

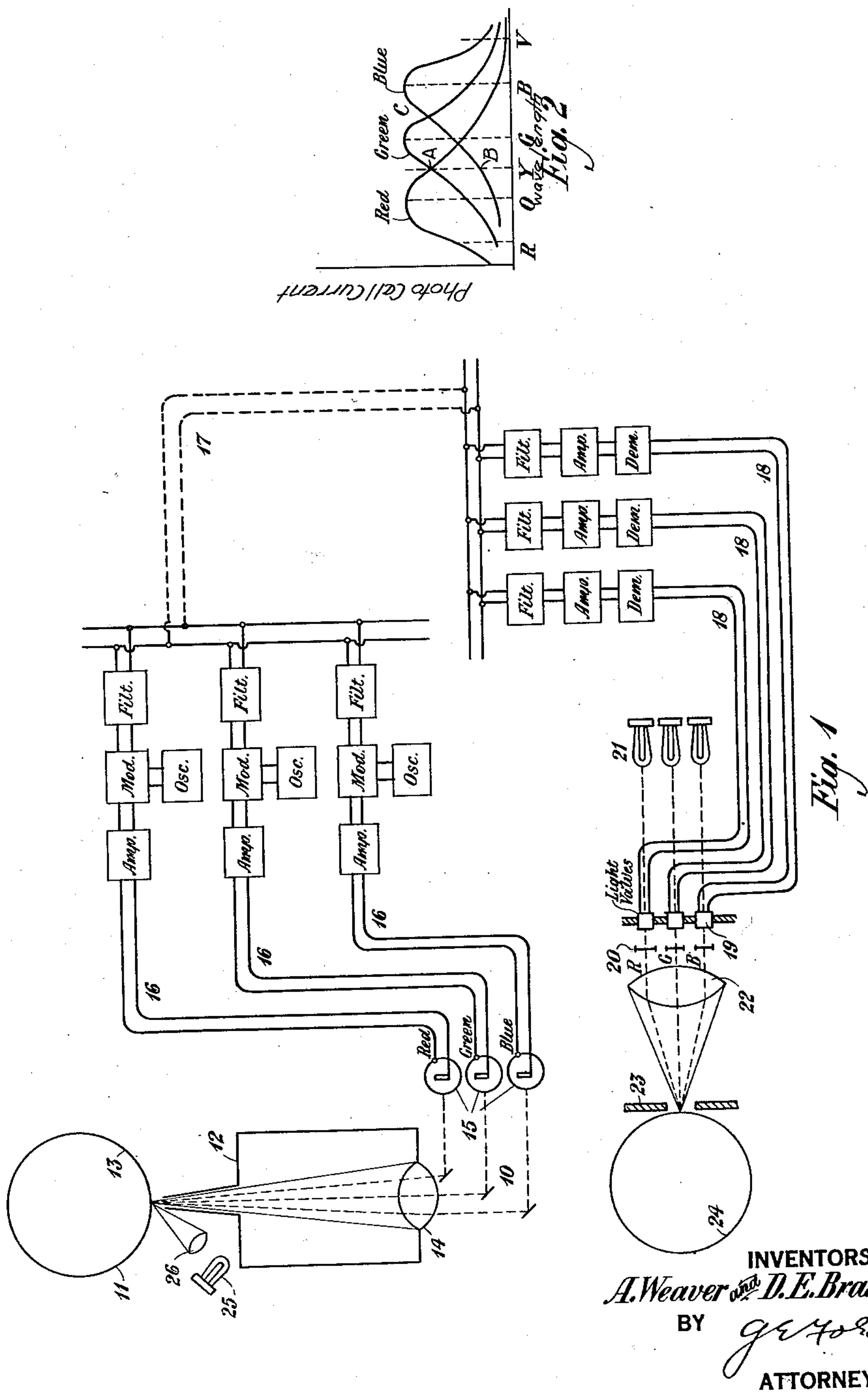
July 14, 1931.

