay H and ground. The busy lamp L₃ will indicate at the central station that the teletypewriter TTY₁₂ at station No. 2 is sending to the central station.

At the end of the transmission from station No. 2 to the central station the operator at station No. 2 may send a character such as "Figs. H," which will be employed to close the contact Y of the teletypewriter TTY₃ at the central station in a manner well understood by those skilled in the art. The transmission of the character "Figs. H" will at the same time stop the motor at station No. 2 in accordance with well-established practice. The closure of contact Y of set TTY₃ will cause relay C₂ to become operated through selector S₄, the interconnected circuit, including the armature and contact Y of set TTY₃, the selector arm S₄ and its contact No. 2, the winding of relay C₂ and its positive battery. The operation of relay C₂ will cause relay B₂ to release by opening the circuit in series with the winding of relay B₂, which includes the upper inner armature and make contact of relay B₂ and the armature of relay C₂, which is disconnected from its grounded back contact. The release of relay B₂ will substitute the main winding of relay A₂ for the receiving magnet RM of teletypewriter TTY₃ in the line circuit of station 2. Thus the battery connected to the main winding of relay A₂ sends current over a circuit which includes the right inner armature and make contact of relay A₂, the break-after-make contact of relay B₂, and the line circuit of station No. 2 which includes contacts 201 and 202 of key K'₂, contacts 203, 204, 205 and 206 of key K₂, and the loop circuit P₂, which extends to the set TTY₁₂. The release of relay B₂ and the re-operation of relay A₂ causes the stepping magnet SM to become re-operated, the circuit from the stepping magnet SM including the arm of selector S₁ and

its contact 2, the lowermost armature of relay B₂ and its back contact, the grounded armature at the extreme right of relay A₂ and its make contact. Due to the operation of other A relays, such as relay A_n, in their normal conditions the stepping magnet SM will act to step arms S₁—S₄ of the selector around in a well-known manner and come to rest at their zero terminals. Thereafter the relay D₂, which is of the slow-release type, will release. The release of relay D₂ will then open the locking circuit of the secondary winding of relay A₂, but relay A₂ will remain operated. The circuit at the central station will then return to its normal condition, as indicated in the drawings, and both lamps L₃ and L₄ at the central station, which correspond to station No. 2, will be ready for subsequent operations. Any other outlying station that was "ready" to transmit to the central office set TTY₃ will then be connected to set TTY₃, and so on.

For outgoing calls originating at but one of the teletypewriter sets, such as TTY₁ of the central station, to an outlying station, such as station No. 2, the key K₂ corresponding to station No. 2 may be moved upwardly. When this happens the teletypewriter set TTY₁, which is connected to a positive battery at its left, will be connected over contacts 101 and 102 of key K₁, and contacts 207 and 206 of key K₂ to the loop circuit P₂ which terminates in the teletypewriter set TTY₁₂. The operation of key K₂ also connects ground to the secondary winding of relay A₂ to hold relay A₂ operated as long as key K₂ remains operated, the holding circuit including the grounded contact 208 and contact 209 of key K₂, the secondary winding of relay A₂ and its positive battery. The attendant at teletypewriter TTY₁ may operate his break key (not shown), and thereby start the motor for the teletypewriter set TTY₁ as well as the motor at station No. 2, which controls the operation of the teletypewriter set TTY₁₂. At the end of the message the operator at the central office may send a character, such as "Figs. H," to stop both the motor of teletypewriter TTY₁₂ at station No. 2 and that of teletypewriter TTY₁.

Suppose it is desired to transmit from one teletypewriter at the central station, such as TTY₁, simultaneously to two or more outlying stations, such as stations Nos. 1 and 2. In that case keys K'₁ and K'₂ are operated. The operation of key K'₁ will connect the teletypewriter TTY₁₁ at station No. 1 to the armature of relay E₁ over a circuit which includes loop P₁, contacts 105 and 106 of key K₁, contacts 107 and 108 of key K₁, contacts 111 and 112 of key K'₁ to the armature of relay E₁, the contact M of which is connected to battery. The teletypewriter TTY₁₂ is likewise connected to the armature of relay E₂ over a circuit which includes loop P₂, contacts 206, 205, 204 and 203 of key K₂, contacts 202 and 212 of key K'₂ to the armature of relay E₂, the marking contact M of which is connected to battery. The key K₀ is maintained in its normal position as shown. The signals or message transmitted from teletypewriter TTY₁ will be relayed to relay F, the interconnected circuit including contacts 101 and 102 of key K₁, 207 and 213 of key K₂, 501 and 502 of key K_n, contacts 51 and 50 of key K₀, and the winding of relay F, which is grounded at its right-hand terminal. The signals traversing the winding of relay F will be repeated in the windings of relays E₁ and E₂, which are in series and connected to the contacts M and S

of relay F and its armature. When contact M is closed by the armature of relay F by a marking pulse from set TTY₁, current will flow from the battery associated with relay F, through resistor 61 and over the series circuit of the windings of relays E₁, E₂ and E_n to ground. When contact S is closed by the armature of relay F, the same battery will send current through resistor 62 and through the series windings of relays E₁, E₂ and E_n, but this current is in the reverse direction.

