

Nov. 14, 1933.

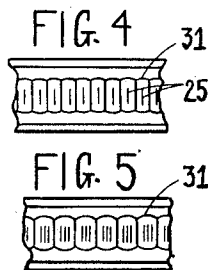
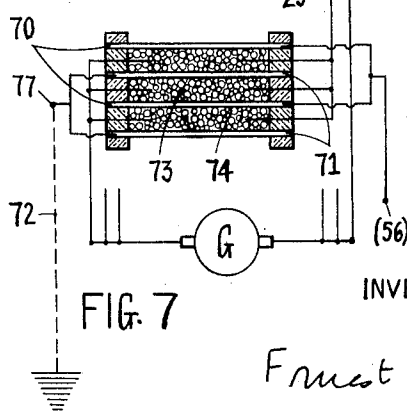
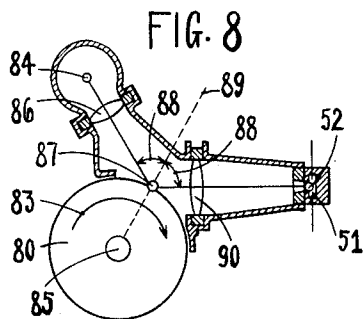
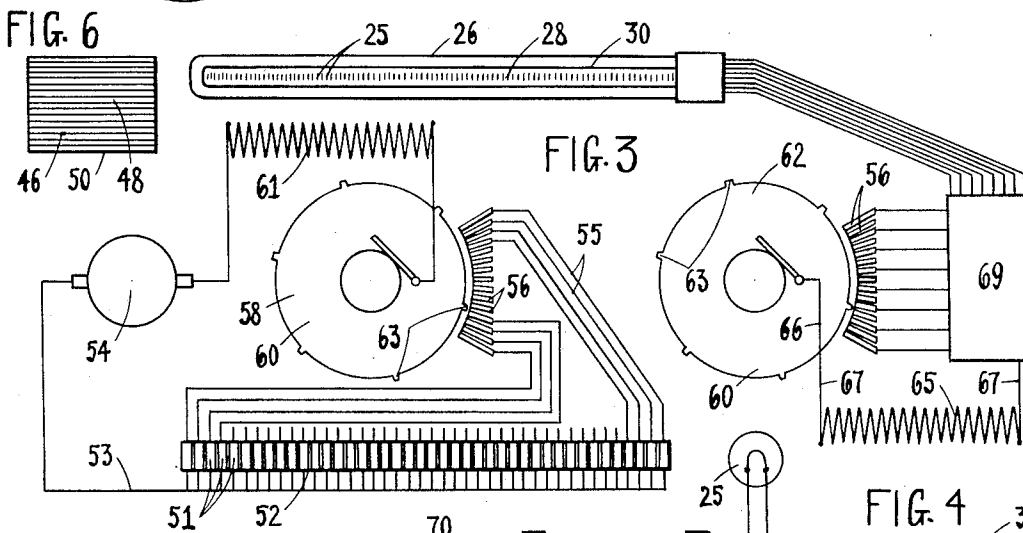
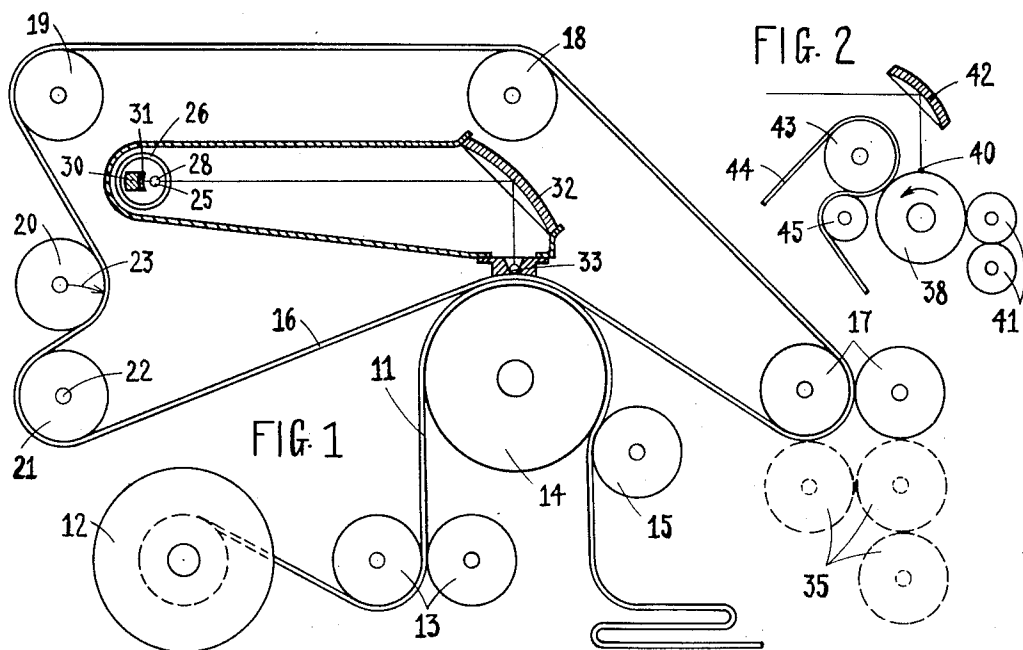
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1,934,753