A. WEAVER ET AL

1,814,987

PICTURE TRANSMITTING SYSTEM

Original Filed Dec. 19, 1923 2 Sheets-Sheet 1



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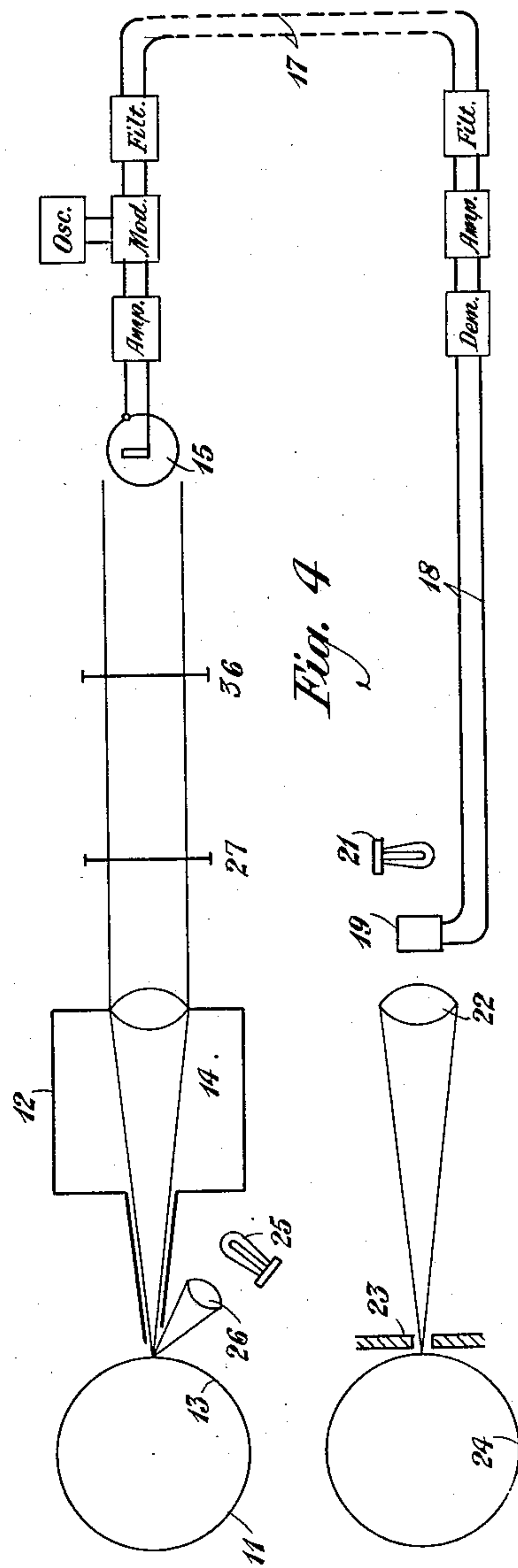
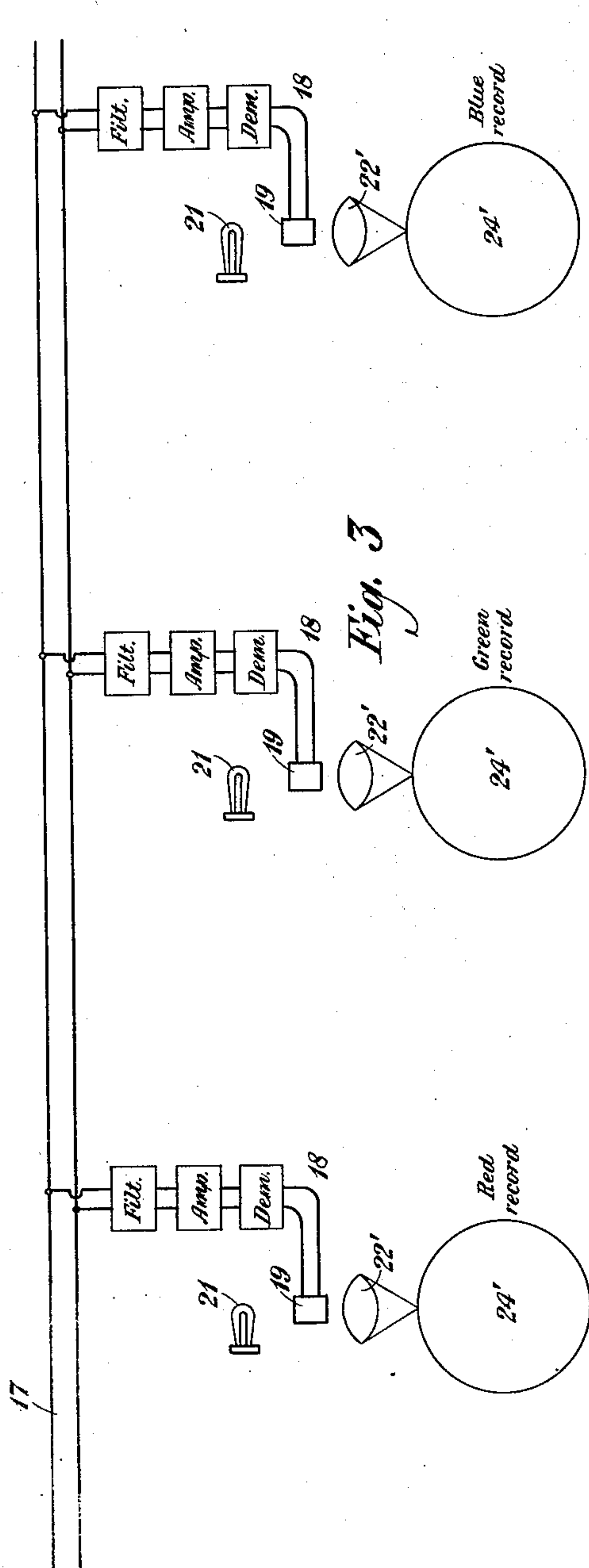
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PICTURE TRANSMITTING SYSTEM

