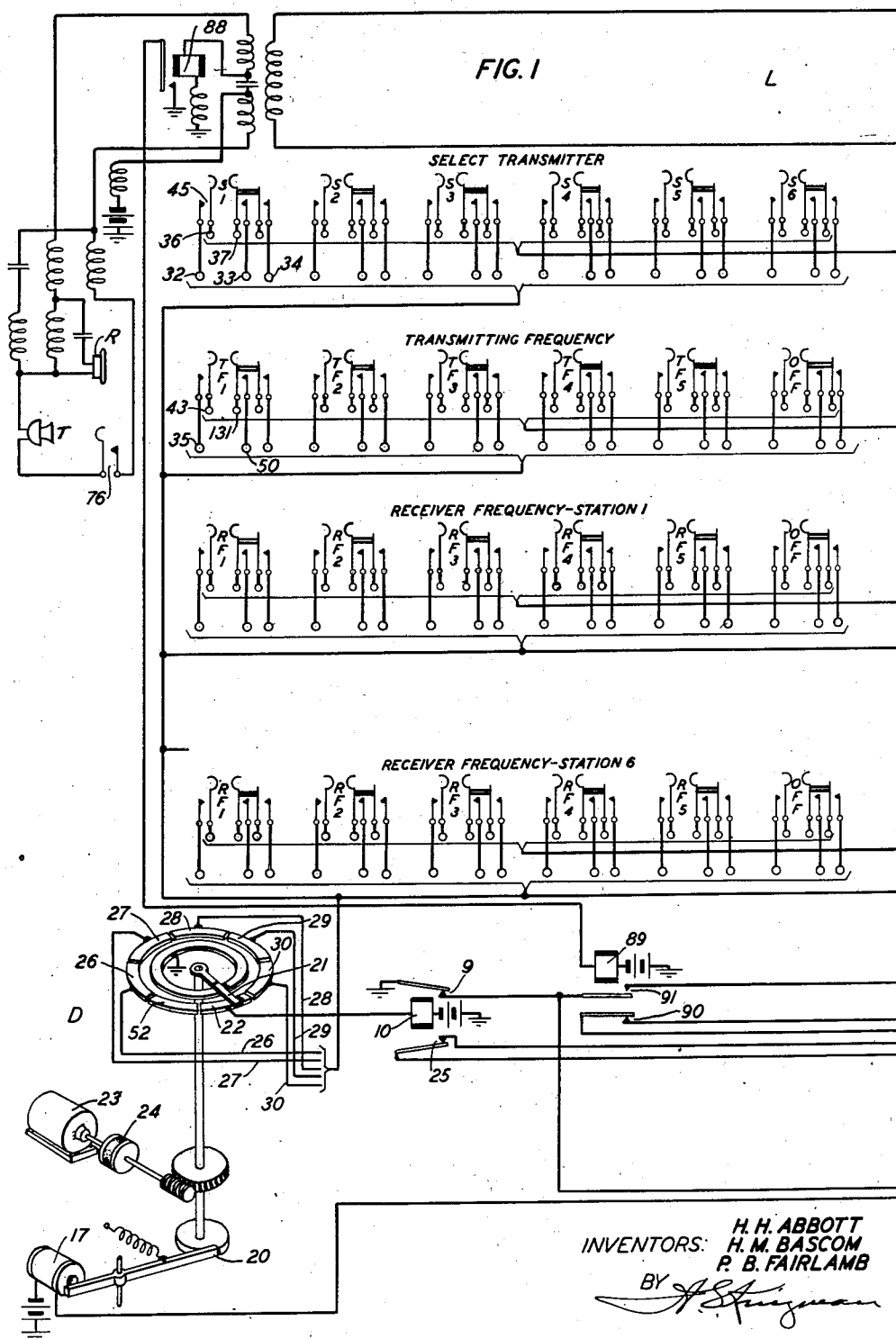


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4 Sheets-Sheet 1



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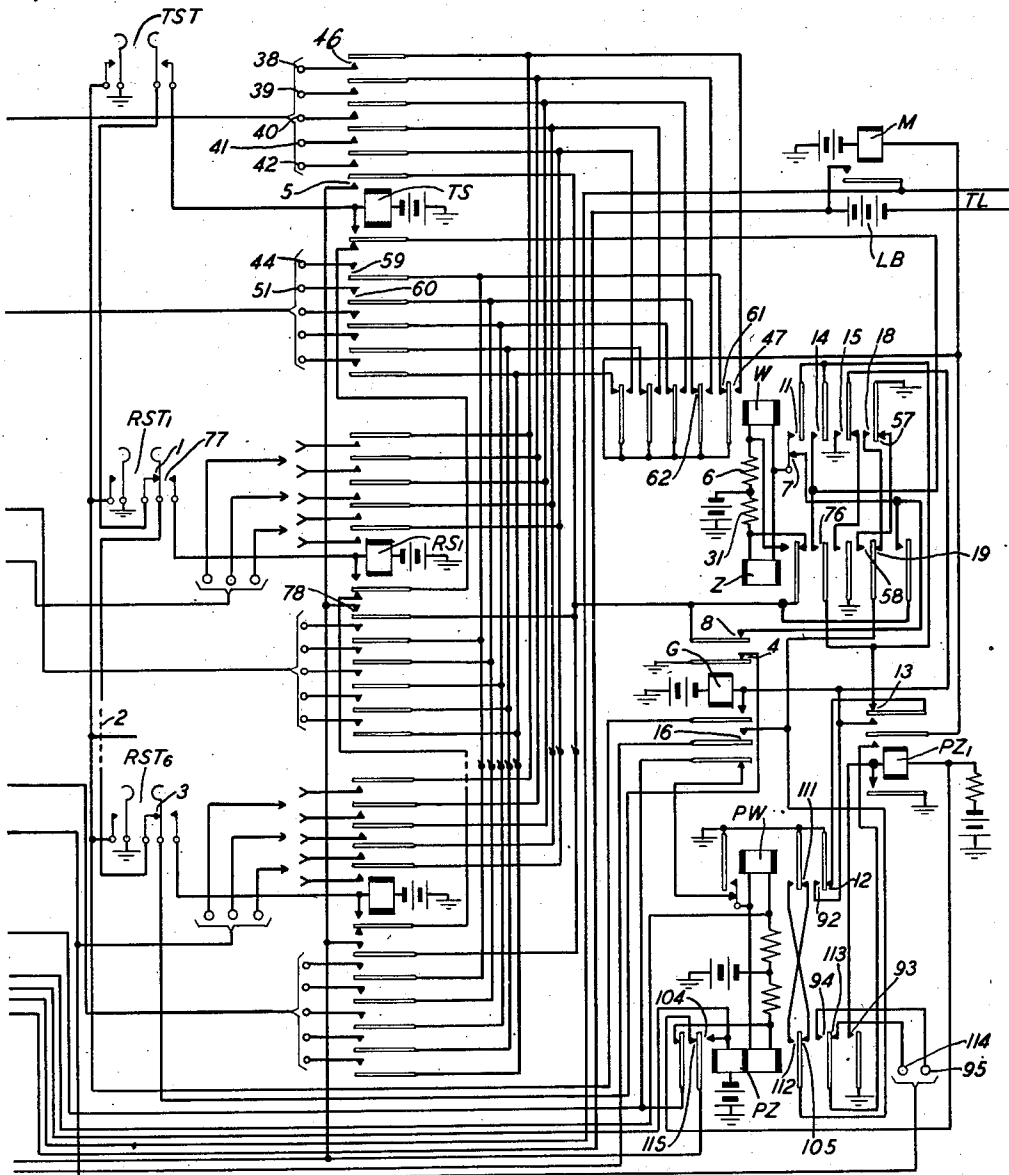
RADIO CONTROL SYSTEM