METHOD AND MEANS FOR TRANSMITTING FACSIMILES

Filed July 26, 1928

3 Sheets-Sheet 1



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Ernest Wildhaber

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METHOD AND MEANS FOR TRANSMITTING FACSIMILES

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3 Sheets-Sheet 2

FIG. 12

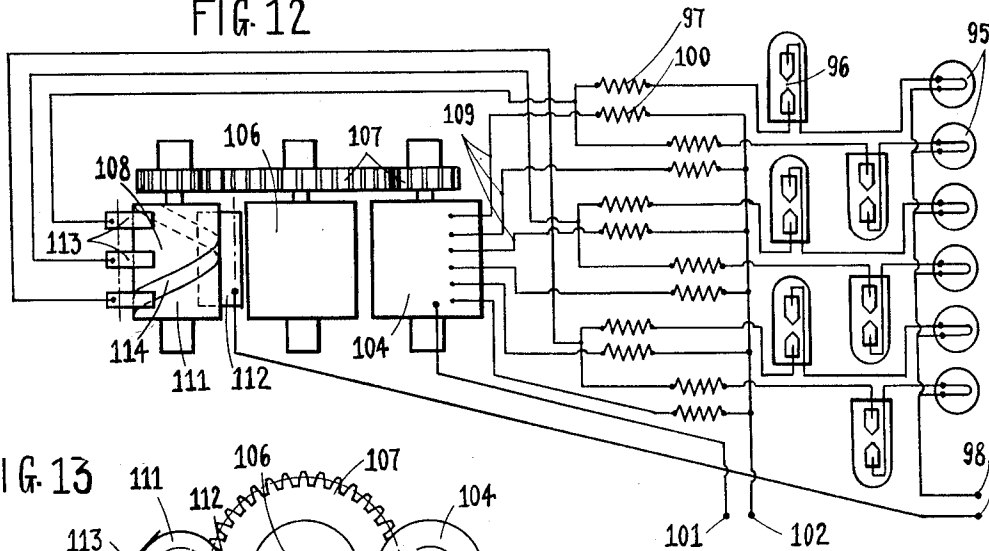