Original application filed December 19, 1923, Serial No. 681,593. Divided and this application filed February 25, 1925. Serial No. 11,537.

The principal object of our invention is to provide a new and improved system for transmitting a picture and reproducing it in its original colors at the receiving end. Another object of our invention is to provide for analyzing the successive elements of a picture into their true colors at the transmitting end, modulating carrier currents accordingly, and at the receiving end synthesizing a ray of light by the received currents and applying it to reproduce the picture in its true colors. These and other objects of our invention will become apparent on consideration of a limited number of specific examples of practice in accordance with the invention. It will be understood that the invention is defined in the appended claims and that the following description applies to these examples, which are presented by way of illustration.

Referring to the drawings, Figure 1 is a symbolic diagram of suitable apparatus for the practice of our invention; Fig. 2 is a curve diagram showing the intensities of the component lights involved and the relative responses of the several photoelectric cells; and Figs. 3 and 4 are respective diagrams of modified receiving apparatus.

Referring to Fig. 1, the colored picture 11 is wrapped upon drum 13 placed before an opening in the box 12. White light from lamp 25 is focussed by lens 26 to illuminate an element of the picture. The colored light from this element is reflected to lens 14 and thence in parallel rays to the three small mirrors 10, where the rays will be reflected to the respective photoelectric cells 15. The photoelectric cells 15 are specially designed or equipped so that one of them is sensitive only to red light, another to green and another to blue. The three cells are designed to respond in intensity of current in accordance with the characteristics shown in Fig. 2. This figure shows characteristic curves for each of the cells 15, the abscissæ representing the wave lengths of the light incident on the cells and the ordinates representing the photoelectric responses. These curves also represent the light transmission characteristics of the filters 20 at the receiving

station. In this case the ordinates represent the quantities of light passed by the respective light valves 19 and the abscissæ indicate the color effect on the receiving film. For example, an inspection of Fig. 2 will show that if the amount of light passed by the red and green filters is equal and represented by the ordinate YA and the amount passed by the blue filter is represented by ordinate YB, the resultant effect on the receiving film is the production of yellow. All other colors may be produced in accordance with the varying amounts of light passed by the several filters, which amounts are in turn determined by the corresponding responses of the cells 15 at the sending station. The photoelectric cells and light screens can readily be given these characteristics either by special design of the cells themselves or by using appropriate light filters.

