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A. A. CLOKEY

SIGNALING SYSTEM

Filed Feb. 18, 1924

2 Sheets-Sheet 1

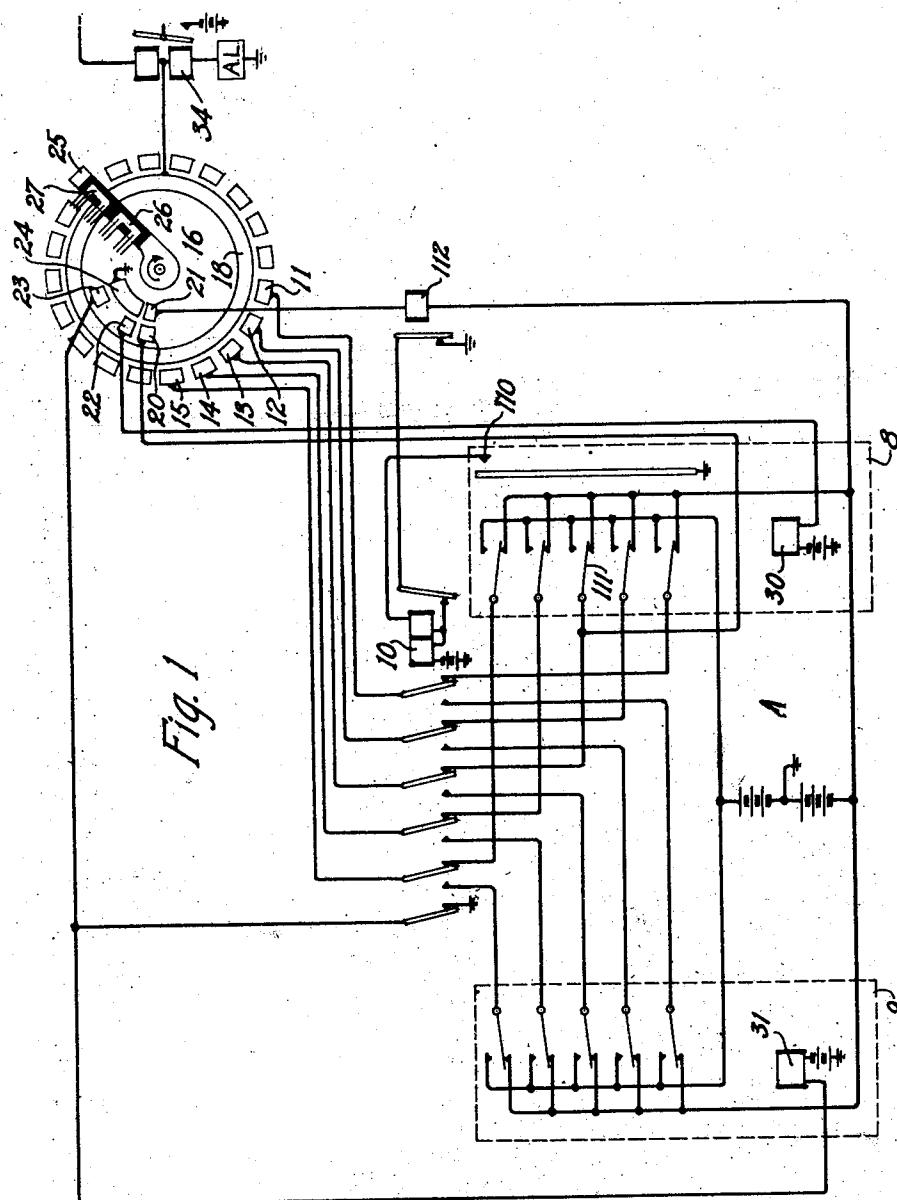


Fig. 1

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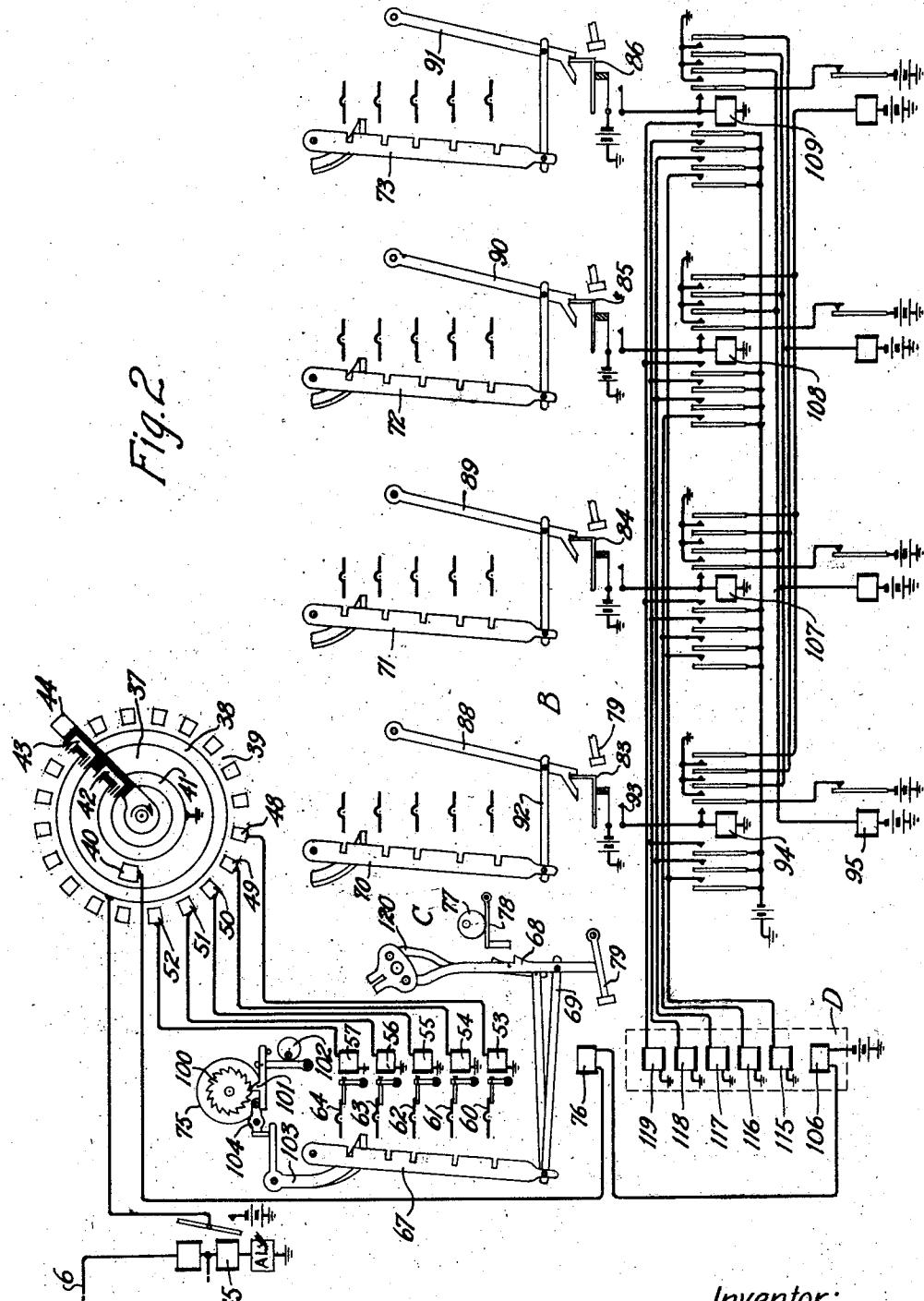
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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SIGNALING SYSTEM.

Application filed February 18, 1924. Serial No. 693,514.

This invention relates to signaling systems and more particularly to the transmission of pictures by electricity.

In the transmission of pictures by electricity involving the use of printing telegraph equipment, it is customary practice to transmit a group of impulses for each shade or elemental tone of the picture. Inasmuch as practically all pictures contain a large number of shades or elemental tones of the same value and density, considerable line time is consumed in the transmission of impulses designating the same shade or elemental tone. It is the object of this invention to economize on line time required in the transmission of pictures by utilizing the line for another purpose during a period when a sequence of elemental tones of the same value occurs. Preferably there is caused the automatic reproduction of the picture independently of line impulses when such a sequence of elemental tones of the same value occurs and during such period messages are transmitted and are recorded at the receiving end simultaneously with the reproduction of the picture.