FIG. 13

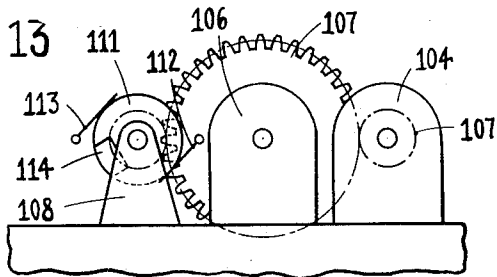


FIG. 10

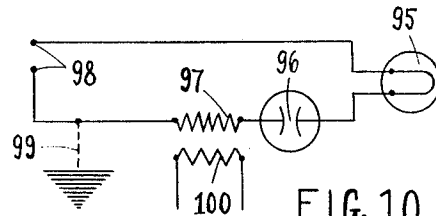


FIG. 9

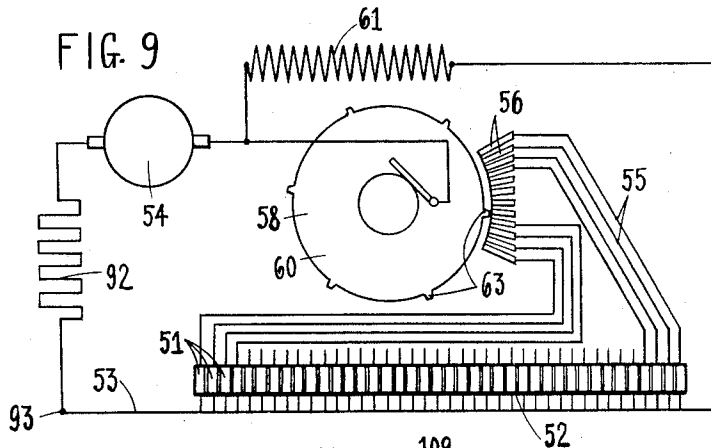


FIG. 11

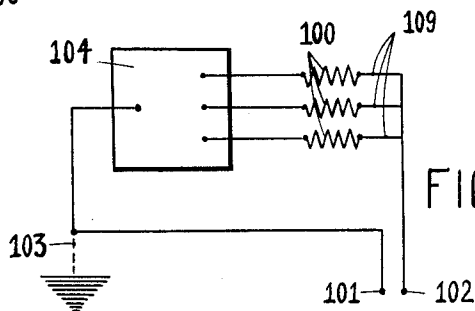
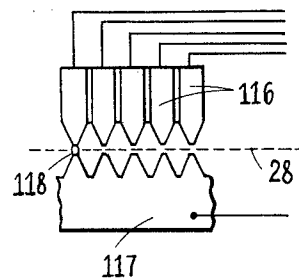


FIG. 14



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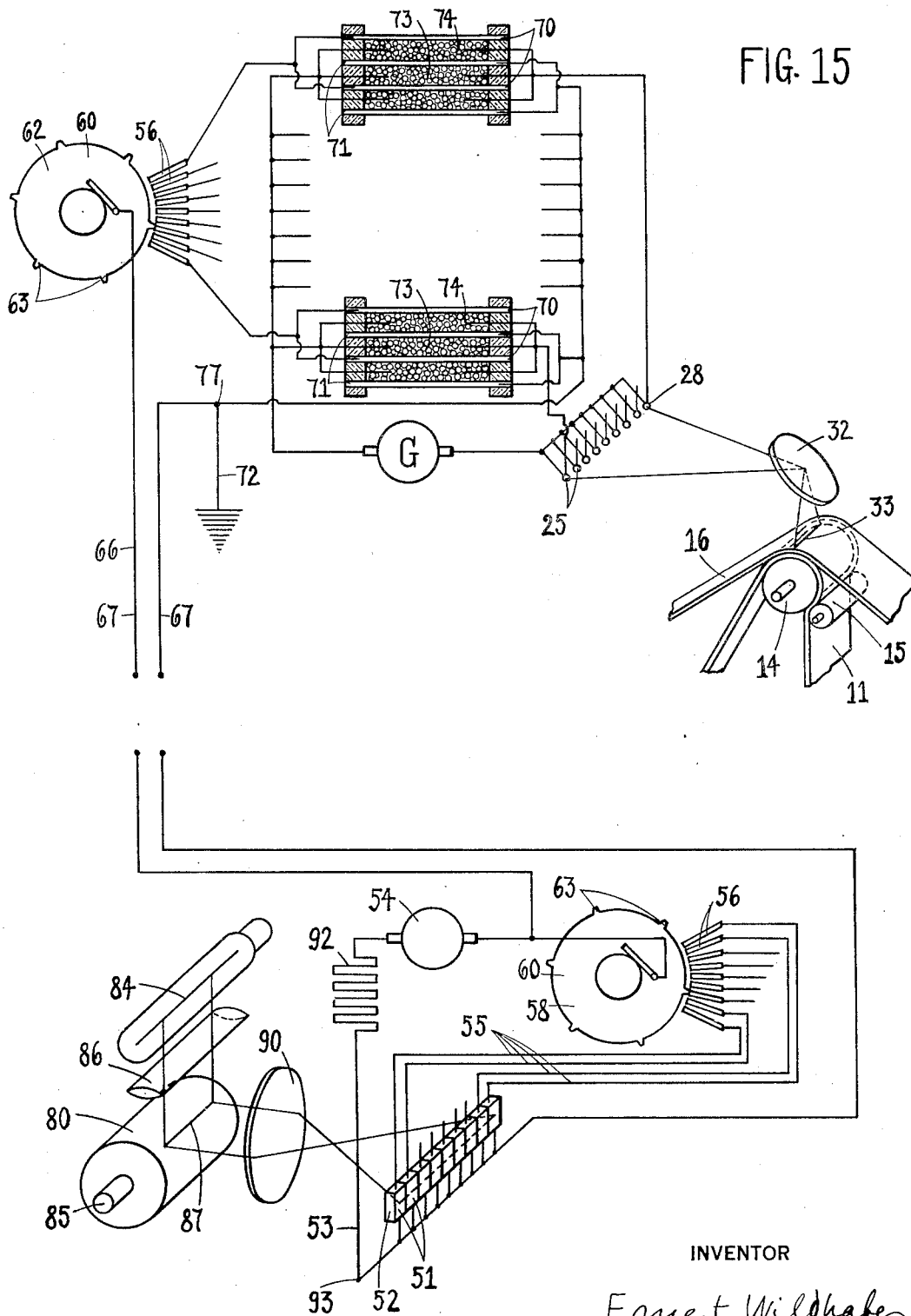
1,934,753

