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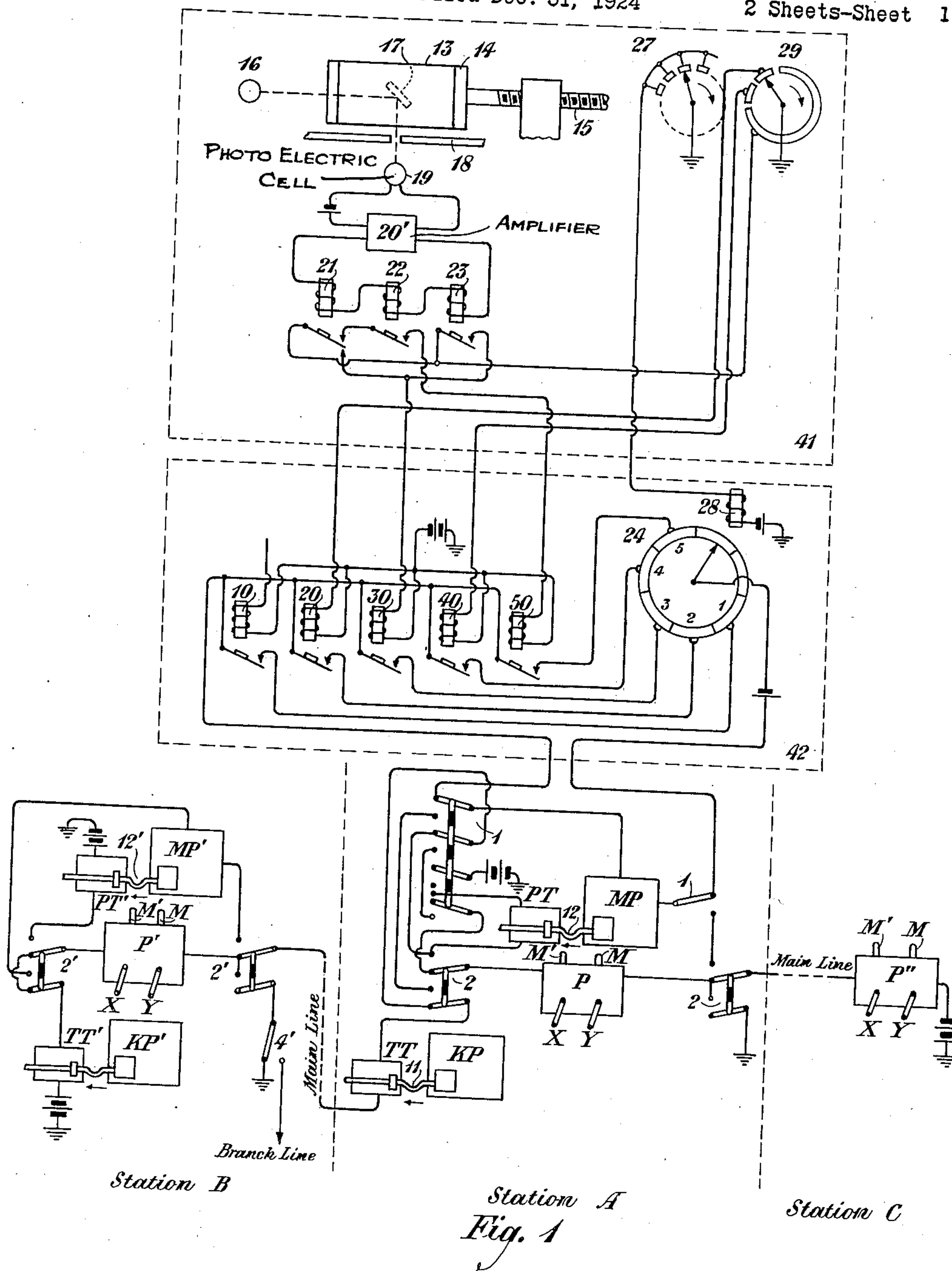
L. F. MOREHOUSE ET AL