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FIG. 2



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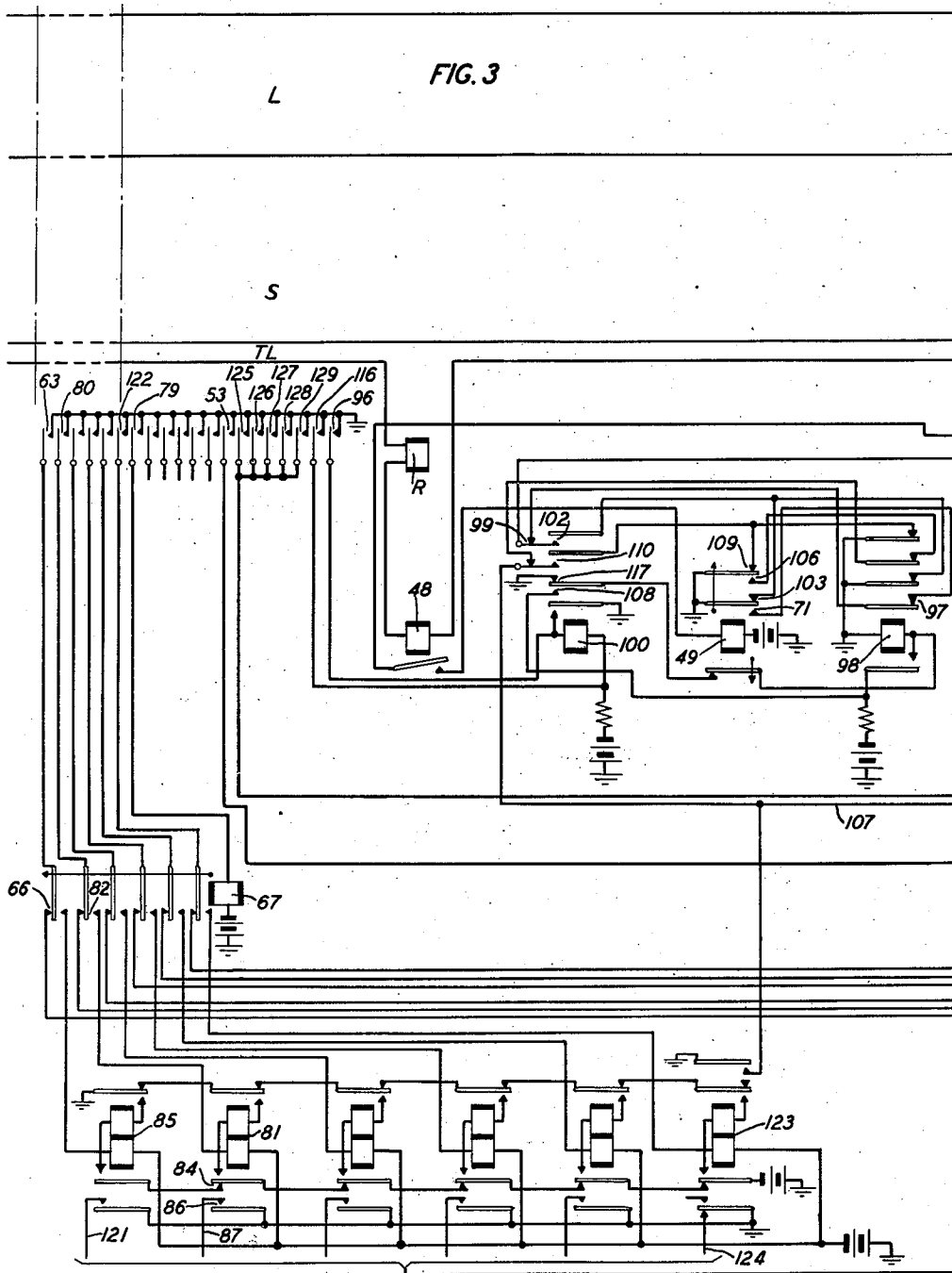
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RADIO CONTROL SYSTEM

