

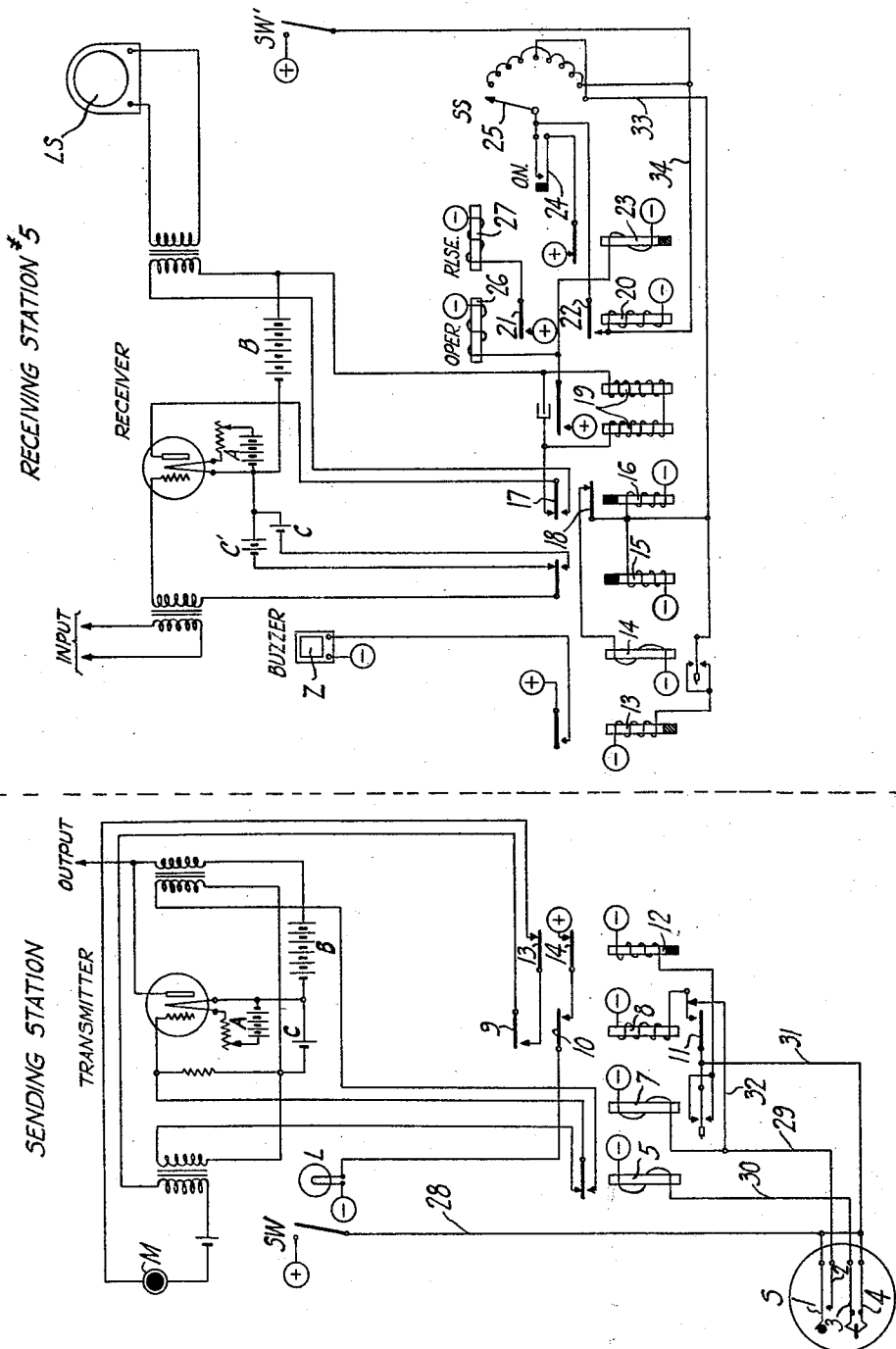
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SELECTIVE SIGNALING SYSTEM

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UNITED STATES PATENT OFFICE

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SELECTIVE SIGNALING SYSTEM

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This invention relates to selective signaling systems in general, but, more particularly, to systems of that character in which radio impulses are employed for selecting a desired remote station and establishing a signaling connection between the control station and the selected remote station.