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SIGNALING SYSTEM

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2 Sheets-Sheet 1



INVENTORS
L.F. Morehouse and
 BY *E.F. Watson*
 ATTORNEY

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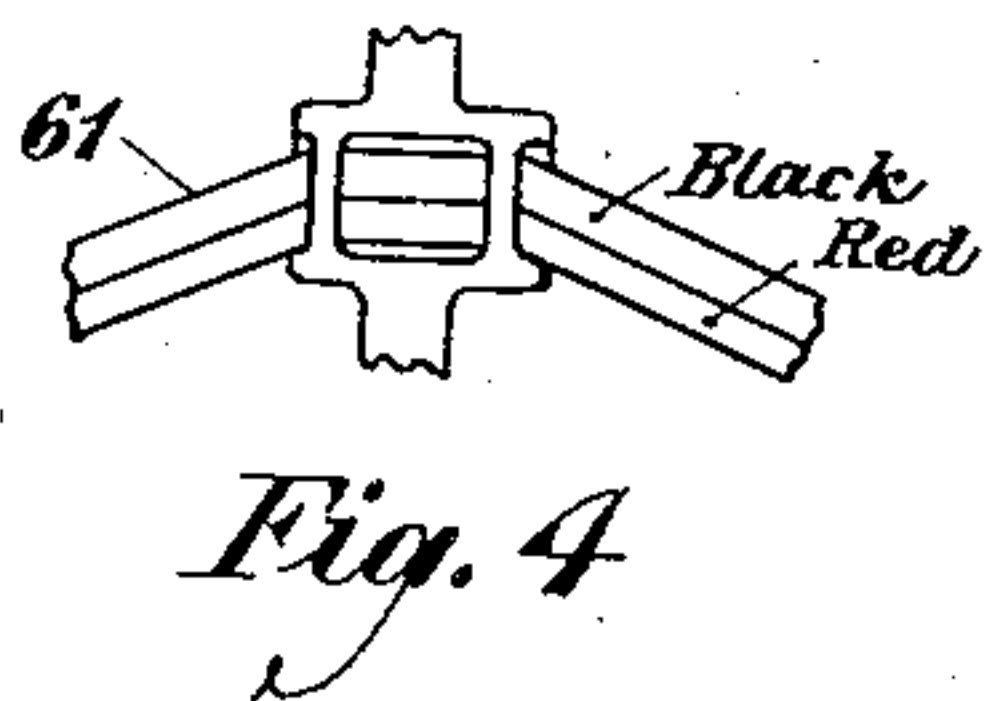
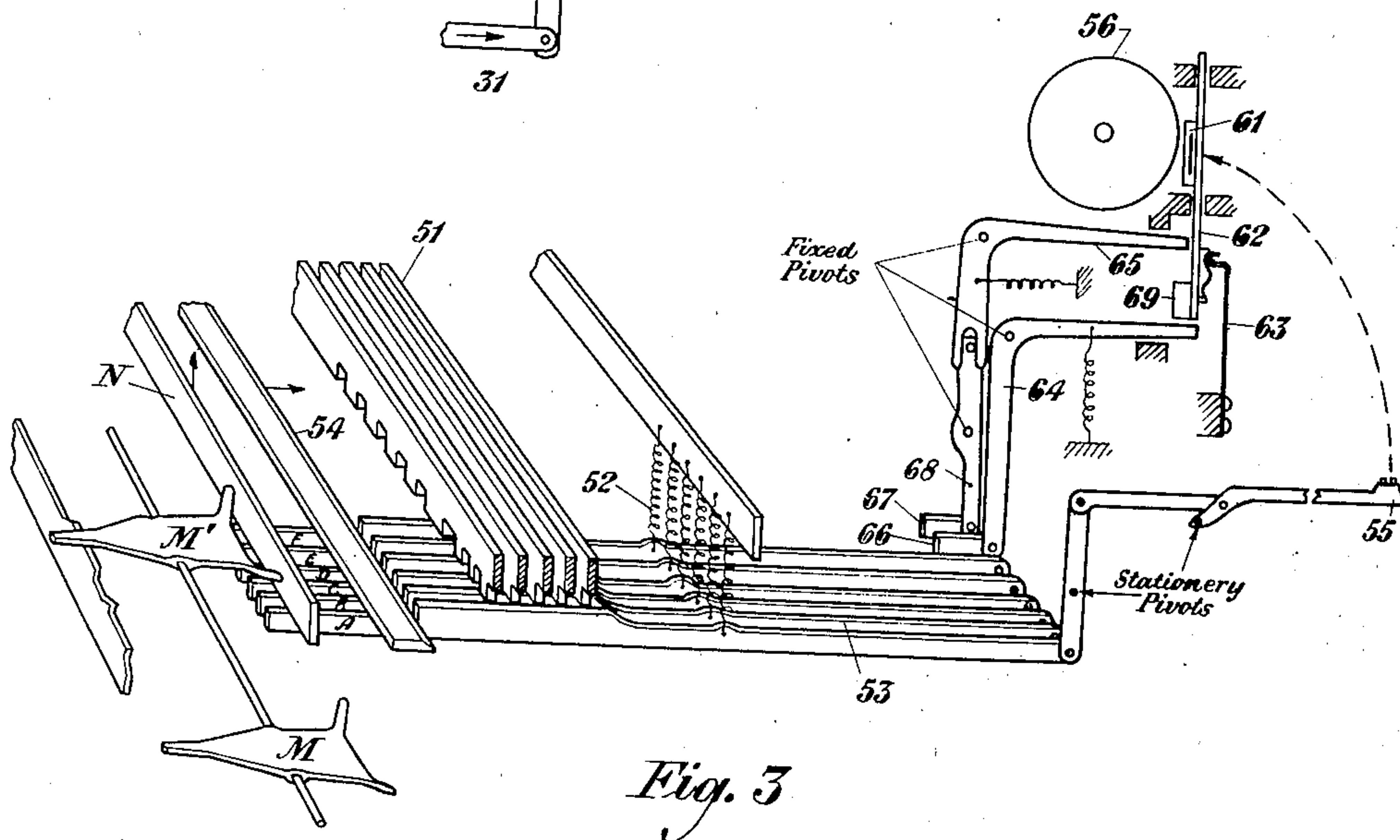
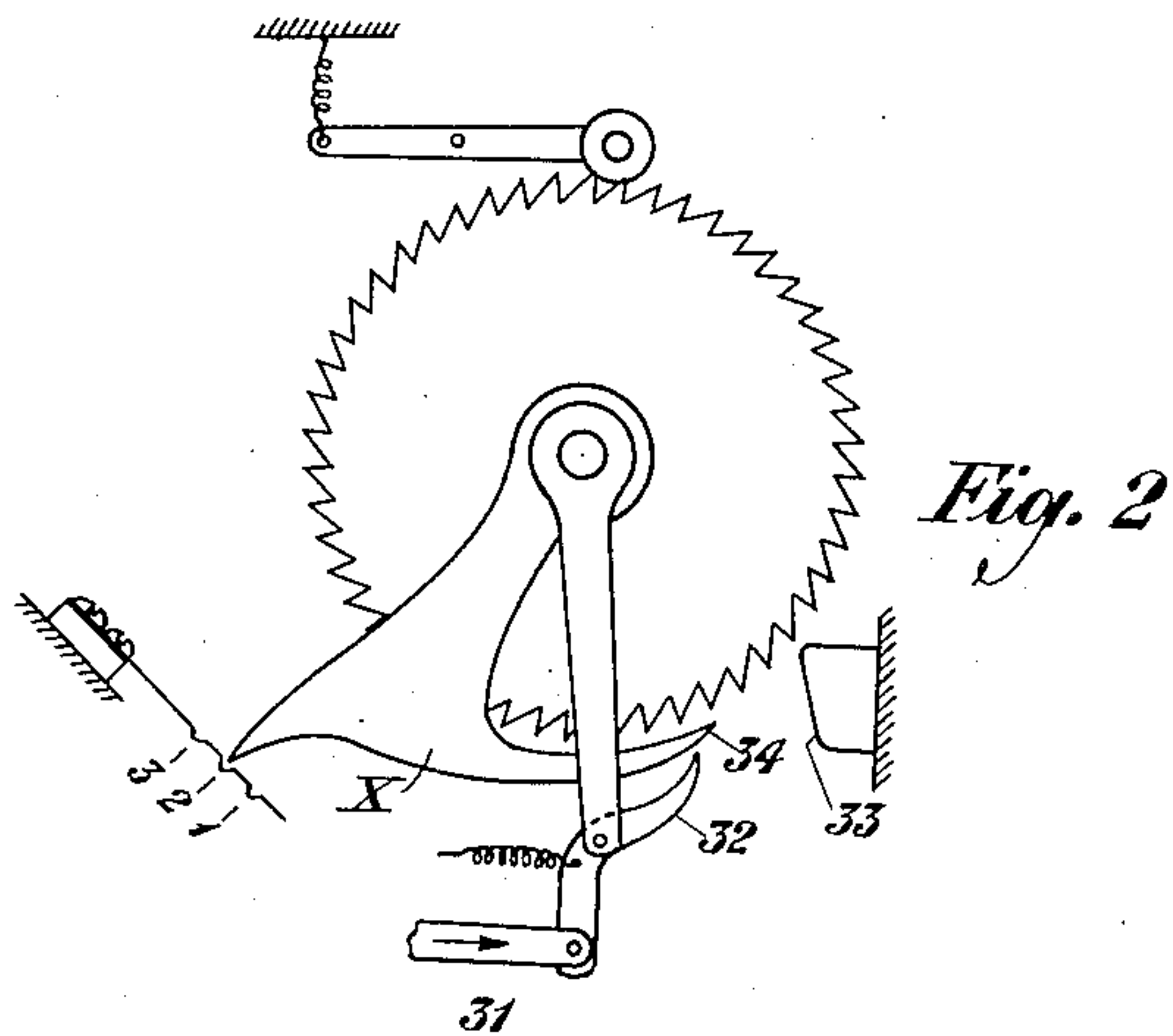
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2 Sheets-Sheet 2