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4 Sheets-Sheet 3

FIG. 3



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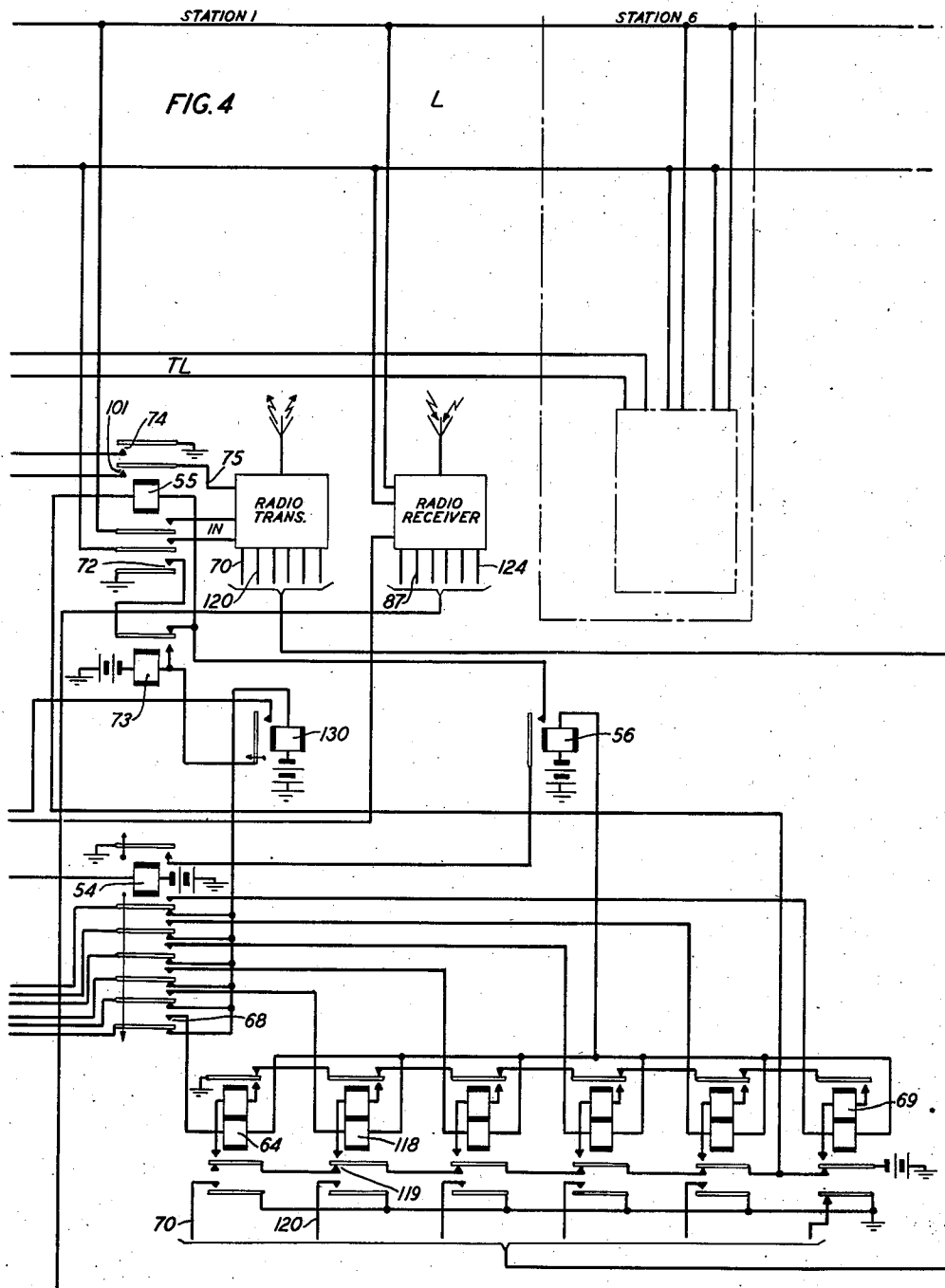
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RADIO CONTROL SYSTEM

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4 Sheets-Sheet 4



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2,469,539

RADIO CONTROL SYSTEM

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5 Claims. (Cl. 250—6)

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This invention relates to radio communication systems and more particularly to the remote connection and control, over a line from a master station, of a desired one of a plurality of distantly located radio stations each comprising either a receiver, or a transmitter, or both.

A feature of the invention resides in means, including permutation code transmitting apparatus, at a master station for selectively controlling, over a line, the operation of selector apparatus located at the several radio stations to connect the input circuit of any desired one of a plurality of radio transmitters to a common communication channel terminating at the master station.

Another feature resides in means including said code transmitting apparatus and selectors for selectively conditioning the selected radio transmitter to transmit on any desired one of a predetermined plurality of frequency bands.

A further feature resides in means also including said code transmitting apparatus and selectors for selectively conditioning desired ones of said radio receivers to respond to desired ones of a predetermined plurality of radio frequency bands.

A still further feature resides in means including said code transmitting apparatus and selector for selectively and individually disconnecting desired ones of said receivers from the communication channel.