It is the purpose of the selective signaling system to provide means at a transmitting station for calling one, more than one, or all of its associated receiving stations, as the case may be, to give instructions to the operator at the receiving station. When the signal is transmitted from the transmitting station, all the receiving stations respond, but only that receiving station, or those receiving stations, corresponding to the transmitted signal remains in operative connection with the transmitting station. All other stations at the completion of the transmission of the signal restore to their normal or starting positions.

In selective signaling systems, it is the usual practice to connect the transmitting station to the several receiving stations by means of a common line over which a signal is transmitted simultaneously to all of the several receiving stations.

The provision of a selective signaling system which will function on radio transmitted signals or carrier current signals has been assumed as the principal object of this invention. Other objects and the novel features of the invention, which are not specifically mentioned at this time, will be apparent from the following description and the appended claims when studied in conjunction with the accompanying single sheet of drawing, which, by means of the usual circuit diagrams and symbols, shows one embodiment of this invention.

With reference to the drawing, it will be noted that a vertical broken line divides the drawing substantially in half. The equipment depicted in the left half represents that comprising the control station, or "sending station", while that depicted in the right half represents the equipment comprising the "receiving station". Although but one receiving station has been shown in the

drawing, it is to be understood that in the system about to be described, there are several receiving stations having equipment identical to that shown.

The equipment at the sending station comprises the "Transmitter", which may be any well known radio telephone transmitter which is capable, preferably, of transmitting at a high frequency, the microphone M associated with the "Transmitter", a group of relays, a knife switch SW, a signal lamp L, and an impulse sender S which is of the type of impulse sender, or calling device, used in automatic telephone systems.

The equipment at the receiving station comprises the "Receiver", which may be of any well known type of radio receiver, a loud speaking receiver, or loud speaker, LS, a group of relays, a buzzer Z, and a rotary selecting switch SS which is of the type of rotary switch whose wiper has a normal position and is moved in a step-by-step fashion from its normal position to select a contact set in its bank, and which is returned to its normal position by the operation of the switch release magnet.

The "Receiver", of which only the tube and associated input and output transformers of the last audio frequency stage have been shown, is permanently tuned to the frequency of the "Transmitter", as are all of the other receivers in the system.

In order to keep the equipment requirements at a minimum, the battery for supplying the filament current of the "Transmitter" and for each "Receiver" has been furnished in each instance as an 8-volt battery which is utilized to supply the current for the operation of the relays. These batteries are designated on the drawing by the conventional character A for denoting the source of filament current. Relay circuit connections to the terminals of the A battery have been denoted on the drawing by encircled plus and minus signs.

The space current sources for the "Transmitter" and the "Receiver" have been designated on the drawing by the conventional character B, while the batteries for furnishing the proper grid biasing potential for

amplification have been designated by the conventional character C. It is to be noted that the last audio frequency amplifier of the "Receiver" appears, under normal conditions, that is, when the "receiver" is not in use, biased in the well known manner as a rectifier by the grid biasing battery C' for a purpose which will be evident as the description progresses.

It is also to be noted that the receiver is "on" all the time, that is, it is in readiness all of the time to receive signals from the sending station.

As a working basis for the detailed description of the operation of the system, it will be assumed that the sending station desires connection with receiving station #5, which, it will be assumed, is that shown on the drawing.

To prepare the "Transmitter" for operation, the operator closes the knife switch SW to connect the conductor 28 to the positive terminal of the A battery. The operator then inserts his finger in the No. 5 hole of the finger dial of the impulse sender S in accordance with the assumed receiving station #5 and turns the finger dial off-normal, which, in the well known manner, allows the engagement of off-normal springs 1 and 2, of the impulse sender S, with each other. This engagement of springs 1 and 2 completes the circuit of relay 7 from positive battery connected to conductor 28 by the switch SW, off-normal springs 1 and 2, conductor 29, and then through the winding of relay 7 to negative battery. A parallel circuit is also closed for relay 8 by way of conductor 32 and normally engaged contacts controlled by armature 11 of relay 8. Relays 7 and 8 energize when their circuits are so completed and attract their armatures. The attraction of the armature of relay 7 into engagement with the upper of the two contacts between which it normally assumes a position, completes a circuit for slow-to-release relay 12 from positive battery on conductor 28 and consequently on conductor 31, armature and upper make contact of relay 7, and winding of relay 12 to negative battery. Engagement of armature 11 of relay 8 with its make contact completes a locking circuit for relay 8 to positive battery on conductor 31 and opens the original energizing circuit of that relay. At its armature 9, relay 8 closes one point in the circuit of the microphone M and at its armature 10 prepares a circuit for the signal lamp L.