Thus it will be observed that by vibrating the armature of relay F between its two contacts M and S in accordance with signals, there will be a reversal of current through the windings of the various E relays. Inasmuch as the armature of relay E₁, for example, is connected to the teletypewriter TTY₁₁, the signals traversing the winding of relay E₁ will be repeated in the teletypewriter receiving magnet RC₁ of teletypewriter TTY₁₁. Likewise the signals traversing the winding of relay E₂ will be repeated in the receiving magnet RC₂ of teletypewriter TTY₁₂. The signals sent from teletypewriter TTY₁ correspondingly actuate the armature of relay F. This in turn will actuate the armatures of relays E₁ and E₂ in accordance with the same signals, and the armatures of relays E₁ and E₂ simultaneously transmit the same signals to the receiving magnets RC₁ and RC₂, respectively, at the outlying stations Nos. 1 and 2 over radial loop circuits P₁ and P₂.

It has been pointed out that when a message is to be transmitted from the teletypewriter TTY₁ at the central station to one or more outlying teletypewriters simultaneously, the key K₀ is unoperated. Should it be desired to send a message from the other teletypewriter TTY₂ at the central station, the key K₀ will then be operated so that its contact arm 50 closes contact 52. The relay F will then receive the message from the teletypewriter TTY₂, actuate its armature in accordance with the signals emanating from the teletypewriter TTY₂ and transmit the signals to the desired outlying station or stations.

The relay H may be employed to control an alarm circuit including the lamp L₁₀, which is connected to the inner make contact of relay H. Relay H may also be employed to operate a buzzer circuit including a buzzer BZ and a key K₁₀ connected to the outer make contact of relay H. Moreover, the relay L may be employed to control a pilot alarm circuit PA, which is connected to the back contact of the armature of relay L. The relay L is preferably of the slow-release type, in which case the pilot alarm circuit will be operated only when the relay L has been fully released.

The arrangements shown in the drawing may be used for interconnecting a central station with a plurality of radially arranged outlying stations, such as stations Nos. 1, 2 . . . N, so that two-way service may at times be provided between the central station and one or more of the various outlying stations. The central station is set up so that a message may be transmitted from any one of the outlying stations to the central station even when the central station is unattended. A circuit of the type here shown and described may be used for interconnecting various business offices to a central office, or if desired, a plurality of outlying districts where air raid or other information regarding the national defense may be received and conveyed to the central station where the information so received may

be recorded and promptly plotted. One of the outstanding features of this invention is that it provides for the interconnection of outlying stations each of which has its individual teletypewriter set with a central station, which may be attended or unattended, and the central station includes a smaller number of teletypewriter sets than are in the various outlying districts.

While the drawing illustrates a plurality of batteries the negative terminals of which are all grounded, it will be understood that all of these batteries may be one and the same battery.

It will also be understood that with this disclosure before him one skilled in the art may connect more than two attended teletypewriter sets at the central station. The circuit modifications for the additional teletypewriter sets, however, need not be shown. Moreover, the circuit may also be modified to include two or more unattended teletypewriter sets used exclusively for receiving, each of which would be similar to the one designated TTY₃. This modification of Fig. 1 is shown in Fig. 2.

Fig. 2 shows a circuit which may be substituted for a part of the arrangement of Fig. 1 to provide three (or more) teletypewriters TTY₃₁, TTY₃₂ and TTY₃₃ each of which is capable of receiving messages only. Each teletypewriter such as TTY₃₁ has associated with it a selector having four arms as, for example, S₁₁, S₂₁, S₃₁ and S₄₁ and three relays as, for example, L₁, G₁ and X₁ and a stepping magnet such as SM₁.

It may be stated in general that if one of the outlying teletypewriters as, for example, TTY₁₁ of Fig. 1 initiates a call, the teletypewriter TTY₃₁ will be connected to the outlying set TTY₁₁ for communication. If while communication is taking place, another outlying set, as, for example, TTY₁₂ initiates a call, the next teletypewriter TTY₃₂ will be connected to the second set TTY₁₂ for communication. A similar connection may be made to set TTY₃₃ from another outlying teletypewriter such as TTY_n.

If while communication is taking place between teletypewriters TTY₁₂ and TTY₃₂ a call from another set such as TTY_n arrives after the set TTY₃₁ has completed receiving a message, the call from set TTY_n will be taken by set TTY₃₁. In other words, the receiving-only sets will be operated in order, that is, first TTY₃₁, next TTY₃₂, then TTY₃₃, etc., except in the event that one of the lower-numbered sets such as TTY₃₁ has previously completed receiving a message. In the latter case the previously operated lowest-numbered idle set TTY₃₁ will pick up the message rather than one of the higher-numbered idle sets.

