

Jan. 22, 1929.

1,699,553

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PICTURE TRANSMITTING SYSTEM

Filed March 26, 1924

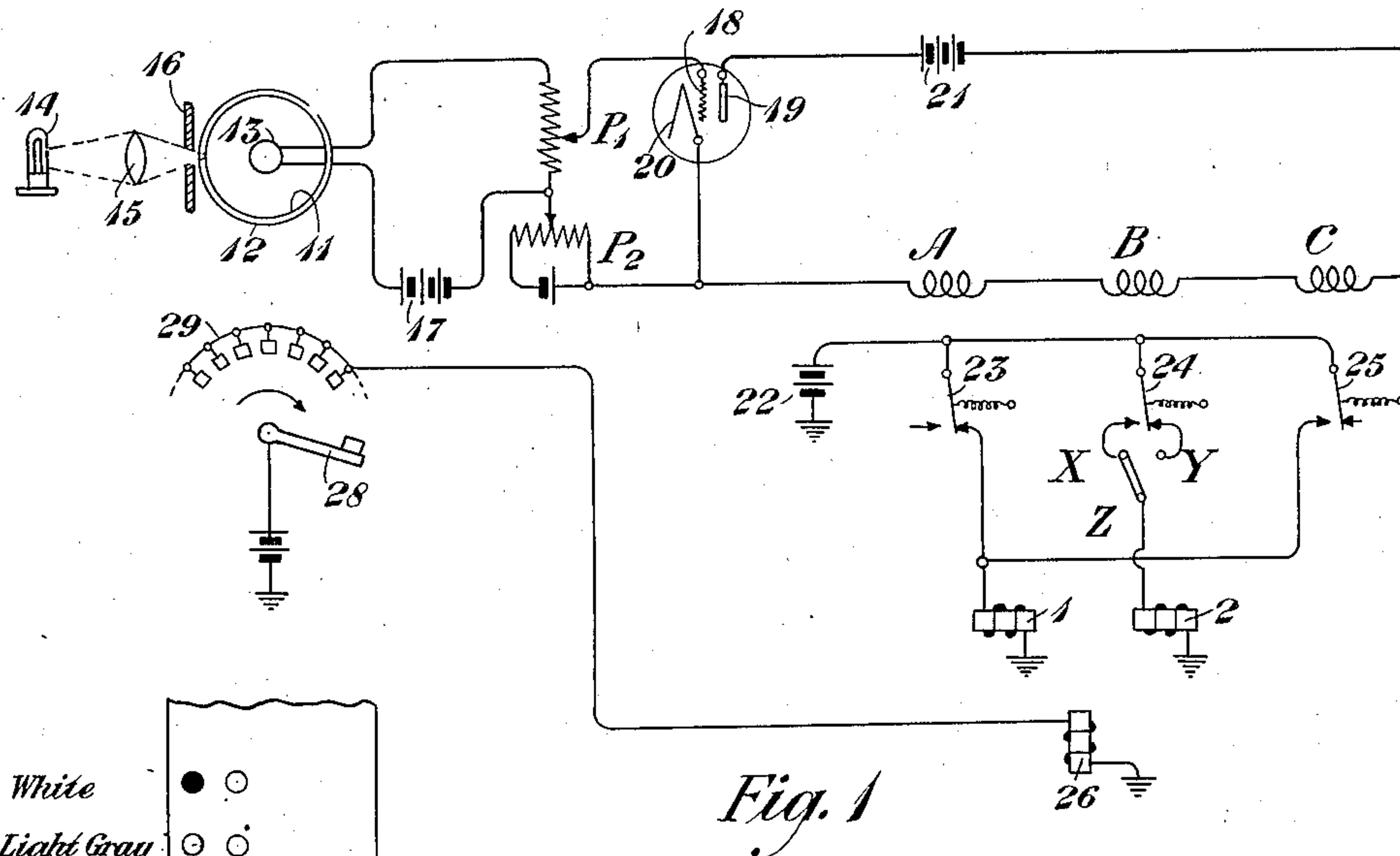


Fig. 1

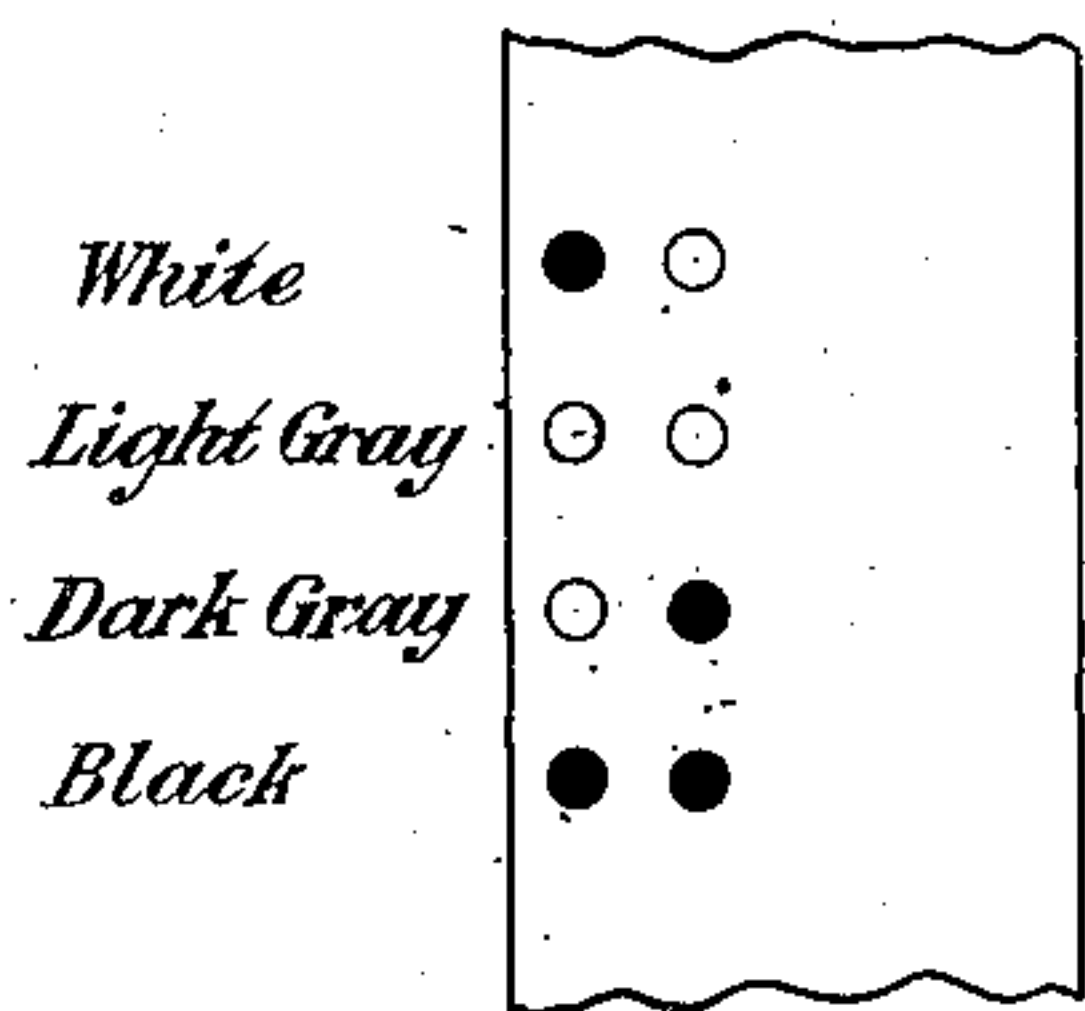


Fig. 2

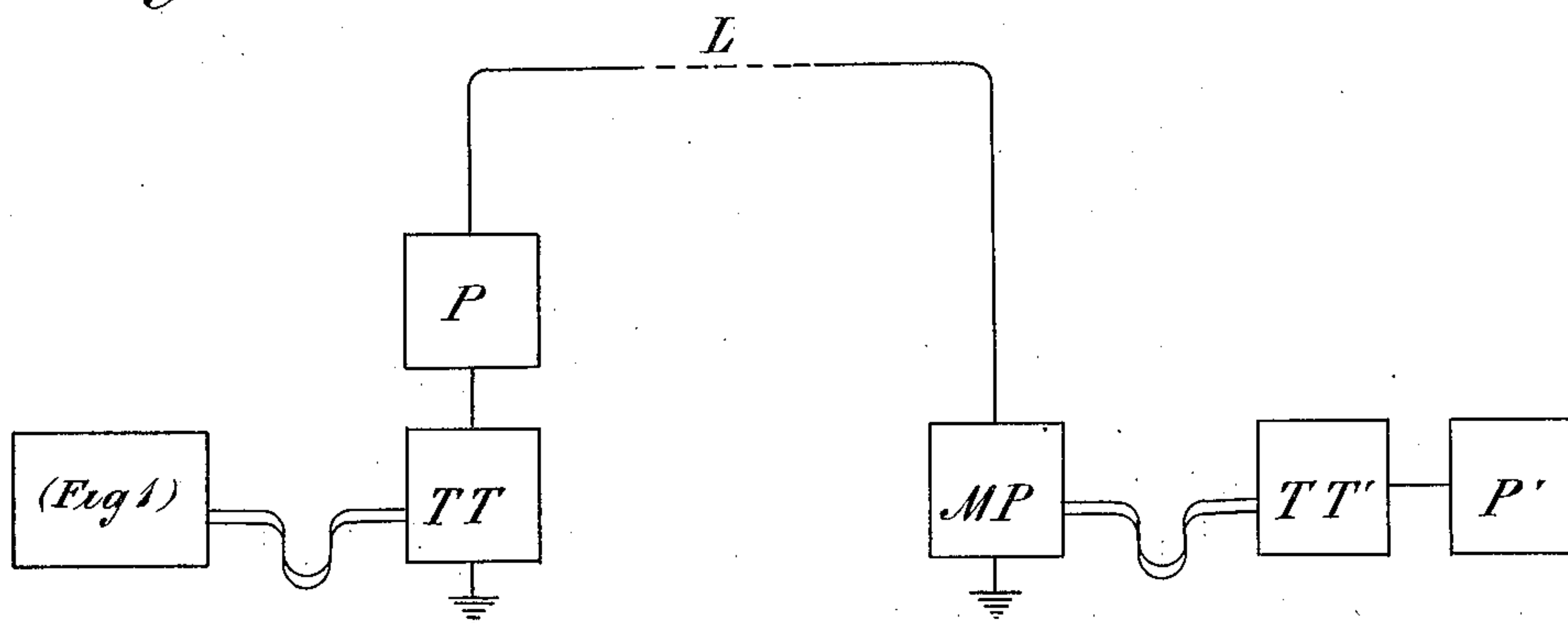


Fig. 3

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PICTURE-TRANSMITTING SYSTEM.

Application filed March 26, 1924. Serial No. 702,084.

The principal object of our invention is to provide new and improved apparatus for the electrical transmission of pictures. Another object of our invention is to provide means to adapt a picture transmitting system for operation according as the transmission is from a positive or a negative. Still another object of our invention is to provide for a simple adjustment of the circuits in a picture transmission system so that it can be changed readily to adapt it for transmission from either a positive or a negative. These and various other objects of our invention will become apparent on consideration of a specific embodiment of the invention which is disclosed in the following specification by way of example. It will be understood that the description that follows relates to this embodiment and that the invention will be defined in the appended claims.

Referring to the drawings, Figure 1 is a diagram of picture transmitting apparatus embodying our invention, Fig. 2 is a diagram showing code variations punched in a tape, and Fig. 3 is a general symbolic diagram of the entire system.

The glass drum 11 is rotated slowly on its axis and traversed lengthwise in the meantime, so that the spot underlying the opening in the screen 16 describes a helical course relatively to the drum 11. Wrapped about the drum 11 is a picture representation in the form of a semi-transparent film 12. The lamp 14 has its light focused by the lens 15 at the opening in the screen 16 and this light shines through the film 12 and the drum 11 on the photoelectric cell 13.

This cell 13 is in circuit with the battery 17 and according to well-known principles, the current in this circuit will vary in dependence on the light that passes through the spot of the film 12 to the cell 13.