Relay 12 energizes immediately when its circuit is completed and attracts its armatures 13 and 14 to open a point in the circuit of the microphone M and to open a point in the circuit of the signal lamp L, respectively.

When the dial of the impulse sender S is

permitted to return to normal, five consecutive impulses are transmitted to the winding of relay 5 by the consecutive closings and openings of the impulse springs 3 and 4. Relay 5 follows these impulses and at its armature momentarily switches the current flow from the transformer associated with the microphone with each impulse, to the output transformer of the "Transmitter" which causes the tube to oscillate and send out a tone signal. In all, five tone impulses will be transmitted to the receiving stations. Although the "Transmitter" has been shown as only one tube, it is to be understood that the "Transmitter" may comprise several tubes. In that case, the "output" of the tube shown, instead of being connected to an antenna will be connected to the input circuit of the succeeding tube.

When the calling device S completes its return to its normal position, the off-normal springs 1 and 2 are separated from each other and the impulse springs 3 and 4 are held apart by the impulse cam as shown in the drawing. As a result of the opening of the off-normal springs 1 and 2, relay 7 deenergizes and retracts its armature. The armature of relay 7 is provided with a weight so that when relay 7 deenergizes the armature will vibrate between its two contacts for a period of approximately three seconds. Relay 12, because of its slow-to-release characteristic, remains operated until the weighted armature of relay 7 comes to rest between its two contacts, because it will receive enough current each time the vibrating armature engages one of its contacts to hold relay 12 operated until the armature comes to rest. The deenergization of relay 12 completes the microphone circuit at its armature 13 and completes the circuit for the signal lamp L at its armature 14. The signal lamp L thereupon lights to inform the sending station operator that any speech into the microphone M will be transmitted to the receiving station. The purpose of the delay in the completion of the microphone circuit and the signal lamp circuit will be pointed out subsequently. Relay 8, being locked to conductor 31, remains operated, its release being dependent only on the opening of switch SW.

In the plate circuit of the last audio frequency tube of the "Receiver," there is included a plate circuit relay 19. The "Receiver" will receive the five impulses transmitted from the sending station and will amplify them and the last audio frequency tube, since it is biased as a rectifier, will transmit five direct current impulses to the plate circuit relay 19. Since all of the receiving stations are tuned to the wave length of the "Transmitter", the plate relay 19 at each of the receiving stations will receive five impulses. These impulses are supplied

to the relay 19 in the circuit including the plate of the last stage of audio, armature 17 and resting contact of relay 16, winding of the plate relay 19, and thence to the positive terminal of the B battery.

The relay 19 at each receiving station follows these impulses and attracts its armature, thereby completing the obvious circuit of the operating magnet 26 of the selecting switch SS five times, thereby stepping the wiper 25 of the switch SS into engagement with its fifth bank contact in the well known manner. Slow-to-release relay 23 is operated in parallel with operating magnet 26 on the first impulse delivered by plate relay 19 and remains operated throughout the impulse series, deenergizing shortly after the last impulse. Relay 23, upon operating, removes positive battery from the off-normal springs 24, so that the passing of wiper 25 over the various bank contacts in its directive movement does not connect the positive battery potential to those contacts. When the wiper 25 of the switch SS moves from its normal position, the off-normal springs 24 are closed in the well known manner. The closure of the off-normal springs 24 and the positioning of the wiper 25 places, upon the release of relay 23, a positive battery potential on the fifth contact of the bank of wiper 25. At receiving station #5, this connection of positive battery to the fifth bank contact completes circuits for relays 15 and 16 in parallel by way of the strap connecting the fifth bank contact with the tenth bank contact and conductor 33. Relays 15 and 16 are provided with copper slugs on the armature end of their cores to make them slow-to-energize.

The circuit of relay 14 is also completed in parallel with relay 16 by way of armature 18 and resting contact of relay 16. Relay 14, being a quick-to-operate relay, operates immediately when its circuit is completed and attracts its weighted armature into engagement with the upper one of its two contacts between which it assumes a position when at rest, thereby completing the circuit of relay 13 through the upper contact of the pair of contacts, and armature of relay 14.

Relay 13 operates when its circuit is so closed and completes the obvious circuit for the buzzer Z to notify the operator at receiving station #5 that he is about to receive a signal from the transmitting station.