In accordance with the above and other objects, the present invention provides a pair of transmitting mechanisms which are adapted to be connected with a line extending to a remote station where a corresponding number of telegraph receiving printers are located. One of the transmitting mechanisms may, for the sake of clearness, be designated as a picture transmitter, while the other may be referred to as a message or traffic transmitter. Likewise, the receiving printers may be so designated, that is, as a picture and a message printer respectively. The tape which is adapted to be passed through the picture transmitter is first perforated by any well known mechanism with a code designating the different shades or elemental tones of the picture to be transmitted. In the construction of one embodiment of the invention when there occurs in the picture a sequence of elements of the same shade or tone value, this fact will be evident by the absence of perforations in the tape which has been previously perforated in accordance with the different elemental tones of the picture to be transmitted. Due to the absence of perforations in the tape, the message transmitter is made

effective to transmit message current impulses which cause the operation of the message printer at the receiving station. During this period, the picture printer continues to print the characters representing the different elemental tone values of the picture independent of line current impulses, since such a printer is designed to continue operation until a change in the tone value of the pictures occurs which is made evident by the transmission of a different code of impulses and which causes the disconnection of the message or traffic transmitter from the line.

One embodiment of the invention is illustrated in the drawing, wherein with Fig. 1, on the left of Fig. 2, the system is shown schematically.

A better understanding of the invention may be had from the following description when taken in conjunction with the accompanying drawing in which one embodiment of the invention is illustrated.

Referring now to the drawing, there is shown a transmitting station A and a receiving station B connected by a line conductor 6 which is preferably equipped for duplex operation, that is, the simultaneous transmission of impulses in both directions over a single line conductor.

The transmitting mechanism A comprises a pair of tape transmitters 8 and 9 designated as a picture transmitter and a message or traffic transmitter respectively. Each of these transmitters is of the tape operated type, that is, each is provided with contacts adapted to be operated in accordance with perforations in a previously perforated tape. A transmitter suitable for this type of system is disclosed in B. J. Benjamin Patent No. 1,298,440, March 25, 1919. The contacts of the transmitters 8 and 9 are adapted to be connected to segments 11 to 15 of a multiplex or synchronous distributor 16 through the contacts and armature of a relay 10, the function of which will be more clearly described hereinafter. The distributor 16 is provided with an outer ring which is divided into a plurality of small segments, such as 11 to 15, these segments being included in one quadrant of the distributor, the segments of the other quadrants being connected either to similar transmitting mechanism or suitable receiving mechanisms.

The distributor 16 also has segments 20, 21, 22, 23 and 24. The respective segments of the distributor are adapted to be bridged by brushes 26 and 27 carried by a brush arm 25 which is secured to a continuously rotating shaft. The continuous ring 18 is connected to the apex of the ratio arms in which the line conductor 6 terminates and which include the windings of a receiving relay 34, thus impulses impressed on the segments 11 to 15 will be transmitted to the line as the brush 27 passes over the respective segments.

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The line conductor 6 terminates at the station B in the duplex equipment of which the relay 35 forms a part. The relay 35 is adapted to respond to incoming impulses but is made non-responsive to outgoing impulses. Consequently the impulses transmitted from station A cause the operation of relay 35 which has its armature connected to a continuous ring 38 of a multiplex synchronous distributor 37. This distributor like distributor 16 has its outer ring divided into a plurality of smaller segments and has an inner segment 40 and a continuous ring 41. The respective segments of the distributor are adapted to be bridged by brushes 42 and 43 carried by a continuously rotating brush arm 44. The segments 48 to 52 inclusive which are individual to one quadrant of the distributor are connected to the selecting magnets 53, 54, 55, 56 and 57 of a receiving printer C. The receiving printer C is similar to that shown and claimed in copending application Serial No. 397,903, filed July 21, 1920, and since the printer structure per se does not form a part of the present invention, only so much of the structure as is necessary for a complete and clear understanding of the present invention has been shown. However, for a more detailed description of the printer structure, reference should be had to the application referred to above.