Still another feature relates to insuring reliable operation of the system by requiring the transmission of two successive codes, in a predetermined sequence, to effect the desired control thus obviating false and improper control of station and frequency selection due to false line impulses caused by accidental line grounds and crosses, crosses with other electrical circuits, false relay operation, etc.

Another feature resides in means also controlled by said code transmitting apparatus and selectors, responsive to energization of a telephone transmitter associated with the communication channel at the master station, for causing the radiation of the radio signals from the selected radio transmitter and disabling all radio receivers connected to the channel and responsive to the deenergization of the telephone transmitter for deenergizing the selected radio transmitter and reenabling all connected receivers.

Other features of the invention will be apparent from the following description when read in connection with the accompanying drawings:

Figs. 1 and 2 of which, when placed side by

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side with Fig. 1 to the left of Fig. 2, show the arrangement of apparatus and circuit at a master or control station connected over a pair of lines to a plurality (six) of distant radio station locations two of which, stations 1 and 6 are shown on Figs. 3 and 4.

Referring to the drawing, Fig. 1 shows a telephone for use by an attendant (dispatcher) at the master or control station, a plurality of groups of selector keys for selectively initiating the desired control at the desired radio station, and a start-stop code transmitting distributor. Fig. 2 shows the relay equipment at the master station associated with the distributor shown in Fig. 1 and Figs. 3 and 4 show a non-typing selector at one of the stations (station 1) and circuits therefor, to control a combined radio transmitter and receiver in accordance with codes transmitted from the master station. An additional station 6 of the system, similar in all respects to the first station, is indicated in the upper right-hand corner of Fig. 4.

In describing the operation of the system, from which an understanding of the invention may obtain, it will be understood that the attendant's, i. e., the dispatcher's telephone at the master or control station is adapted to be connected to a speech communication line L which extends to a plurality of distant radio station locations, as for example, stations 1 and 6 shown in Figs. 3 and 4, and that the output circuit of the radio receiver at each of the stations is connected to line L and one of the receivers, for example at station 1, is conditioned to receive on one of the frequencies for which it is adapted, frequency 1 for example, whereby the attendant is able to monitor on the line, i. e., listen.

Now let it be assumed that the dispatcher, after listening on the line, desires to transmit from the transmitter at station 1 on frequency TF1. He therefore selects the desired radio transmitter by depressing the transmitter selecting key S1 which locks, and selects the desired transmitting frequency by depressing the frequency key TF1 and, thereafter, momentarily operates the non-locking code start key TST (Fig. 2) whereupon relay TS operates in a circuit from battery, winding of TS, right-hand contacts of TST, contact 1 of receiver start key RST1, through similar contacts of the receiver start keys for receivers 2 to 5, inclusive, as indicated by the broken line 2, contact 3 of receiver start key RST6, and contact 4 of relay G to ground. Relay TS operates and closes its contacts 5 to operate relay W, of a so-called "W-Z" combination, in a circuit from

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battery, resistance 6, winding of W and contacts 7 thereof, contacts 8 of relay G, contacts 5 of relay TS and contacts 9 of relay 10 (Fig. 1) to ground. Relay Z is short-circuited at this time by the connection of ground to both ends of its winding.

Relay W in operating closes its contacts 11 to complete a locking circuit for itself from ground, contacts 12 of relay PW contacts 13 of relay PZI, contacts 11 and winding of W and resistance 6 to battery.

Relay W also closes its contacts 14 to close a holding circuit for relay TS which is completed from ground over contact 12 of relay PW, 13 of PZI, contacts 14 of W, lower front contacts and winding of TS to battery. Further, relay W closes its contacts 15 to operate relay G in an obvious circuit. Relay G in operating closes its contacts 16 to operate the release magnet 17 of the distributor D (Fig. 1) in a circuit from ground, contacts 18 of W, contacts 19 of relay Z, contacts 16 of G and winding of magnet 17, whereupon the stop latch 20 of the distributor, which normally holds the distributor brush 21 in contact with the stop segment 22, releases the brush and it starts to revolve under the influence of motor 23 which it will be assumed is in operation but prevented from rotating the brush shaft due to slipping of clutch 24. When the brush 21 leaves stop segment 22 and passes onto "start segment" 52, which latter segment has no connection to the key and relay equipment at the master station, ground is removed from relay 10 which relay thereupon releases and opens its contacts 25 thereby opening the normally closed telegraph or signal line TL which serially includes line battery LB and during the interval the brush is passing over segment 52, the line TL remains open and the receiving magnets associated with the selector at the various distant radio stations, such as magnet R at station 1 (Fig. 3), releases.

Release of relay 10 also opens its contact 9 thereby removing the ground previously applied to the left-hand end of the winding of relay Z and this relay thereupon operates in a circuit from ground, contact 12 of relay PW, contact 13 of relay PZI, contact 11 of relay W and winding of Z and resistance 31 to battery.

Now if the code required to select the transmitter at station 1 requires a marking impulse during the contact of the distributor brush with segments 26 and 27, then leads 26 and 27 from the distributor will be connected to terminals 32 and 33 of key S1 of the row of transmitter select keys and in like manner if the code required to condition the transmitter at station 1, to transmit on the desired frequency (TF1), consists of two marking pulses caused by contact of the distributor brush 21 with segments 26 and 28 then lead 26 will be connected to terminal 35 of transmitter frequency key TF1 and lead 28 will be connected to terminal 50. Further terminals 36 and 37 of key S1 will be connected to terminals 38 and 39 of relay TS (Fig. 2) and terminals 43 and 131 of key TF1 will be connected to terminals 44 and 51 of the same relay.