INVENTORS
L. F. Morehouse and
BY *E. F. Watson*
92408
ATTORNEY

UNITED STATES PATENT OFFICE

LYMAN F. MOREHOUSE, OF MONTCLAIR, NEW JERSEY, AND EDWARD F. WATSON, OF LARCHMONT, NEW YORK, ASSIGNORS TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK

SIGNALING SYSTEM

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An object of our invention is to provide new and improved apparatus for transmitting messages or pictures by telegraphy. Another object of our invention is to provide such apparatus adapted to print a received picture or message in several colors. Another object is to provide for adjustment so that the received picture or message can be printed in a single color or in several colors, as desired. These and various other objects of our invention will become apparent on consideration of a specific embodiment which will be described as an example of the invention in the following specification. With the understanding that the scope of the invention will be defined in the appended claims, we now proceed to a specific description of the embodiment thereof shown in the drawings.

Figure 1 is a diagram of a system embodying the invention; Fig. 2 is an elevation of apparatus for adjusting the spacing or the line feed in a telegraph page printer to adapt it for printing text messages or pictures, as desired; Fig. 3 is a diagrammatic perspective of mechanism for operating different sets of type bars, one set for message printing, and another for picture printing and still another set for permitting the picture or message to be printed in a single color or in several colors, as desired; and Fig. 4 is an elevation of a ribbon and ribbon guide employed in the printer.