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The receiving printer C is provided with a plurality of selecting members 60, 61, 62, 63 and 64, which are adapted to be selected in accordance with the energization of the selecting magnets 53 to 57 and which are adapted to remain in their selected position until a change in the character of the selecting current impulses is received from the distant station. Positioned in front of the selecting members 60 to 64 is an auxiliary code bar 67 which has cut on one of its faces a plurality of notches which, when the selecting members 60 to 64 are in a predetermined position, allow the auxiliary code bar 67 to move to the right. In addition to the auxiliary code bar 67 which is connected to a pull bar 68 by a connected lever 69, a plurality of other code bars 70, 71, 72 and 73 are arranged to be selected by the selecting members 60 to 64. The selection of the aux-

iliary code bars 70, 71, 72 and 73 is, however, prevented so long as the platen 75 is in the lower case or unshifted position. When it is desired to select any one of the auxiliary code bars 70, 71, 72 or 73, the transmitter at the distant station is so operated as to transmit a group of impulses for causing the operation of the selected magnets 53 to 57 in a manner such that the auxiliary code bar 67 is allowed to move to the right. As described in detail in application, Serial No. 397,903, hereinabove cited, upon the rotation of the cam shaft which is released upon the energization of an electromagnet 76 and which carries cam 77, the operating member 78 is caused to engage the projection on the pull bar 68 and cause the platen to be shifted to the upper case position. Upon this operation, pivoted member 79 is moved out of the path of pivoted members 88, 89, 90 and 91 which are individual to the auxiliary code bars 70, 71, 72 and 73 and which are connected thereto by connecting link 92 and serve to operate contact operating members 83, 84, 85 and 86. Now when the selecting magnets 53 to 57 are energized such that their ends are in the path of notches cut in any one of the auxiliary code bars, 70, 71, 72 and 73, the selected code bar is free to move to the right a distance sufficient to cause the operation of its associated contact operating member for closing contacts associated therewith.

For example, should the code bar 70 be selected, contact 93 would be closed, whereupon a circuit for relay 94 would be completed. This relay upon being energized establishes a locking circuit for itself through the back contact and armature of a control relay 95 and completes predetermined circuits for the selecting magnets of the picture printer D. The picture printer D is similar in all respects to the receiving printer C except that such printer need not be provided with the auxiliary code bars 70, 71, 72 and 73. Whenever any of the auxiliary code bars 70, 71, 72 and 73 are selected, it is, of course, necessary to prevent the spacing of the printing mechanism which usually occurs upon each rotation of the cam shaft. In the construction of the embodiment disclosed, the spacing between characters is accomplished by a ratchet wheel 100 which is adapted to be engaged by a stepping pawl 101 upon each rotation of a cam 102 for causing the advancement of the platen or type carriage, as the case may be, step-by-step. However, when any of the auxiliary code bars 70, 71, 72 and 73 are selected, they cause the movement of a pivoted member 103 which has one end in operative connection with a pivoted lever 104 serving, when the pivoted member 103 is operated, to cause the disengagement of the stepping pawl 101 from the teeth of the ratchet wheel 100. Now upon

the rotation of the cam 102, the advancement of the platen or carriage is prevented owing to the disengagement of the pawl 101 from the teeth of the ratchet wheel 100. It should be noted that for each revolution of the distributor 37, segment 40 is bridged with ring 41 and the release magnet 76 of the printer C and the release magnet 106 of printer D are energized for causing the release of the 10 associated cam shafts. No character of the message or traffic printer C is printed upon the selection of any of the auxiliary code bars 70, 71, 72 and 73 due to the fact that the type bars which are also selected upon the 15 selection of any one of these auxiliary code bars have the type removed for their upper case position, and although the type bar for each one of the selections is caused to strike the platen, no printing results due to the fact 20 that it is blank for the upper case position.

The operator in perforating the tape in accordance with the different shades or elemental tones of the picture, on observing a sequence of the same shade or tone causes 25 the tape to be perforated in accordance with the code designating the shift operation of the distributor 25 the printer. Following this perforation, the character designating the particular shade or elemental tone of the picture is perforated 30 in the tape which controls the selection of one of the auxiliary code bars 70, 71, 72 and 73 for closing the energizing circuit of relays 94, 107, 108 and 109 respectively. Following this perforation, there appears a 35 perforation designating the unshift operation which causes the printer C to assume its unshifted position. The picture printer D will, however, continue to print the character designating the particular shade or tone 40 due to the fact that the relay controlled by the auxiliary code bars of the traffic or message printer C is locked up until a change in the shade or tone value of the picture is evident by the transmission of a shift signal 45 followed by a code designating a different shade or tone value of the picture and an unshift signal, as previously described. When this occurs, the control relay which controls through its back contact the locking 50 circuit of one of the relays 94, 107, 108 or 109, is energized whereupon the locking circuit of the associated relay is opened and the relay is deenergized.