Relays 15 and 16 energize shortly after relay 13 and attract their armatures into engagement with their make contacts. Relay 15, upon energizing, disconnects the biasing battery C' from the grid of the last audio stage and connects in place thereof the biasing battery C, thereby changing the tube from a rectifier to an amplifier. Relay 16, upon energizing, at its armature 17

switches the plate circuit of the last stage of audio from the plate circuit relay 19 to the primary winding of the output transformer to which is connected the loud speaker LS, and at its armature 18 opens the circuit of relay 14.

Relay 14 restores and allows its weighted armature to vibrate between the pair of make springs included in the circuit of relay 13 to thereby delay deenergization of relay 13. However, relay 13 will deenergize after an interval of approximately two seconds and at its armature will open the circuit of the buzzer Z. The receiving station equipment is now in condition to receive signals from the sending station.

Receiving station #5, will be the only station in which the No. 5 and No. 10 blank contacts of the switch SS are strapped together. Each of the other stations will have the number of the bank contact, corresponding to the number of the station, connected to the tenth bank contact. Therefore, when the wipers of the other switches similar to SS come to rest upon their fifth bank contacts, as did wiper 25 of switch SS at receiving station #5, the positive battery potential connected to the wiper through the off-normal springs will be connected to conductor 34 instead of to conductor 33, since all except the tenth bank contact and the contact corresponding to the number of the station are multiplied together and connected to conductor 34.

This connection of positive potential to the conductor 34 at the other receiving stations, causes the energization of the relay 20 at each one, which relay thereupon operates and at its armature 22 completes a locking circuit for itself through the off-normal springs, which locking circuit is independent of the wiper and the bank contact. These relays 20 also at their armatures 21 complete the circuits of their respective release magnets 27, which release magnets operate and restore the switches corresponding to SS, to their normal positions. Restoration of each switch SS to normal opens the off-normal springs and consequently the locking circuit of the associated relay 20, which relay thereupon restores and opens the switch release magnet circuit. Since the relay 20 at receiving station #5 is the only one which did not operate, the switch SS at that station is the only one to remain in its operated position.

It is now evident that the delay of three seconds before the lighting of the signal lamp L and the completing of the microphone circuit at the sending station after the completion of the transmission of the selecting signal is for the purpose of allowing ample time for all of the switches SS at the uncalled stations to restore to normal, and the buzzer Z at the called receiving station

#5 to give the "standby" signal to the operator at that station so that only the called receiving station shall receive instructions from the operator at the sending station.

Any instructions now spoken into the microphone M will be broadcast by the "Transmitter" and will be heard by the operator at receiving station #5 through the loud speaker LS, since by the operation of relay 16 the output circuit of the "Receiver" was connected to the loud speaker LS.

If, at this state of the operation, the operator at the sending station should desire to call a second receiving station, he will again operate the impulse sender, or calling device, S to transmit a number of impulses corresponding to the desired receiving station and the "Transmitter" will function as previously described. At receiving station #5, since relay 16 is in its operated position, the plate circuit relay 19 will receive none of the impulses and consequently the selecting switch SS at receiving station #5 will remain in its fifth position. However, the operator at receiving station #5 will know that the operator at the sending station is calling a second receiving station because the loud speaker LS is coupled to the output of the "Receiver."

When the operator at the sending station has completed transmitting the instructions, he will operate the switch SW to disconnect the conductor 28 from the positive battery connection to thereby open the locking circuit of relay 8. Relay 8, thereupon deenergizes and at its armature 9 opens the microphone circuit and at its armature 10 opens the circuit of the signal lamp L to extinguish that lamp. The operator at receiving station #5, in order to condition his "Receiver" for the reception of another signal, momentarily closes the switch SW' to connect positive battery to the conductor 34 to complete the circuit of relay 20. Relay 20 thereupon operates and at its armature 22 completes a locking circuit for itself which is independent of the wiper 25 of the selecting switch SS, and at its armature 21 completes the circuit for the release magnet 27 which operates in turn to restore the switch SS to normal. Upon switch SS reaching its normal position, the off-normal springs 24 are opened and the locking circuit of relay 20 is thereupon opened. Since the switch SW' was only momentarily closed, relay 20 will restore when its locking circuit is opened and will open the circuit of the release magnet 27. The restoration of wiper 25, of switch SS, to its normal position opens the circuit of relays 15 and 16 by removing the positive battery connection from conductor 33. Relays 15 and 16 thereupon restore and place the "Receiver" in the condition in which it is shown in the drawing.