Other connections, in various combinations, between the distributor D and the terminals of the other select keys of Fig. 1, and between these keys and switching terminals of the relays of Fig. 2, will be made to transmit over line TL, the characteristic codes required, as hereinafter discussed, to effect the desired controls which

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will be understood to those familiar with teleprinter systems.

Now continuing with the description of the operation of the system, when the distributor brush, now in motion, moves off segment 52 and makes contact with the first transmitting segment 26, ground is applied thereto and an energizing circuit for relay M is closed over lead 26, terminal 32, closed contacts 45, and terminal 36 of key S1, terminal 38, and contacts 46 of relay TS (Fig. 2), contacts 47 of relay W, now operated, and winding of relay M to battery which latter relay now operates and recloses the line TL, which was opened when relay 10 (Fig. 1) released at the beginning of the code cycle and reoperates the selector magnets such as R at the different stations, which magnets control the closure of contacts of the selector.

During contact of the distributor brush with segments 26 and 27, relay M remains operated, and the line TL closed, thereby transmitting the predetermined code for which the selector S is adjusted, thus closing its contacts 53 which operate the transmitter start relay 54 at station 1 which relay opens its lower back contacts and closes its front contacts in preparation for the next code transmitted which determines the frequency on which the transmitter is to operate. Operation of relay 54 closes an upper contact to prepare a circuit for relay 55 when relay 56 is energized. When the distributor brush moves off segment 27, relay M releases thereby opening the line TL and when the brush completes its first revolution, and engages the stop segment 22, relay 10 operates which closes its contacts 25 to again close the line TL. Relay 10 also closes its contacts 9 to connect ground over contacts 5 of relay TS and the front contacts of relay Z to short circuit relay W which thereupon releases. Release of relay W at this time, however, does not open the circuit for, and release, the latch magnet 17 associated with the distributor for the reason that an alternate circuit for magnet 17 is closed at contact 57 of relay W and contact 58 of relay Z. Further the release of relay W does not open the holding circuit of relay TS due to the operated condition of relay Z.

Due to the continued energization of relay 17, the distributor does not stop at this time and as soon as the brush moves off start segment 52 another code is transmitted to operate the selector at station 1 to adjust the transmitter thereat for the desired frequency, as determined by the operation of transmitting frequency key TF1 which codes consist of an impulse when the brush passes over segment 26 and another when it passes over segment 28, relay M being controlled at this time over contacts 59 and 60 of relay TS and contacts 61 and 62 of relay W now released. When the distributor brush moved off the stop segment 22, relay 10 released thereby removing the ground which had been holding relay Z operated and this relay then released thereby releasing, at its contact 76, the holding circuit for relay TS which released. Sending the transmitting frequency code on the second revolution of the distributor causes the selector S at station 1 to close its contacts 63 to operate relays 64 and 56 over back contacts 66 of relay 67 and front contact 68 of relay 54, lower winding of relay 64 and winding of relay 56 to battery. Relay 64 opens its upper back contacts to release any succeeding relays which may be operated and by closing its upper and lower front contacts locks itself over its upper winding and the series chain

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of lower contacts to battery on the inner lower armature of relay 69. Operation of relay 64 also closes its lowermost contact thereby connecting ground to the lead 70 to condition the transmitter to transmit on the desired frequency, i. e., f_1 .

Operation of relay 56 completes a circuit to operate relay 55 which was prepared by the operation of relay 54.

Relay 55 closes its contacts to lock itself operated under control of relays 73 and 69. Operation of relay 55 also connects the input of the transmitter to the line L and by closing its contacts 101 prepares a circuit to energize the carrier control lead 75 when the dispatcher at the master station energizes his telephone transmitter by pressing the "press to talk" key 76 which will be later referred to.

It will be noted that at station 1, selector contacts 125, 126 and 127, 128 and 129 are strapped together and connected to relay 130 whereas contacts 53 are connected to relay 54. While not shown it will be understood that at station 2, for example, contacts 125 will be connected to the relay at that station corresponding to relay 54 and the contacts 53, 126, 127, 128 and 129 will be strapped and connected to the relay corresponding to relay 130. At station 3, contacts 126 will be connected to the relay 54 and so on.

It will therefore be obvious that when a code is transmitted, to close contacts 53 at station 1, corresponding contacts at the other stations will be closed to operate relays corresponding to relay 130 and when the succeeding code was transmitted, it closed contacts 63 and operated relay 64, and simultaneously this same code will also operate selector contacts corresponding to 63 at station 2, and succeeding stations, and due to the fact that the relays of these other stations, corresponding to relay 54 are not operated, circuits at the other stations will be completed over back contacts of 54 and front contacts of relays 130 to operate the corresponding release relay 73 which will release relay 55, if operated, and disconnect and disable the transmitter which at the time is connected to line L.

It will now be understood that the selection and connection to the line of the desired transmitter has been effected and also the transmitter has been conditioned to transmit on frequency f_1 . Now when the distributor completes its second revolution and the brush engages the stop segment 22, ground will be applied to relay 10 which operates and closes its contacts 25 to close the line TL, as previously described. Relays W and Z are now released which was their original condition.