Referring to Fig. 1, a main line is shown with three stations, A, B and C. At station A there is an equipment adapted for printing telegraph sending or receiving or picture sending or receiving. When the two sets of switches 1 and 2 are both thrown down, the station is in condition for either printing telegraph sending or receiving. In this case it will readily be seen that the main line extends through the printer P and the tape transmitter TT. For transmitting, the keyboard perforator KP is operated in the usual manner to punch a tape 11. This punched tape is then fed through the tape transmitter TT and, in accordance with the code represented by the perforations therein, impulses

are sent over the line. These impulses will be received in the printer P' at station B and the printer P'' at station C and will be recorded as page printed text at those stations. It should be understood that the tape transmitter TT' at station B, when it stands idle, affords a connection therethrough for the main line. For record purposes, or as a check on the accuracy of transmission, the message is also printed by printer P at station A, just as it is printed by printers P' and P'' at stations B and C.

All of the apparatus involved in the transmission just described is well known, and accordingly it is represented symbolically. In this connection it should be understood that the rectangle TT represents all that mechanism necessary for testing the tape for perforations and for sending line signals in accordance with the holes perforated in the tape. Rectangle P represents all the mechanism necessary for receiving and interpreting the line signals into printed characters on a page. Rectangle MP represents all the mechanism necessary for receiving line signals and recording them as perforations in a tape.

In case it is desired to receive by ordinary printing telegraphy at station A from station B, the tape transmitter TT is allowed to stand idle in which case it affords a conductive path therethrough for the main line, and the received message is printed on a page in the printer P. The keyboard perforator KP' and the tape transmitter TT' at station B are operated in the manner heretofore described for the corresponding elements at station A when transmission is from station A. The message also prints at P' and at P'', the same as at P.

If it is desired to receive a message at station A on a perforated tape, instead of directly on the printer, this may be done by placing the switches 2 in their upper position and the switches 1 in their lower position. With these adjustments, it will be seen that the main line coming in from the left extends through the tape transmitter TT and the machine perforator MP and thence out to the right. The tape transmitter TT stands idle, merely affording a conductive path there-

through, and the machine perforator MP perforates the message in code in the tape 12. The tape 12 may be allowed to accumulate or, as desired, it may be sent through the transmitter PT. With the switches at the adjustment last stated, the transmitter PT is in a local circuit with the printer P so that the message will be printed in the printer P from the transmitter PT.

If it is desired to send a picture from the station A, the switches 1 and 2 are placed in the positions shown in Fig. 1. The picture in the form of a transparent film 13 is wrapped on the glass drum 14 which is rotated and traversed by the screw-threaded shaft 15. Light from the source 16 is reflected by the mirror 17 through the spot of the film underlying the opening in the screen 18, and the transmitted ray of light shines on the photo-electric cell 19 and accordingly determines the current input to the amplifier 20'. The amplified output current from the amplifier 20' goes to the three marginal relays in series 21, 22 and 23.

For white in the picture, no relay picks up. For light gray in the picture, relay 21 picks up.

For medium gray in the picture, relays 21 and 22 pick up.

For dark gray in the picture, all three relays pick up.

It will readily be seen that the third and fifth sending relays, 30 and 50, respectively, will be energized as follows:

Picture shade	Marginal relays energized	Sending relays energized	Corresponding printing telegraph character
White	None	30	Space
Light gray	21	None	Period
Medium gray	21, 22	50	T
Dark gray	21, 22, 23	30 and 50	M

Accordingly, the distributor 24 will send code impulses through the machine perforator MP, and the tape 12 will be punched to correspond. As shown in the foregoing table, the punched code for white in the picture will be the same as for a space in printing telegraphy; light gray in the picture will be the same as for a period in printing telegraphy; medium gray in the picture will be the same as for a T in printing telegraphy; and dark gray in the picture will be the same as for an M in printing telegraphy.