When a perforation appears in the tape of 55 the picture transmitter 8, contact 110 is closed for causing the energization and locking up of relay 10. This relay, as previously described, controls through its contacts and armature the connection and disconnection 60 of the transmitters 8 and 9 from the segments 11 to 15 of the distributor 16. So long as perforations appear in the picture tape, relay 10 remains energized and the picture transmitter is connected to the segments 11 to 15 inclusive. However, in the case of the

transmission of the signal current impulses designating the unshift operation, operating member 111 of the picture transmitter 8 is caused to move to its opposite contact. Thus, upon the passage of the brush 26 over segments 20 and 21, a circuit is completed for relay 112 which is now energized and which opens at its contact the locking circuit of relay 10. Relay 10 for this operation is deenergized and thereupon disconnects the picture transmitter 8 and connects the message or traffic transmitter 9 with the segments 11 to 15 of the distributor 16. During the period which the picture transmitter 8 is operated, the stepping magnet 31 of the message or traffic transmitter 9 is prevented from operating due to the closure of the extreme left-hand contact of relay 10. However, when this relay is deenergized, a circuit for the stepping magnet 31 is completed upon each revolution of the brush arm 25 and the passage of the brush 26 on the segments 23 and 24 of the distributor 16. It should also be noted that for each revolution of the distributor brush arm 25, the stepping magnet 30 of the picture transmitter 8 will be energized irrespective of whether there are perforations in the tape which is at this time passing through it.

A better understanding of the invention may perhaps be obtained from a description of the operation of the system. Assuming for the sake of illustration that the tape passing through the picture transmitter has advanced to a point where a perforation 95 therein designating the shaft operation of the printer is in position to cause the operation of the contact operating members of the transmitter. Upon the operation of any one of these operating members, contact 110 100 is closed, whereupon relay 10 is energized and the traffic transmitter 9 is disconnected from the segments 11 to 15 and the picture transmitter 8 connected thereto. The advancement of the tape through the message or traffic transmitter 9 is at this time prevented due to the establishment of an energizing 105 circuit for stepping magnet 31 which extends from grounded battery, winding of magnet 31 to the extreme left armature and contact of relay 110. The impulses set up 110 in the transmitter 8 in accordance with the perforations in the tape will be transmitted over the line 6 upon the passage of brush 27 over the segments 11 to 15. These impulses, upon being received at station B, cause the operation of relay 35 which causes the energization of the selecting magnets 53 to 57 at the instant the brush 43 passes on to the segments 48 to 52 inclusive. It is, of course, to be understood that the distributors 16 and 37 are operating in synchronism and passing over the same segments at the same instant. The selecting magnets 53 to 57 will thereupon cause the setting of the selecting 115 120 125 130