Receivers at stations 1 and 6 set to receive on frequency f_2

It will be further assumed that the dispatcher at the time of making the original selection of the radio transmitter at station 1 also desired to condition the radio receivers at stations 1 and 6 to receive on frequency f_2 which receivers at that time were conditioned to receive on frequency f_1 and the dispatcher therefore depressed receiver frequency keys RF₂ for stations 1 and 6 which keys in operating, release in a well-known manner, the keys RF₁ which we have assumed were previously operated. The dispatcher now operates receiver start keys RST₁ and RST₆ in succession. Operation of RST₁

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closes a circuit to operate relay RS₁ which is traced from battery, winding of RS₁, contacts 77 of key RST₁, contacts 3 of key RST₆, before this key is operated, to ground over contacts 4 of relay G. Relay RS₁ in operating closes its contacts 78 to operate relay W in a circuit from ground over contacts 9 of relay 10, contacts 78 of relay RS₁ and contacts 8 of relay G and contacts 7 of relay W. Relay W in operating locks itself and relay RS₁ to ground over contacts 12 of relay PW and operates relay G thus energizing the latch magnet 17 of the distributor, whereupon the distributor starts to revolve and sends code pulses over the line TL as determined by the receiver frequency key now operated. From this point on the operation is the same as before described for sending the transmitter selection and transmitter frequency code, i. e., on the first revolution of the distributor ground will be applied to certain upper contacts of relay RS₁, determined by the operated key RF₂, and the wiring therefrom to the relay contacts which will control the relay M over the front left contacts of relay W now operated, and on the second revolution, at which time relay W is released as previously described, a different code will be transmitted as determined by the wiring between the key RF₂ and the lower contacts of relay RS₁.

The first code sent, on the first revolution of the distributor, we will assume actuates the selector at station 1 to close its contacts 79 thereby operating relay 67 which in operating closes its left-hand contacts in preparing for the immediately following code which we will assume causes the selector to close its contacts 80 thereby completing a circuit to operate relay 81 in a circuit including contacts 82 of relay 67 and lower winding of relay 81 to battery.

Relay 81 operates and opens at its contacts 84 the locking circuit for relay 85, which we have assumed was previously operated to condition the receiver at station 1 to receive on frequency f_1 . Relay 81 thereupon locks over its inner front contacts and by closing its contacts 86 connects ground, over conductor 87, to the radio receiver which will perform the necessary switching functions to condition it to receive on the desired frequency f_2 and to transmit the received signals to the dispatcher's station over line L.

The same operation as just described is also effected at station 6, the circuits of which are not shown.

After the distributor completes its second revolution it stops as before described and the line TL is now closed and relays W and Z are in their normal released condition.

It will be noted from the foregoing that after the proper transmitter selection code impulses are received at the station thereby operating slow-release relay 54, no operation of relay 55 is effected unless there immediately follows, before 54 releases, a frequency selection code to operate one of the transmitting frequency relays such as 64, 118, etc., which relays are controlled over the front contacts of relay 54. Relay 56 operates in series with any one of the transmitting frequency relays and closes a circuit to operate relay 55 provided relay 54 is operated.

Further, in case the dispatcher desires to control any receiver frequency at a particular station, the operation of any one of the receiver frequency keys of the desired station causes a predetermined code to be transmitted to close a contact at the station to operate a relay, such as 67 at

station 1, which is slow-releasing. Following this code a second is immediately transmitted and if it is received before relay 67 releases, the desired frequency receiver relay such as 85, for example, will be operated.

In other words, high reliability of the system is assured by requiring the receipt of two sets of selecting impulses in the proper sequence within a predetermined short time interval before a desired connection is effected or an established connection is changed.

Dispatcher operates "press to talk" key

With the radio transmitter at station 1 connected to the line L and conditioned to transmit on frequency f_1 , and the corresponding receiver conditioned to receive on frequency f_2 , the system is now ready for communication and the dispatcher then actuates the "press to talk" key 76 associated with his telephone set, thereby closing the circuit from battery through the telephone transmitter and relay 88 to cause that relay to operate thus closing a circuit to operate relay 89. Relay 89 opens its lower contacts 90 and closes its contacts 91 thereby short-circuiting the right-hand winding of relay PZ and operating relay PW which relay operates and locks and also closes at its contacts 92 a circuit to operate relay G which relay, in operating, closes its contacts 16 to operate latch magnet 17 thus starting the distributor and thereby releasing relay 10 when the brush moves off segment 22. This opens the line TL and removes the short-circuit from the right-hand winding of relay PZ which relay operates and holds to ground on the left front contact of PW.

Relay PZ closes its contact 93 to operate PZ₁ which locks, opens its contacts 105 to open the circuit for the latch magnet 17 and also closes its contacts 94. If we assume that segment 26 is connected over lead 26 to terminal 95 associated with contacts 94, when the brush engages segment 26, relay M will operate to close the line to send a single pulse to operate selector magnet R and close contacts 96 of the selector. Prior to the transmission of this pulse, relay 48, which is in series with magnet R in the line TL, releases during the open interval of the line and due to the fact that relay 55 is operated at this time ground, over its contacts 74, is connected to the windings of slow-release relay 49 which thereupon operates and closes a circuit from ground, contact 71 of relay 49, contacts 97 of relay 98, contacts 99 of relay 100, and contacts 101, to energize the radio transmitter and put the carrier frequency on the air. This operation provides a very rapid energization of the transmitter at the first movement of the distributor, i. e., as soon as the distributor brush engages the start segment 52 and opens the line TL. Now when the line is closed by the first code pulse, relay 48 operates at the same time as the selector magnet R thereby opening the circuit previously closed to operate relay 49 and this relay is deenergized, but as its slow-release characteristics are such that it holds for a short interval, during which time the selector contacts 96 are closed to operate relay 100, this relay locks and closes its contacts 102 thereby completing the holding circuit to maintain a ground connection to conductor 75 to keep the transmitters on the air. This circuit may be traced from ground, contacts 103 of relay 49 released, contacts 102 of relay 100 and contacts 101 of relay 55. Release of relay 49 after relay 100 operates completes a circuit to operate relay 98

which accomplishes no useful function at this time.

When the distributor completed its revolution and stopped due to the release of latch magnet 17, relay 10 reoperated thereby connecting ground over contacts 104 of relay PZ to hold that relay operated.