Let it be assumed that sets TTY₁₁ and TTY₃₂ are interconnected on a call from TTY₁₁. Relays L₂ and G₂ will be operated in the same manner as previously described for the operation of relays L and G of Fig. 1. The operation of relay G₂ will cause relay X₂ to operate upon the closure of the make contact at the right of relay G₂.

Let it be further assumed that while the connection to set TTY₃₂ remains continuous, the set TTY₃₁ has completed receiving its call and is idle while another call from, for example, set TTY_n arrives. Relay A_n then releases with the arrival of the break signal from set TTY_n. The ground at the armature at the extreme right of relay A_n will be connected to point e₁ of Fig. 2 and since relay X₁ is released, its armature will pass the grounded circuit through contact O and the arm of selector S₁₁ and through the armature

at the extreme left of relay G₁, to the stepping magnet SM₁. Upon the operation of stepping magnet SM₁, the circuit to its winding will be broken and thereby advance the selector arms S₁₁, S₂₁, S₃₁ and S₄₁ one step to point 1. The stepping magnet will then be re-operated and stepped again and again until the arms S₁₁—S₄₁ reach their terminals marked N.

When terminals N are reached, relays G₁ and B_n (of Fig. 1) operate, the circuit including the winding of relay G₁, contact N and selector arm S₃₁, conductor h₃, winding of relay B_n of Fig. 1, the inner left armature and back contact of relay A_n, the winding of relay H and ground. Relay G₁ operates to close the communication circuit extending between sets TTY₃₁ and TTY_n, the interconnected circuit including, among other things, the inner left armature and make contact of relay G₁, the winding of relay L₁, contact N and the arm of selector S₂₁ to conductor h₂. The operation of relay G₁ also causes relay X₁ to operate. The relay X₁ is of the slow operate type, allowing time for relay B₁ to operate relay D₁ which in turn will re-operate relay A₁ before the completion of the operation of relay X₁. The full operation of relay X₁ connects conductor e₁ to the armature of relay X₃ over a circuit which includes the armature and front contact of relay X₁ and the armature and front contact of relay X₂. Thus the circuit arrangement is prepared so that the immediately succeeding call from any of the other outlying sets may be picked up by set TTY₃₃.

While this invention has been shown and described in certain particular arrangements merely for the purpose of illustration, it will be understood that the general principles of this invention may be applied to other and widely varied organizations without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. In a teletypewriter system, the combination of a central station which may be unattended, an unattended teletypewriter set at the central station, a plurality of outlying stations at each of which there is a teletypewriter set, a step-by-step selector at the central station, means responsive to a break signal received from any one of the teletypewriters at the various outlying stations to operate the selector to connect the central station teletypewriter set only to the teletypewriter set at the outlying station from which the break signal is received, means responsive to a predetermined signal from the set at the outlying station designating the termination of the message from the set at the outlying station to further operate the selector to immediately return the selector to its unoperated position and at the same time disconnect the set at the outlying station from the set at the central station, means including apparatus at the central station responsive to a break signal received from a second teletypewriter set at a different outlying station to prepare the circuit to connect the latter teletypewriter set to the central station teletypewriter set, and means responsive to the disconnection of the first-mentioned outlying teletypewriter set from the central station teletypewriter set to connect the second teletypewriter set to the central station teletypewriter set.

2. In a teletypewriter system, the combination of a centrally located unattended teletypewriter set capable only of receiving messages, a plurality of teletypewriter sets at outlying points with respect to the central teletypewriter, a step-by-

step selector associated with the central teletypewriter and having a plurality of terminals each of which corresponds to but one of the outlying teletypewriters, means responsive to a break signal received from any one of the outlying teletypewriters to operate said selector step-by-step to connect the central teletypewriter to the outlying teletypewriter from which the break signal is received to the exclusion of all other teletypewriters, means responsive to a predetermined signal designating the termination of the message from the outlying teletypewriter to further operate the selector and immediately return it to its unoperated position, and means responsive to the disconnection of said outlying teletypewriter from said central teletypewriter for automatically connecting to the central teletypewriter any other outlying teletypewriter awaiting connection to the central teletypewriter.

3. In a teletypewriter system, the combination of a central teletypewriter capable of receiving messages only, a plurality of outlying teletypewriters which may be connected to the central teletypewriter over radial circuits, a step-by-step selector associated with the central teletypewriter, means responsive to break signals from the various outlying teletypewriters to prepare the circuits connecting said outlying teletypewriters to the central teletypewriter, only the first outlying teletypewriter being operatively connected to the central teletypewriter by the selector, and means responsive to the disconnection of an outlying teletypewriter from the central teletypewriter for progressively connecting each of the remaining outlying teletypewriters in order to the central teletypewriter.

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