METHOD AND MEANS FOR TRANSMITTING FACSIMILES

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3 Sheets-Sheet 3

FIG. 15



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UNITED STATES PATENT OFFICE

1,934,753

METHOD AND MEANS FOR TRANSMITTING
FACSIMILES

Ernest Wildhaber, Brooklyn, N. Y.

Application July 26, 1928. Serial No. 295,393

15 Claims. (Cl. 178—7)

The present invention relates to the transmission of pictures and telegrams by wires and by radio.

Hitherto transmitted pictures or telegrams have been recorded in a comparatively slow and complicated manner, which usually amounted to photographic developing, and which necessitated wet chemical processes.

One object of the present invention is to provide a method of recording, which is fast and which avoids wet processes. Another object is to provide a method of recording transmitted pictures and telegrams, which is extremely simple, and which can be automatically performed in the short time of reception, so that a copy of a transmitted picture is completed in the moment when the transmission ends, and is ready for distribution.

Another object is to devise a method of sending, receiving and recording facsimile telegrams, which is faster and simpler than the present transmission of ordinary telegrams. Another object is to devise a method of receiving and recording facsimile telegrams which is faster and cheaper than recording ordinary telegrams with printing automats.

A still further aim is to devise a new and practical method of sending pictures and telegrams, and a new and useful method of sending, receiving and recording views seen at the sending station.

Other aims will be apparent in the course of the specification and from recital of the appended claims.

The invention is exemplified in the accompanying drawings, in which

Fig. 1 is a diagrammatic view, partly in section, of a device for receiving and recording pictures and facsimile telegrams in accordance with my invention.

Fig. 2 is a partial diagrammatic view of a modified device having the same purpose.

Fig. 3 is a diagram explanatory of a preferred way of sending and receiving pictures and telegrams in accordance with the present invention.

Fig. 4 and Fig 5 are enlarged and slightly modified views of parts 25, Fig. 3.

Fig. 6 is a diagrammatic view of a transmitting sheet or original, showing the lines (46) which are successively transmitted.

Fig. 7 is a diagram illustrative of a novel kind of secondary electric circuits used on the receiving end.

Fig. 8 is a diagrammatic view and section of a device for sending pictures and telegrams, illustrative of a preferred embodiment of my invention.