The grid 18 of a three-electrode vacuum tube or audion has its circuit completed to the filament 20 through an adjustable portion of the resistance of the potentiometer P₁, the entire resistance being comprised in the circuit of the photoelectric cell 13. The electromotive force normally applied to the grid 18 is determined by the potentiometer P₂. As the current through the cell 13 increases, the potential drop in the portion of the potentiometer resistance P₁ comprised in the grid circuit increases, and vice versa;

thus the current through the cell 13 determines a corresponding voltage on the grid 18.

The plate circuit of the audion comprises the battery 21, the plate 19, the filament 20 and the windings of three marginal relays A, B and C. These are adjusted so that for a certain small amount of light in the cell 13, none of them picks up; for a limited increase of the light, A only picks up; then with more light, A and B pick up; and with still more light, A, B and C pick up.

The armatures of the relays A, B and C control the circuits of the two selector magnets 1 and 2. For successive elements of the film 12, successive contacts are made at 29 by the wiper 28 which rotates with the drum 11. At each contact the circuit of the punch magnet 26 is closed and a transverse row of holes (more or less complete) is punched in the tape of Fig. 2, which holes are determined by the energization of the magnets 1 and 2. In Fig. 2, a solid black circle means a hole punched in the tape and an open circle merely indicates a position at which a hole might have been but was not punched.

It will be seen that the circuit for the magnet 2 comprises a switch Z which may make connection either with the front contact X or the back contact Y of the relay B. As shown in Fig. 1, the switch Z makes contact with X and, as will be explained presently, this adapts the system for transmission from a negative at 12. When the film at 12 is a positive, the switch Z must be thrown to the other contact Y.

Remembering that for the element of the film 12 under the opening in the screen 16, increased transparency means increase of light on the cell 13 and increase of current in the marginal relays A, B and C, the following relations can readily be established from Fig. 1 as given in the table below:

Marginal relays operated	Reproducing from negative (Z on X)			Reproducing from positive (Z on Y)		
	Picture shade	Magnets selected	Code	Picture shade	Magnets selected	Code
None	White	1	0 -	Black	1 and 2	0 0
A	Light gray	None	- -	Dark gray	2	- 0
A and B	Dark gray	2	- 0	Light gray	None	- -
A, B and C	Black	1 and 2	0 0	White	1	0 -

For example, when reproducing from a negative, a picture shade of white means

black in the negative and none of the marginal relays will be operated and magnet 1 will be selected. On the other hand, when reproducing from a positive, a picture shade of black means black in the negative and with switch Z to the right, both magnets 1 and 2 will be energized. Similarly, the table can be followed through for the other combinations.

10 From the foregoing it will be seen that according as the film 12 is a negative or a positive, the system will be completely adapted by throwing the switch Z to the left or the right, respectively.

15 By the term "picture representation" we mean either a negative or a positive. If the picture representation is a negative, then light places therein correspond to dark places in the picture, and vice versa. If the
20 picture representation is a positive, then light places therein correspond to light places in the picture, etc.

The tape produced by the apparatus of Fig 1 is fed to a tape transmitter TT as shown
25 in Fig. 3. This device and the remaining elements of Fig. 3 here to be mentioned and all elements of text message printing telegraph apparatus and, therefore, they are represented only symbolically in Fig. 3 and are
30 only described briefly here. The tape entering the tape transmitter TT causes code currents to be put on the line L. P is a printer at the sending station that prints the picture the same as it is printed at P' at the
35 receiving station. There the received code currents actuate a machine perforator MP which produces a tape similar to that at the sending station. This tape goes to the tape transmitter TT' which determines the
40 operation of the printer P', which prints a blank for white, a small dot for light gray, a medium dot for dark gray and a heavy dot for black. Thus the sheet produced by the
45 printer P' is a half-tone reproduction of the picture corresponding to the picture representation 12 at the sending end.

Special code combinations are punched in the tape and sent for carriage return and line shift when the edge of the picture representation 12 passes the opening in the screen
50 16 in Fig. 1.

In the foregoing specification, the case has been considered more particularly in which the picture is to be received as a positive. If
55 it is desired to receive it as a negative, the proper adjustment of switch Z will be obvious. In general, when the transmitted picture representation and the received picture representation are to be alike, both positives
60 or both negatives, then switch Z should be on contact X, but when unlike, then on Y.