As long as the "press to talk" key 76 remains operated, thus holding relay 89, relays PW, PZ and PZ₁ remain operated at the master station.

At station 1 when relay 49 operated in addition to energizing the transmitter to put its carrier frequency on the air, this relay also closed contacts 106 to connect ground to conductor 107 to disable the radio receiver and when relay 100 operated and relay 49 released, a substitute circuit was closed to hold ground on conductor 107 to keep the receiver in stable condition. This can be traced from ground, contacts 109 of relay 49, contact 110 of relay 100 to lead 107.

The radio transmitter at station 1 is now on the air and the corresponding radio receiver is disabled. The dispatcher at the master station now talks over the line L and the speech signals are transmitted from the antenna. At the end of the speech transmitting interval the dispatcher releases the "press to talk" button 76 thereby releasing relay 89 which closes its contacts 90 thus shunting relay PW by connecting ground to the right-hand terminal of its winding which can be traced from ground, contacts 9 of relay 10, contacts 104 of relay PZ and contacts 90 of relay 89 to the right-hand terminal of relay PW. This latter relay therefore releases and closes its contact 12 thereby operating relay G which closes its contacts 16 to operate the latch magnet 17 of the distributor. This can be traced from ground, contacts 111 of relay PW, contact 112 of relay PZ, contact 16 of G and winding of magnet 17 to battery. Latch magnet 17 in operating releases the distributor and when the brush moves off segment 22 relay 10 releases thereby opening its contacts 25 to open the line TL and by opening its contacts 9 releases relay PZ which closes contacts 113 thereby connecting relay M to a predetermined segment of the distributor, for example, 28 by way of terminal 114 of relay PZ, whereby a single pulse is transmitted over the line TL when the distributor brush passes over segment 28. Relay PZ in releasing also opens its contacts 112 thereby releasing the latch magnet 17.

When the distributor completes its revolution, it stops on segment 22 and relay 10 reoperates thereby shunting relay PZ₁ in a circuit to ground from contacts 9 of relay 10, contacts 115 of PZ to the right-hand winding of terminal of PZ₁. This relay now releases and releases relay G. Relays PW, PZ and PZ₁ are now released in readiness for another operation cycle.

When the line TL was opened at the start of the distributor relay 48 at station 1 released thereby reenergizing relay 49 which operated, thereby opening contacts 103 to remove ground from the transmitter control lead 75 and also reopens its contact 109 to remove ground from receiver control lead 107 which thereby reenables the receivers.

When the last-described line pulse, caused by release of the "press to talk" key, is received, it will be assumed that it causes selector S to close its contacts 116 thereby short-circuiting relay 100 which previously had been operated and locked. Relay 48 reoperated at or before the first operation of the selector magnet R thereby deenergizing relay 49 which starts to release and finally

closes its bottom contact at or before relay 100 releases thereby completing a circuit to cause the release of relay 98. This circuit can be traced from ground, contact 117 of relay 100, lower back contact of relay 49 to the right-hand terminal of the winding of relay 98 which relay now releases and restores this part of the station circuit, i. e., relays 100, 49 and 98 to normal.

Change transmitting frequency

If the dispatcher desires to transmit on a different frequency than the one originally selected, for example f_2 he will depress transmitting frequency key TF_2 which locks and automatically releases key TF_1 . Transmitting start key TST is then operated thereby starting an operation cycle to again transmit in the same manner as before described, a pulse code determined by the still operated key S_1 of the row of transmitter select keys to cause the distributor to control the selector at station 1 to again close its contacts 53 to operate relay 54 and to immediately thereafter transmit the pulse code determined by the operation of transmitting frequency key TF_2 to control the station selector to close its contact 80 to operate transmitting frequency relay 118 in series with relay 56 which, however, performs no useful function if we assume that relay 55 is still operated. Operation of relay 118 opens its contact 119 to open the holding circuit for relay 64 which releases and by closing its upper back contact applies ground to lock relay 118. Relay 64 removes ground from conductor 70 and relay 118 connects ground to conductor 120 thereby changing the transmitter to transmit on frequency f_2 .

Change receiver frequency

If on the other hand the dispatcher desires to change the receiver at station 1 to receive on the same frequency as that for which the transmitter is conditioned, i. e., f_1 , which it may be mentioned is the most common condition, namely, transmitter and receiver sending and receiving on the same frequency, he will operate the RF_1 key for station 1 thereby releasing relay RF_2 which was previously operated. He will then operate receiver start key RST_1 to cause a distributor to send the code to operate relay 67 and immediately thereafter sends the code to operate relay 85 which releases relay 81 thereby connecting ground to receiver frequency lead 121 and removing ground from control lead 87 thus changing the frequency at which the radio receiver at station 1 responds.

Disconnect the transmitter

If the dispatcher desires to disconnect the transmitter from the line L at station 1 he will operate the transmitting frequency key OFF and hereafter actuate transmitter start key TST thereby initiating operation of relays TS , W , Z and G to cause the distributor to again transmit the code determined by the already operated key S_1 which causes the selector at station 1 to again close its contacts 53 to operate relay 54 and immediately thereafter to send the code determined by the operation of the OFF key thereby causing the selector to close its contacts 122 to operate relay 69 which releases relay 64 to remove ground from transmitter frequency lead 70 to disable the transmitter and to release relay 55 which disconnects the transmitter from the line and to also open the carrier control lead 75. The dispatcher can now select and connect another

transmitter, if desired, in the manner originally described.