The distributor 24 is a start-stop distributor, controlled by the magnet 28 whose circuit is closed momentarily from the commutator 27 for each successive element of the film 13. The carriage return and line feed codes are determined respectively by magnets 20 and 40 whose circuits are closed once each revolution of drum 14 by the commutator 29. At the time their circuits are closed, the ground connection to contacts of relays 21, 22

and 23, is removed at commutator 29 to prevent possible operation of relays 30 and 50.

The tape 12 with the picture record punched therein will be fed through the transmitter PT, and the corresponding current impulses will be sent out through the local printer P and over the line. In each of the printers P, P' and P'' there will be printed a combination of spaces, periods, T's and M's that will give a half tone representation of the picture contained in the film 13. It will be noticed that the quantity of shade in the letter M is considerably greater than in the letter T, and in turn the quantity of shade in the letter T is greater than in the period.

The picture printed in this way in any one of the printers P, P' or P'' may be reduced by photography so as to give a very good half tone likeness.

Station B is adapted for printing telegraph transmitting or receiving and for picture receiving. Either messages or pictures may be received directly on the printer P' with the switches as shown in Fig. 1. By throwing switches 2' up, the message or picture may be received on the machine perforator MP' and recorded in the tape 12', which may then be put through the transmitter PT' to reproduce the picture message in the printer P', PT' and P' being in series in a local circuit when the switches are adjusted as last mentioned. Also, the picture or message recorded in the tape 12' may be sent out over the branch line from the station B, for which purpose the switch 4' is to be thrown from the position shown in the drawing.

Station C is equipped only with apparatus for receiving page printing and pictures.

In order to print a received picture with a finer grained half tone, it may be desirable to reduce the spacing and the line feed as compared with ordinary printing telegraphy. The ratchet wheel shown in Fig. 2 determines the line feed in the printer P, and a similar ratchet wheel determines the spacing in the printer P. Each stroke of the feed lever 31 advances the feed pawl 32 till it strikes the abutment 33. With the lever X adjusted at the position shown in Fig. 2, the feed pawl 32 will drop from the ledge 34 and carry the ratchet wheel two notches before it strikes the abutment 33. By shifting the lever X, the feed pawl can be made to carry the ratchet wheel one notch, or three notches instead of two notches. This lever X is indicated symbolically on the printers P, P' and P'', and it will be understood that for printing pictures it may be desirable by means of it to reduce the line shift so that the lines will be closer together than for ordinary telegraph printing.

Also, in a similar manner the levers Y shown on the printers P, P' and P'' may be operated to reduce the spacing in the lines, so that the printed characters will be closer

together than for ordinary message printing.

If it is considered desirable to use other characters than T's and M's to make the half tone impressions, this may be done by means of the apparatus shown in Fig. 3. The permutation bars 51 are displaced lengthwise in accordance with the code, and for any particular code combination there will be one, or in some cases two, places where their notches on the underside are in alignment. 10 After the permutation bars 51 are positioned, the bail N rises and the springs 52 pull up the type-bar push-bars 53, and any push-bar 53 which lies under aligning notches in the permutation bars 51 will be pulled up into 15 those notches, (unless such push-bar is restrained by plate M to be mentioned presently). Then the printing bar 54 advances in engagement with the shoulder of the selected push-bar 53 and causes the corresponding type 55 to print its impression on the paper on the platen 56. 20

The permutation bars 51 are constructed so that they will provide two sets of aligning notches one set for each of several type bars 25 corresponding to the period, T and M, and another set for each of several characters such as a light dot, a medium dot and a heavy dot. The plate M has two adjustments, and in one position it will prevent one set of type bars 30 53 from being pulled up by the springs 52, and in the other position it will likewise prevent the other set.