As an example of the utility of sending from a positive, it may be desired to send from a sketch made with a black crayon on
65 semi-transparent paper; such a sketch could

be put directly on drum 11 in Fig. 1 and by putting switch Z on contact Y it would reproduce as a positive at the receiving end.

We claim:

1. The combination in a picture transmission system of means for testing the lights and shades of the elemental areas of a picture representation, a line, a plurality of selective devices operable in accordance with said lights and shades for sending over said line
70 a signaling current, means at the receiving end of the line responsive to said current for reproducing the picture, and means for altering the operation of said selective devices
75 such that the character of the picture reproduction at the receiving end remains the same whether the representation at the sending end be positive or negative.

2. In combination, means to test successive elements of a picture representation for light
80 or shade, marginal relays to be actuated accordingly, selector magnets with circuits comprising contacts of said marginal relays, and means to change said circuits to adapt the marginal relays to actuate the proper selector magnets in accordance with whether the
85 said picture representation is a negative or a positive.

3. In combination, a light-sensitive element, marginal relays in which electric currents are determined according to the light
90 on said element, a source of light directed toward said element, means to interpose successive parts of a picture representation in the path of said light, selector magnets controlled by said marginal relays, and adjustable means to adapt the system according to
95 whether the picture representation is a negative or a positive.

4. In combination, means to test successive
100 elements of a picture representation for light or shade, marginal relays to be actuated accordingly, selector magnets with circuits comprising contacts of said marginal relays, and a switch to change the connection for one
105 of such circuits from a front contact to a back contact, or vice versa, whereby the combination of operated marginal relays will actuate the proper selector magnets in accordance
110 with whether the said picture representation is a negative or a positive.

5. In combination, means to test successive elements of a picture representation for light
115 or shade, marginal relays to be actuated accordingly, a line, selector magnets, circuits including contacts of said marginal relays, means controlled by said magnets to send currents on said line corresponding to the
120 tone values of the picture elements in succession, and means to adjust said circuits including the relay contacts so that the current on said line will be the same for like picture elements whether the picture representation
125 is a negative or a positive.

6. In combination, a light-sensitive ele-
130

ment, a source of light and means to direct it to said element, means to pass the elements of a picture representation in succession across the path of the light from said source to said sensitive element, means including a marginally operated device to transmit electrical impulses determined by the light falling on said sensitive element, and means to adjust the last mentioned means so that the electrical impulses will be the same for like picture elements whether the picture representation is a negative or a positive.

7. The combination in a picture transmission system of means for testing the lights and shades of the elemental areas of a picture representation, a line, a transmitting device selectively operable in accordance with the tone value of an elemental area of the picture representation to send over the line a signaling current of a definite character, means for altering said device whereby a current of the same definite character is also sent for a different tone value of a picture element, and means at the receiving end of the line responsive to said current for reproducing the picture.

8. In a picture transmission system, means for testing the elemental tone values of a picture representation, a line, a tape perforator for punching in a tape combinations representing the tone values of said representation, means for sending over the line a signaling current varying in accordance with the punchings in said tape, means at the receiving end of the line for reproducing the picture, and means for altering the operation of said perforator whereby the same combination is punched for either a positive or a negative representation.

9. In combination, means to test the elemental areas of a picture representation to determine the tone values thereof which may vary over a range of values, a plurality of selector magnets for producing code combinations in accordance with the tone values of the picture, and means for controlling the production of said code combinations so that they correspond to the tone values of the picture whether the picture representation is a negative or a positive.

10. In combination, means to test successive elements of a picture representation for light or shade, a plurality of devices to be selectively energized in accordance with the degree of light or shade of the successive elements of the picture, and means to control the energization of said devices so that they will be energized the same for like elements of the picture whether the picture representation is a negative or a positive.

11. The combination in a picture transmission system of means for testing the lights and shades of the elemental areas of a picture representation, a line, a marginal relay operable in accordance with said lights and shades for sending over said line a signaling current, means at the receiving end of the line responsive to said current for reproducing the picture, and means for altering the operation of said relay such that the reproduction may be either positive or negative regardless of whether the picture representation at the transmitting end is positive or negative.

In testimony whereof, we have signed our names to this specification this 24th day of March, 1924.

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