Since, as explained, the conductor 33 at each of the receiving stations is connected to the tenth contact of the selecting switch SS at that station, all these selecting switches SS when operating responsive to the reception of a signal comprising ten impulses will cause the respective relay groups to function to sound the buzzer and to condition all of the receivers for reception of the instructions to be transmitted to all of the receiving stations simultaneously from the sending station. Thus by a common call signal, the operator at the sending station can connect the transmitter in a signaling connection with all of the receivers at the same time. Restoration of the receivers to their normal condition is afforded by the momentary operation of the switch SW' at each of the receiving stations.

Although the foregoing has been chosen as the preferred embodiment of this invention, it is not intended that the invention shall be limited to the exact disclosure since there are modifications and adaptations, such for example, the adaption of the equipment to a carrier current system, which could be made by those skilled in the art without departing from the scope of the invention.

The invention having thus been described, what is considered new and what it is desired to have protected by Letters Patent will be pointed out in the appended claims.

What is claimed is:

1. In a selective signaling system, a sending station, a plurality of receiving stations, means at the sending station for transmitting coded radio impulses to said receiving stations, a receiving device at each receiving station for receiving said radio impulses and repeating them, and means at each receiving station responsive to the repeated impulses for altering said receiving means for reception of a different character.

2. In a signaling system, a sending station, a receiving station, a radio telephone transmitter at the sending station having a normally disconnected microphone, means including said transmitter for transmitting radio impulses to the receiving station, means automatically operable a predetermined interval after the completion of the transmission of impulses for connecting said microphone to the transmitter, a radio receiver at the receiving station normally conditioned to receive the radio impulses, and means responsive to the reception of said impulses for conditioning the receiver to receive voice currents.

3. In a signaling system, a sending station, a receiving station designated by a particular code, a radio telephone transmitter at said station having a normally disconnected microphone, means including said transmitter for transmitting coded radio impulses, means at the sending station automatically

operable a predetermined time after the completion of the transmission of impulses for connecting said microphone to said transmitter, a radio receiver at the receiving station normally conditioned to receive all radio impulses transmitted from said sending station, and means at the receiving station for conditioning said receiver to receive voice currents whenever the impulse code corresponding to said particular code is received.

4. In a signaling system, a sending station, a receiving station, a radio telephone transmitter at the sending station, a microphone normally disconnected from said transmitter, a signal lamp at the sending station, means including said transmitter for transmitting radio impulses to the receiving station, means at the sending station automatically operable a predetermined time after the completion of the transmission of impulses for connecting the microphone to the transmitter and lighting said signal lamp to indicate such connection, a radio receiver at the receiving station normally conditioned to receive impulses, a signaling device at the receiving station, and means responsive to the received impulses for operating said signaling device for a predetermined time and for conditioning said receiver to receive voice currents.

5. In a signaling system, a sending station, a receiving station, a radio telephone transmitter at the sending station, a microphone at the sending station, means including said transmitter for transmitting radio impulses to the receiving station, means at the sending station automatically operable a predetermined time after the completion of the transmission of impulses for connecting said microphone to said transmitter, a radio receiver at the receiving station normally conditioned to receive and rectify said radio impulses, a loud speaker, and means responsive to the rectified impulses for connecting said speaker to the receiver.

6. In a selective signaling system, a sending station, a plurality of receiving stations, each receiving station being designated by a different code, a radio telephone transmitter at the sending station, means including said transmitter for transmitting coded radio impulses, a radio receiver at each receiving station normally conditioned to receive all coded radio impulses transmitted from the sending station, means at each of the receiving stations responsive to the received impulses, and means at each of the stations operated by said impulse responsive means thereat for conditioning the receiver at that station to receive voice currents only when the coded impulses received correspond to the particular code for that station.

7. In a selective signaling system, a send-

ing station, a plurality of receiving stations, each of which is designated by a different code, a radio telephone transmitter at the sending station, means including said transmitter for transmitting coded radio impulses to the receiving stations, a radio receiver at each receiving station normally conditioned to receive all coded impulses transmitted from said sending station, a step-by-step switch at each receiving station, means responsive to the received impulses for operating the switch at each station in a step-by-step manner, and means at each receiving station operated by the switch thereat for conditioning the receiver to receive voice currents when the coded impulses received correspond to the code for that station and for restoring the switch when the coded impulses received correspond to the code of another station.