The normal adjustment for telegraph printing will be with the plate M where it 35 permits the period, the T and the M to print. When shifted to the other position it will prevent them from printing, but will then permit other characters to be printed, such as a light dot, a medium dot or a heavy dot. 40 The handle for this plate M is indicated on the printers P, P' and P'' in Fig. 1, and this may be adjusted when the change is made from message printing to picture printing, and vice versa. 45

Thus far the system has been described as for printing the received pictures or messages in a single color. But the ribbon 61 50 in the printer is a two-color ribbon, its upper part black and lower part red. The black portion is normally in position, as shown in Fig. 3, to give the black color in the printed picture or message. However, provision is made for shifting the ribbon, so that any 55 desired portion of the picture or message can be printed in red.

In case it is desired to print part of the picture in red, the operator at the station A at this point will stop the transmitter PT for a moment and will manually operate the keyboard 60 perforator KP in such a manner as to cause a modified code combination to be punched in tape 11. This modified code combination may then be transmitted by the tape transmitter TT. With a copy of the picture to be trans-

mitted before him, he can readily do this as the tape 12 is passing from the perforator MP to the transmitter PT. The transmitter PT may again be started in operation to continue the transmission of the picture code combinations. It will be understood that the 70 operation of the machine perforator MP is not interrupted while the operator is transmitting the color shift combination. If a message is being transmitted, whenever it is 75 desired to change the color in which the message is being printed, the keyboard perforator KP is operated to punch the tape 11 with a special code for this purpose at the desired portion of the message being set up 80 by the keyboard perforator KP.

The plate M' is adapted in one position to restrain the two type bars 66 and 67 from operation, and it will have this position when it is desired to print the picture entirely in 85 black, but if it is desired to print the picture partly in black and partly in red, the plate M' will be shifted, so that whenever the code combinations come through at the receiving station for a change from black to red or 90 from red to black, the ribbon will be shifted accordingly, as will now be described.

The ribbon guide 62 carrying the two-color ribbon 61 has a lug 69 at its lower end adapted to be engaged by the levers 64 and 65. 95 When the type bar 66 is operated, it will cause the lever 64 to push the guide 62 up, unless it is already up, and when the type bar 67 is operated it will cause the levers 68 and 65 to push the guide 62 down, unless it is 100 already down. A jockey spring 63 operates to hold the guide 62 in either extreme position until it is shifted in the manner just described. Thus it will be seen that whenever the code combination comes through for a change of 105 color, the ribbon 61 will be shifted accordingly and will remain in its new position until the proper code combination comes through to shift it back.

We claim:

1. In a picture transmitting system, means 110 to test a restricted elemental area of a picture and give a response according to its degree of shade, means to shift the test to successive elemental areas of the picture, means 115 to punch code combinations in a tape corresponding in order to the degrees of shade of the picture elements, means governed by such a tape to transmit corresponding electric currents, a receiver for said currents 120 adapted to print successive impressions on a picture receiving surface determined in shade according to the said code combinations, and means associated with said receiver to change 125 the color for said impressions in accordance with special code combinations transmitted for that purpose.

2. In a picture transmitting system, means to punch code combinations in a tape corresponding in order to the degree of shade of 130

successive elemental areas of a picture to be transmitted, means governed by such a tape to transmit corresponding electric currents, means determined by said currents to reproduce the successive picture elements in corresponding shade at the receiving end, and means to govern the color of said picture elements in accordance with special code combinations in a tape and the corresponding currents determined thereby.

3. The method of transmitting a picture which consists in testing restricted elemental areas of a picture in succession, transmitting for each element a code combination of electric currents corresponding to its shade, and also in proper sequence transmitting a code combination of electric currents for a change of color in the picture, and at the receiving end reconstructing the picture by printing the successive elements each in corresponding shade and with corresponding change of color as determined by the received code combination of currents.

4. In combination, means for analyzing a picture to produce code currents corresponding to the shades and to the colors of elementary areas of the picture, a page printer for printing a picture in accordance with received code combinations for its successive elemental areas comprising means to print these areas each in proper shade as determined by the respective code combinations, said printer having means to change the color in which the printing is effected as determined by appropriate code combinations, and adjustable means for controlling the general tone of the picture reproduced.