members 60 to 64 to a position such that the auxiliary code bar 67 is allowed to move to the right a distance sufficient to cause a projection on the pull bar 68 to be moved into the path of the operating member 78. When the brush 42 bridges segment 40 with ring 41, an energizing circuit is established for release magnets 76 and 106 of the printers C and D respectively, whereupon the cam 10 shaft on which cam 77 is mounted is set in rotation. Cam 77 on being rotated causes the movement of the operating member 78, and consequently the downward movement of the pull bar 68 and the shifting of the platen 75 to the upper case position. Also, upon this operation, the pivoted member 79 is moved out of the path of the pivoted members 88, 89, 90 and 91. Following the passage of the brush 27 off segment 15, brush 26 bridges segments 22 and 24 whereupon an energizing circuit is established for stepping magnet 30 of transmitter 8. This causes the advancement of the tape of this transmitter to bring the next group of perforations in alignment with the contact operating members of the transmitter. Assume, for the sake of illustration, that this group of perforations is such as to cause the transmission of current impulses for the 20 positioning of the selecting members 60 to 64 to a position for allowing the auxiliary code bar 70 to be selected. The selection of the auxiliary code bar 70 causes the movement of pivoted member 88 and the closure of contact 93. Upon the closure of contact 93, the energizing circuit for relay 94 is completed which, upon closing its contacts, completes a locking circuit for itself and energizing circuits for selecting magnets 115, 117 and 118 of the picture printer D. Due to the energization of these selecting magnets, the selecting mechanism of the printer D will be positioned such that a character will be printed which designates 30 the particular shade or elemental tone of the picture being transmitted. Assume further that there appears in the picture a sequence of the same shade or elemental tone values, in which case, following the perforations designating the particular shade or elemental tone value of the picture, there will appear a set of perforations designating the unshift operation of the printer. When this occurs, contact operating member 111 of the picture transmitter 8 establishes an energizing circuit for relay 112 which is completed upon the passage of brush 126 on to segments 20 and 21 following the passage of the brush 127 off segment 15. At the transmitting station A, the picture transmitter 8 will be disconnected from the segments 11 to 15 and the message or traffic transmitter 9 connected thereto. At the receiving station, the code bar immediately to the left of the auxiliary

code bar 67 is selected for causing the movement of pull bar 120 in the path of the operating member 78. When this operating member 78 is moved downwardly, due to the engagement of the enlarged portion of the cam 77, the platen will be moved to its unshift position, thereby restoring pivoted member 79 in the path of the members 88, 89, 90 and 91. Now, should the selecting magnets 53 to 57 be energized in a manner to position the selecting members 60 to 64, such as would allow the auxiliary code bars 70, 71, 72 and 73 to move to the right, they would be prevented due to the positioning of the pivoted member 79 in their path. The picture printer will, however, continue to function to print the character which was selected due to the energizing of relay 94, due to the fact that this relay is locked up through the back contact and armature of relay 95.

Likewise, any other character may be printed on the picture printer D upon the selection of the auxiliary code bars 71, 72 and 73. However, when any of these code bars are selected, no printing on the traffic or message printer C results due to the fact that the printer is in the upper case position and the type bar individual to the selection of these code bars has the type in its upper case position removed.

So long as no perforations appear in the tape passing through the picture transmitter, the message transmitter 9 continues to operate for transmitting message current impulses in accordance with the perforations appearing in its tape. These impulses upon being received at the receiving station B cause the operation of the selecting mechanism of message printer C and the recording of the characters designating the particular group of impulses transmitted simultaneously. Simultaneously with this operation, the picture printer D functions to print a character designating the particular shade or elemental tone of the picture.

Although the invention has been disclosed and described with reference to a particular type of apparatus, it is, of course, obvious that various modifications may be made without departing from the spirit and scope of the present invention.

What is claimed is:

1. The method of operating a picture telegraph transmission system in which the picture is reproduced by successively reproducing unit areas, each having one of a group of elemental tone or color values which comprises transmitting indication of changes of elemental tone or color values, transmitting no indication relative to the picture during periods representing repetition of tone or color values, and transmitting during such periods other indications which do not represent such repetitions.

2. The method of signaling which comprises transmitting electrical impulses in accordance with a characteristic of successive scanned elements of a picture, ceasing such transmission during portion of periods when a succession of elements have substantially the same tone value, and transmitting during such periods impulses which do not represent repetitions of tone values.

3. In combination, a signaling path extending between two stations, means at one of said stations for transmitting over said signaling path signal indications of changes of the elemental tone or color values of a picture, means at the other station for reproducing the picture in accordance with such indications, and means effective during periods representing repetitions of the tone or color values of the picture for transmitting signal impulses which do not represent such repetitions.

4. In combination, a signaling path extending between two stations, means at one of said stations for transmitting over said signaling path signal indications in accordance with the elemental tone or color values of a picture, means at the other station for reproducing the picture in accordance with such signal indications, means for rendering said first recited means ineffective during periods representing repetitions of the tone or color values of the picture, and means operative during such period for transmitting signal impulses other than those representing the elemental tone or color values of the picture.