Accordingly, the currents in the respective circuits 16 to the amplifiers will vary in magnitude in accordance with the intensity of the light of the corresponding color. The amplified currents will go to respective modulators where they will modulate carrier currents generated by the respective oscillators. The currents will then be passed through band filters and put on the line 17. At the receiving station they will be separated by the respective band filters and amplified and demodulated, so that in the circuits 18 there will be generated electric currents corresponding to those in the circuits 16 at the transmitting end. These currents in the circuits 18 will control respective light valves 19 so that the quantity of light passing from each source 21 will be proportional to the intensity of the respective current. The light passed by the light valves 19 goes through the light filters 20 to the lens 22. These filters 20 have the same characteristic curves, respectively, as shown in Fig. 2. Accordingly, the lens 22 synthesizes at the opening in the screen 23 the lights of the same component colors as determined by analysis at the transmitting end. On the drum 24 there is a film adapted to develop in colors, which is moved by means not shown in the drawing

so as to synchronize the exposed point with the point that is scanned in the picture 11.

Instead of receiving the picture as indicated in connection with Fig. 1, the separate lenses 22' may be employed as in Fig. 3, each directing its corresponding beam of light on a respective synchronized film carried on a drum 24'. The films 24' may be ordinary films that develop in black and white. The received picture will then be made by directing light through the three films separately and through three color filters each associated with its proper film, so that the light will register on a single receiving surface where the colors will combine to give the picture as at the transmitting end.

Another modification is shown in Fig. 4. Here instead of sending the color components simultaneously in three channels, they are sent successively in one channel. The photoelectric cell 15 is combined with light filter 36 so that the resultant characteristic of the cell is pan-chromatic. A filter 27, passing a certain color, say blue in accordance with the corresponding curve of Fig. 2, is interposed as shown and the entire picture is analyzed, element by element, for blue. The light valve 19 at the receiving end will then allow light from source 21 to pass to the sensitive film on the drum 24 according to the amount of blue there is in the picture. The film on the drum 24 may be color sensitive as in the structure in Fig. 1 or be of the ordinary kind as is used in Fig. 3. An ordinary film will be produced with the amount of silver deposit determined by the amount of blue in the picture. Likewise, other films will be formed for other colors as in Fig. 3, each with its corresponding filter at 27. When three primary colors are used the picture will eventually be reproduced in colors as in the original or with ordinary film an additional step is necessary. To accomplish this, the films may be used to reproduce the complete picture as explained heretofore in connection with Fig. 3 or the three films, each shaded in accordance with a respective primary component color, may be used to determine the application of the colored inks in a three-color printing process, so that the color synthesis will be effected when the printing of a picture is completed.

This application is a division of our application Serial No. 681,593, filed December 19, 1923.

We claim:

1. The method of producing colored pictures, which comprises progressively analyzing a colored object for each of a plurality of primary colors, transmitting to a distant point a plurality of separate series of electrical impulses each series corresponding to the varying values of one of said primary colors and utilizing each of said separate series of impulses to produce corresponding separate pri-

mary color records which, when used together, produce a picture of the original object in its original natural colors.

2. The method of transmitting and reproducing a picture in colors, which consists in varying an electric current in a manner corresponding to the light values, for any primary color of successive elemental areas of the picture producing varying light effects of intensity determined by the said current, making a record of said varying light effects, repeating the foregoing procedure for other primary colors of the picture to be transmitted, and combining the received records to reproduce the picture in its original natural colors.

3. The method of transmitting and reproducing a picture in colors, which consists in varying an electric current in a manner corresponding to the light values, for any primary color, of successive elemental areas of the picture, exposing corresponding successive elemental areas of a sensitive film to a source of light of intensity determined by the varying current, transmitting light variations from the elemental areas of the picture for each other primary color, making a record of the light effects for each primary color, and assembling the received records to produce a picture in the natural colors of the picture transmitted.

4. The method of transmitting and reproducing a picture in colors which consists in producing electrically a record of the picture in terms of the light values of one of the primary colors, repeating this operation for each of the other primary colors, and then synthesizing the successive records for the various primary colors at the receiving end to produce the picture in its original natural colors.

5. The method of transmitting and reproducing a picture in colors, which consists in varying an electric current in a manner corresponding to the light values, for any primary color, of successive elemental areas of the picture, exposing a color-sensitive surface to a source of light of a variable intensity determined by said current and of the same primary color, making a record of said varying light effects over corresponding elemental areas in the color sensitive surface, repeating the foregoing procedure for other primary colors of the picture, and developing the sensitive surface to reproduce the picture in its original natural colors.

In testimony whereof, we have signed our names to this specification this 21st day of February, 1925.

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