Fig. 9 is a diagram of a sending device illustrative of an arrangement for obtaining positive reproduction.

Fig. 10 and Fig. 11 are diagrams further illustrative of a picture reception in accordance with the present invention.

Fig. 12 is a diagrammatic plan view illustrative of a receiving mechanism suited to prolong the time of recording of individual points, which feature is preferably made use of in methods according to the present invention.

Fig. 13 is a partial front elevation corresponding to Fig. 12.

Fig. 14 is a diagram illustrative of a modified detail structure, such as may be used in receiving devices operating in accordance with the present invention.

Fig. 15 is a diagrammatic assembly drawing, partly in perspective, showing a preferred embodiment of the present invention. It comprises a sending device, shown on the lower half of Fig. 15, and a receiving device, shown on the upper half of Fig. 15.

Throughout the specification equal numerals denote equal parts.

In Fig. 1, a receiving strip 11, shown in exaggerated thickness, is unwound from a roll 12, and fed through rolls 13 over cylindrical roll 14. Feed may be effected by roll 15, which is strongly pressed towards roll 14, or if so desired, feed may be effected by the rolls 14, 15 and simultaneously by rolls 13, while in any case a certain tension is maintained in strip 11.

A color strip 16 is fed over the same cylindrical roll 14 by rolls 17. Both strips, 11 and 16 contact on a certain arc on roll 14, the receiving strip 11 being disposed underneath the color strip. The color strip has a width equal to or smaller than the width of the receiving strip. In Fig. 1 I have shown an endless color strip, which passes over rolls 18, 19, 20, 21 to roll 14 and rolls 17, suitable tension being maintained by roll 20, which may swing about center 22 and which is pressed by a spring in the direction of arrow 23.

In operation both strips are fed at exactly the same rate over roll 14, which also moves at the same peripheral speed. No relative sliding occurs therefore between the two strips, nor between the lower strip and roll 14. Ordinarily the color on strip 16 is dry, and the pressure exerted between the two strips is not sufficient to effect transmission of color.

Individual lights 25, or broadly sources of radiating energy 25 are disposed in a line, which is perpendicular to the plane of Fig. 1. Preferably the different lights are enclosed in a common glass tube 26. The purpose of these lights is to represent individual points of a straight line of a transmitted picture. They are therefore placed as close together, and are concentrated to points as much, as practically possible. A front view of such a row of lights is afforded by Fig. 3, where it is designated with character 28. In the shown

embodiment the lights are of the form of incandescent lamps, each light containing a small and preferably metallic filament. The lights project from a holder 30, which may contain spherical mirrors (31) disposed back of the filaments, to throw the light forward. As indicated in Fig. 4, each light 25 may be provided with an individual mirror 31, or groups of lights may be provided with common spherical mirrors 31, see Fig. 5. The lights are operated by individual circuits in the manner hereafter to be described.

The line composed of lights 25 corresponds to the line of the original, which is just being transmitted. When a point of said line is transmitted, a corresponding light 25 may be started by the received and suitably amplified electric current. As the transmission goes on, and as other lights are started, light 25 is nevertheless maintained burning a multiple of the time attributed to it by the received electric current. Preferably a light is maintained burning until shortly before it is covered again by the received electric current; that is to say it is left burning a time during which a plurality of other lights are started. Line 28, which is composed of burning lights and dark spots, is projected to the color strip 16 on roll 14 by any suitable means, such as by a concave spherical mirror 32. The proportions are so selected, that an image of line 28 is formed at 33 on the color strip, adjacent roll 14. Preferably line 28 is made of larger size than image 33, to furnish an image having finer points than the lights of line 28. Moreover a reduction in the size of the image increases concentration of energy to the individual points. It is well known that with the means of optics, with those shown or with other means, a considerable fraction of the total radiated energy can be projected to and concentrated on an image, such as the points of line 33.