5. In combination a line, a station on said line, a printer at said station to print a picture according to code currents received on the line, means to adjust the printer for changing the color of the picture elements as determined by appropriate code currents received on the line, means to adjust the printer to control the general tone of the reproduced picture independently of the received code currents and a machine perforator and a tape transmitter for sending picture currents.

6. In a picture transmitting system, a line, means to put on the line code currents corresponding to the shade of successive elemental areas of the picture to be transmitted and also corresponding to the color, and receiving apparatus adapted to print the successive elemental areas of the picture in shade and color as determined by the code currents.

7. In a picture transmitting system, means to transmit electric currents corresponding to the shade and color of successive elemental areas of the picture, and means to print the picture at the receiving end with its successive elemental areas having the shade and color determined by the said currents.

8. In combination, means for producing a non-pictorial record of a picture, said record

representing the colors and shades of successive elementary areas of the picture, means for sending code currents corresponding to said record, a line, a station on said line, a printer at said station to print a message or a picture in a plurality of colors according to code currents received on the line, and means to adjust said printer so it will print a text message or a picture in a plurality of colors as desired according to the character of the code currents received from the line.

9. In combination, means for producing a non-pictorial record of a picture, said record representing the colors and shades of successive elementary areas of said picture, means for sending code currents corresponding to said record, a line, a station on said line, a printer at said station comprising means to print characters in various colors, and means adapting said printer to print the characters in colors as determined by appropriate code currents received from the line.

10. In a picture transmission system, a transmitting station and a receiving station, multicolor printing apparatus at said receiving station operable to print a picture in accordance with the received picture current in a plurality of colors, and means at said transmitting station whereby any desired portion of the picture can be printed at said receiving station in either of a plurality of colors under the control of the transmitting operator.

11. A signaling system comprising a transmitting station and a receiving station, means at said receiving station for printing received messages in plain language, said means being controllable from said transmitting station, and a color changing mechanism at said receiving station whereby any letter, word, phrase or sentence forming part of a transmitted message can be printed in a different color from that of the remainder of the message, said color changing mechanism being also controllable from said transmitting station, the arrangement being such that any desired portion or portions of a message can be transcribed in a different color from that of the remainder of the message at the will of the transmitting operator.

12. In a printing telegraph system a transmitting station and a receiving station in communicative relation thereto, a typing mechanism at said receiving station operable to type received messages in plain language, said typing mechanism being operable under the control of an operator at said transmitting station, a color changing mechanism at said receiving station by means of which a received message can be typed in a plurality of colors, and means at said transmitting station whereby an operator thereat can operate said color changing mechanism at will and whereby any part or parts of a message can be typed in a different color from the

remainder of the message, said system being characterized in that individual letters, words, phrases and sentences forming parts of a message can be typed in a different color from that of the remainder of the message at the will of the transmitting operator.

13. In a printing telegraph system a transmitting station and a receiving station in communicative relation thereto, typing mechanism at said receiving station, said typing mechanism comprising a full set of type for printing received messages in plain language, mechanism at said transmitting station operable under the control of an operator thereat to transmit electrical impulses to said receiving station, means at said receiving station responsive to said electrical impulses for selectively operating said typing mechanism under the control of the transmitting operator, and color changing mechanism at said receiving station operable under the control of the transmitting operator, the arrangement being such that any letter, word, phrase, sentence or numeral forming part of a message can be typed at the receiving station in a different color from that of the adjacent portions of the message, all under the control and at the will of the transmitting operator.

14. In a printing telegraph system, a transmitting station and a receiving station, multi-color printing apparatus at said receiving station operable to print received messages in a plurality of colors, and means at said transmitting station whereby any desired portion or portions of a transmitted message can be printed at said receiving station in either of a plurality of colors under the control of a transmitting operator.

In testimony whereof, we have signed our names to this specification this 29th day of December 1924.

LYMAN F. MOREHOUSE.
EDWARD F. WATSON.