5. In combination, a line extending between two stations, means at one of said stations for transmitting over said line signal impulses of changes of the elemental tone or color values of a picture, means at the other station responsive to said signal impulses for reproducing the picture, and means effective during periods representing repetitions of tone or color values of the picture for transmitting over said line signal impulses representing words and characters.

6. The method of electrical transmission of pictures which consists in transmitting a single group of impulses which designate each change in the elemental tone value of the picture, causing the transmission of message impulses during the occurrence of a sequence of elemental tones of the same value, and simultaneously recording the message and reproducing the picture on separate receiving mechanisms.

7. The method of electrical transmission of pictures which consists in perforating a code in a tape to indicate a change in the elemental tone values of the picture, causing the transmission of current impulses corresponding to such code to operate a picture reproducer and reproducing a series of like tone values of the picture independent- ly of said current impulses until a code indication of a different elemental tone value of the picture is received.

8. The method of electrical transmission of pictures which consists in perforating a code in a tape to indicate a change in the elemental tone values of the picture, perforating a tape in accordance with a message to be transmitted, transmitting the code which designates such change in the tone value of the picture, and thereafter transmitting current impulses in accordance with the perforations of the message tape until a change in the tone value of the picture is indicated by a perforation in the first tape.

9. The method of electrical transmission of pictures which consists in perforating a code in a tape to indicate a change in the elemental tone values of the picture, perforating a tape in accordance with a message to be transmitted, transmitting the code which designates such change in the tone value of the picture, thereafter transmitting current impulses in accordance with the perforations of the message tape until a change in the tone value of the picture is indicated by a perforation in the first tape, and reproducing the picture at the receiving end as determined by such code independent of line current impulses during the occurrence of a sequence of the same elemental tones.

10. In combination, a line, a distributor connected to said line, a plurality of tape transmitters associated with said distributor, a corresponding number of tapes for said transmitters perforated in accordance with a message to be transmitted and the elemental tones of a picture also to be transmitted, and means controlled by one of said transmitters when there occurs an absence of perforations in one of said tapes designating a sequence of the same elemental tones of the picture for causing the disconnection of the associated transmitter and the connection of the other transmitter with the said distributor.

11. In a telegraph system, a line connecting a transmitting and a receiving station, a plurality of transmitting and receiving mechanisms at the respective stations, means operated when a sequence of conditions of the same character occur for disconnecting one of said transmitting mechanisms from the line and connecting the other mechanism thereto, and means at the receiving station for causing the simultaneous operation of said receiving mechanisms irrespective of whether both of said transmitting mechanisms are operating.

12. In combination, a line, a distributor connected to said line, a pair of telegraph transmitters associated with said distributor, means controlling the connection and disconnection of said transmitters with said

distributor, and means responsive to predetermined conditions for rendering said means non-operated to disconnect said transmitter and connect the other of said transmitters with said distributor.

13. In combination, a line, a receiving printer associative with said line for recording messages, a second receiving printer controlled by said first receiving printer, and means effective on the transmission of predetermined groups of impulses for causing the operation of said second receiving printer.

14. In combination, a line, a receiving printer associative with said line for recording messages, a second receiving printer controlled by said first receiving printer, means effective on the transmission of predetermined groups of impulses for causing the operation of said second receiving printer, and means for causing the continuous operation of said second receiving printer independently of said first receiving printer.

15. In combination, a line, a receiving printer associative with said line for recording messages, a second receiving printer controlled by said first printer for reproducing

a picture in accordance with a prearranged code as determined by the elemental tones 80 of the picture, and relay means selectively operated by said first receiving printer on the transmission of predetermined groups of impulses for causing the reproduction of the picture on said picture printer. 85

16. In combination, a line, a receiving printer associative with said line for recording messages, a second receiving printer controlled by said first printer for reproducing a picture in accordance with a prearranged code as determined by the elemental tones 40 of the picture, relay means selectively operated by said first receiving printer on the transmission of predetermined groups of impulses for causing the reproduction 45 of the picture on said second receiving printer, and relay means effective when said other relay means is operated for maintaining said means operated whereby by said second printer is caused to reproduce 50 the picture independently of the operation of said first printer.

In witness whereof, I hereunto subscribe my name this 15th day of February A. D., 1924.

ALLISON A. CLOKEY.