8. In a selective signaling system, a sending station, a plurality of receiving stations, each of which is designated by a different code, a radio telephone transmitter at the sending station, means including said transmitter for transmitting coded radio impulses, a radio receiver at each receiving station normally conditioned to receive all coded impulses transmitted from said sending station, a loud speaker at each receiving station, a step-by-step switch at each receiving station and having a normal position, means responsive to the impulses received by each receiver for operating the switch associated therewith in a step-by-step manner from its normal position, and means at each receiving station operated by the switch thereat for connecting the loud speaker at that station to the receiver at the station when the coded impulses received correspond to the code of that station and for restoring the switch thereat to its normal position when the coded impulses received correspond to the code of another receiving station.

9. In a signaling system, a sending station, a receiving station, a radio telephone transmitter at the sending station, means including said transmitter for transmitting radio impulses to the receiving station, a radio receiver at the receiving station having the tube comprising the last stage of audio frequency amplification normally biased as a rectifier to rectify said radio impulses, a loud speaker adapted for connection in the plate circuit of a said tube, a relay in the plate circuit of said tube and responsive to the rectified impulses, and means operated by said relay for excluding said relay from the plate circuit of said tube and including said loud speaker in said plate circuit and for rebiasing said tube as an amplifier.

10. In a signaling system, a sending station, a receiving station, a radio telephone

transmitter at the sending station, means including said transmitter for transmitting radio impulses to the receiving station, a radio receiver at the receiving station having the tube comprising the last stage of audio frequency amplification biased as a rectifier for receiving and rectifying said radio impulses, a loud speaker adapted for connection in the plate circuit of said tube, a switch at the receiving station, a relay in the plate circuit of said tube and responsive to the rectified impulses for operating said switch, and means operated by said switch for excluding said relay from said plate circuit and including said loud speaker therein upon the cessation of impulse reception and for rebiasing said tube to make it operate as an amplifier.

11. In a signaling system, a sending station, a receiving station, a radio telephone transmitter at the sending station, means including said transmitter for transmitting radio impulses to the receiving station, a radio receiver at the receiving station having the tube comprising the last stage of audio frequency amplification biased as a rectifier for receiving and rectifying said radio impulses, a loud speaker adapted for connection in the plate circuit of said tube, a switch at the receiving station, a relay in the plate circuit of said tube and responsive to the rectified impulses for operating said switch, and means operated by said switch for excluding said relay from said plate circuit and including said loud speaker therein upon the cessation of impulse reception and for rebiasing said tube to make it operate as an amplifier; and manually operated means for thereafter restoring said switch to cause the disconnection of said speaker from said plate circuit and the inclusion of said relay therein, and to cause the initial biasing of said tube to be restored.

12. In a signaling system, a sending station, a receiving station, a radio telephone transmitter at the sending station, a microphone normally disconnected from said transmitter, means including said transmitter for transmitting series of radio impulses to the receiving station, means at the sending station automatically operable to connect said microphone to said transmitter a predetermined length of time after the completion of impulse transmission, a radio receiver at the receiving station having the tube comprising the last stage of audio frequency amplification normally biased as a rectifier for receiving and rectifying said radio impulses, a loud speaker at the receiving station, a switch at the receiving station, a relay in the plate circuit of said tube and responsive to the rectified impulses for operating said switch, means operated by said switch for substituting said loud

speaker for said relay in said plate circuit upon the completion of impulse reception and for rebiasing said tube to make it operate as an amplifier, manually operable means at the sending station for thereafter disconnecting said microphone from said transmitter, and manually operable means at the receiving station for thereafter restoring said switch to cause the exclusion of said speaker from said plate circuit and the inclusion of said relay therein, and for causing the initial biasing of said tube to be restored.

13. In a selective signaling system, a sending station, a plurality of receiving stations, a single wave radio telephone transmitter at the sending station, means including said transmitter for transmitting coded radio impulses to said receiving stations simultaneously, a radio receiver at each receiving station permanently tuned to the wave length of said transmitter and normally conditioned to receive and rectify said coded impulses, and means at each receiving station responsive to the rectified coded impulses for conditioning the receiver thereat to receive voice currents only when the coded impulses received correspond to the code of that receiving station.

In witness whereof, I hereunto subscribe my name this 4th day of June, A. D. 1930.

HARRY E. HERSHEY.