Disable receiver

If the dispatcher desires to disable any radio receiver which may be in receiving condition, as for example the receiver at station 1, he will press the OFF key of the row of receiver frequency keys for station 1 and thereafter the receiver start key RST_1 to initiate two revolutions of the distributor and the transmission of a code to first close selector contacts 79 at station 1 and thereafter a second code to close selector contacts 122 to operate relay 123 which relay opens the holding circuit for relay 85 which releases and removes ground from conductor 121. Relay 123, in operating, locks, opens its lowermost contacts to remove ground from lead 124, and by closing its uppermost contacts connects ground to conductor 107 to further disable the receiver.

From the foregoing description it will be seen that the system of the present invention enables the dispatcher at the master station to control by means of the code distributor, selector keys and relay circuits, any of the radio transmitters and radio receivers along the lines L and TL, i. e., (a) to connect any transmitter to the line L to the exclusion of any of the others, (b) to condition the selected transmitter to transmit on any one of a number of predetermined frequencies, (c) to condition any number of the radio receivers to receive on any one of a number of predetermined frequencies, (d) to condition the connected transmitter for radio transmission and to disable all of the radio receivers during the interval the dispatcher's telephone transmitter is energized, i. e., while he is talking, (e) and to restore the radio receivers to normal receiving condition and to deenergize the connected radio transmitter, (f) to disconnect any connected radio transmitter from the line and (g) to disable any conditioned radio receiver.

What is claimed is:

1. In a station selecting system, in combination, a master station, a telegraph line extending therefrom, a plurality of radio stations along said line, each station comprising a radio transmitter and a radio receiver, each of said transmitters being adapted to be adjusted to transmit on any one of a predetermined number of different radio frequencies and each receiver being adapted to be adjusted to respond to any one of a predetermined plurality of different received frequencies, a common communication channel extending from the master station to all of said radio stations, said telegraph selector apparatus in said telegraph line individual to the several radio stations, said telegraph selector apparatus adapted to respond to two successive and different codes initially, and start-stop permutation code transmitting apparatus adapted to transmit two successive and different codes initially, said code transmitting apparatus being selectively controlled at the master station and associated with the telegraph line for controlling said selector apparatus in different manners to selectively adjust any desired one of the radio transmitters to transmit on a desired one of said transmitter frequencies and to connect the input circuit thereof to said communication channel to the exclusion of any other transmitter, to disconnect any connected transmitter, to selectively condition a desired one of said receivers to respond to any desired one of said predetermined frequencies, to connect the output circuit thereof to the communication channel, and to

selectively disconnect any connected receiver therefrom.

2. A system in accordance with claim 1, characterized by means for causing said code transmitting apparatus when started to complete two successive operation cycles and to transmit two respectively different codes and means at each substation responsive to the first of said two transmitted codes to prepare for the desired selective adjustment and responsive to the second transmitted code to complete said desired adjustment.

3. In a station selecting system, in accordance with claim 1, in which said master station comprises an attendant's telephone set connected to said communication line, said set including a telephone transmitter adapted to be energized and deenergized under control of attendant operated means, characterized by means responsive to energization of said telephone transmitter for causing said code transmitting apparatus to transmit a code to control the selectors in the telegraph line to simultaneously condition the radio transmitter, connected to the communication line, for radio transmission and to disable all said radio receivers, and responsive to deenergization of said telephone transmitter to cause the code transmitting apparatus to control said selectors to simultaneously decondition the conditioned transmitter and remove the disabling condition from said receivers.

4. In a station selecting system in accordance with claim 1 in which said master station comprises an attendant's telephone set connected to said communication line, said set including a telephone transmitter adapted to be energized and deenergized under control of attendant operated means, said start-stop permutation code transmitting apparatus being connected to the telegraph line to serve as a distributor after it has transmitted the codes to effect the desired selection at the radio station, said distributor being operated by the energization of the telephone transmitter and being adapted to transmit an initial pulse, means associated with the telegraph line and responsive to said initial pulse to energize the radio transmitter, and other means associated with said telegraph line responsive to said initial pulse to temporarily disable all said radio receivers and to simultaneously condition the radio transmitter, connected to the communication line for radio transmission, and responsive to deenergization of said telephone transmitter to cause a second operation of said distributor, said other means associated with the telegraph line, responsive to the respective pulse,

being effective to simultaneously remove said disabling condition from the radio receivers, and decondition the transmitter.

5. In a station selective system in combination, a master station, a telegraph line extending therefrom, a radio station comprising a radio transmitter and a radio receiver on said telegraph line, a communication line between said master and radio station, a selector apparatus associated with said telegraph line at said radio station, said selector apparatus adapted to make station and station frequency selections in response to two successive and different codes received over said telegraph line, switching means controlled by said selector for selectively and simultaneously conditioning said radio transmitter for radio transmission and for disabling the receiver, and for deconditioning the transmitter and enabling the receiver, a start-stop permutation code transmitting distributor at the master station adapted, when started, to transmit an initial open circuit pulse for conditioning said selector apparatus over said telegraph line, an attendant's telephone set comprising a telephone transmitter at said master station, attendant controlled means for energizing said telephone transmitter for speech transmission, means responsive to energization of said telephone transmitter to initiate operation of said distributor to transmit a code to control said selector to effect said simultaneous conditioning of the radio transmitter and disabling of said receiver and responsive to a subsequent deenergization of said telephone transmitter to initiate the second operation of said distributor to transmit code pulses to effect deconditioning of the radio transmitter and reenabling the receiver, and other means responsive to the open circuit start pulse, transmitted by said distributor at the start of its operation for temporarily conditioning said radio transmitter and disabling said receiver or deconditioning the transmitter and enabling the receiver, depending on their previous condition, until the selector responds to the code transmitted.

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HENRY M. BASCOM.
PRESTON B. FAIRLAMB.

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