When the power of the lights 25 is in proper proportion to the time during which the lights are maintained burning, that is also to the motion of roll 14, then the heat concentrated at the images of lights 25, on color strip 16, will change the consistence of the color on the light spots. In other words, the heat concentrated to points of the color strip, which is a considerable part of the heat produced by lamps 25, will be sufficient to produce a certain melting effect at said points. The result will be, that some of the affected color is transmitted to the receiving strip underneath, to which the color strip is pressed. Hence light points of line 28 will be printed or recorded as dark points on the receiving strip.

It is understood that the whole process takes place at a very high speed, and that the melting effect takes place instantly, on account of the great amount of heat concentrated to small spots, which require extremely small quantities of heat to jump up their temperature, that is to say which are practically without thermic inertia. Printing or recording takes place as roll 14 turns around, and the record is completed at the same time when transmission ends. It is noted that the color used is of more solid consistence than ordinary printing color. The color becomes liquid to a certain extent only when it is heated. It is dry again as soon as cooled down. And it will cool down immediately, because it contains no appreciable amount of heat, although it may have been heated to a high temperature. The color transmitted to a receiving strip will be dry much quicker than the color in ordinary printing processes, and it will usually be dry long before

the printed parts arrive at roll 15. If so desired roll 15 may nevertheless be so constructed, that it touches the receiving strip only on the two sides, and avoids the printed parts.

It is noted that the present process requires no bath and is entirely dry. As soon as the receiving strip comes out of the receiver, it is cut off and is ready for distribution; no after treatment being necessary.

The color strip 16 may be used several times on its whole length, before it needs replacement, especially in the case of transmission of telegrams. Instead of replacing the color strip at intervals, a continuous regeneration may be provided, which distributes the color evenly on the whole surface, and which adds such an amount of color, as may have been given off through printing. I have shown a number of rolls 35 in dotted lines to indicate this purpose, some of which may be given a periodical motion in the direction of their axes, in addition to a turning motion, and the lowest of which receives new color. On account of solid consistence of the color, at normal temperatures, some of the rolls 35 are preferably heated.

A modified embodiment of my invention is indicated in Fig. 2. This embodiment dispenses with a color ribbon or color strip, by having color applied directly to a cylindrical roll 38, to which the lights 25 are projected at 40. Roll 38 consists of a material which is nonconductive of heat and for the purpose of recording pictures preferably contains on its surface a fine net of grooves, formed by two or three systems of lines disposed at angles to each other. Color may be applied to roll 38 by heated rolls 41, either to the high spots of said roll or to its grooves. If applied to the grooves, a suitable instrument is provided for sweeping the high spots free from color, as known in the printing art. The color applied will be sufficiently solid ordinarily, before it arrives at roll 43. Images of lights are formed along points of a line, which is projected as point 40 and which extends parallel to the axis of the cylindrical roll 38. The images are produced along this line (40) in the same manner as along line 33 in Fig. 1. A concave spherical mirror 42 reflects sources of light and heat, which are arranged in a straight line and are not indicated in Fig. 2.

The heat concentrated to the lighted points melts the color of roll 38 in such points. The color remains in a sufficiently fluid consistence during the short time required for passing at high speed to roll 43, where the affected points are printed to a receiving strip 44, which is fed over the rolls 43 and 45.

A further and important embodiment of my invention is obtained by leaving color strip 16 off entirely in Fig. 1, and by providing lights of such power, that the heat projected to light points 33 burns these points superficially to the surface of receiving strip 11, so that dark points or dark parts are formed on strip 11. A permanent record is thus obtained in a very simple manner. Instead of providing lights of increased power, the speed of roll 14, and with it the feed of the receiving strip can be so moderated, that the same aim can be obtained with an increased duration of exposure instead of increased intensity of projection.

It is also understood, that the novel way of recording is not restricted to the particular arrangement of lights indicated, but is broadly applicable. It can be used also, when radiation

of a single, powerful source is successively projected to the points of a receiving surface, and especially, when individual lights are arranged not merely along a line, as described, but fill a whole surface, each point of a picture surface having a corresponding electric lamp or light.

It is noted, that radiating energy is projected to a receiving surface or to a color surface contacting with a receiving surface from points outside said surfaces, and that projection is effected by optical means, in a manner that an image of a radiating point is formed on said surfaces. This procedure maintains either of said surfaces free from damage and moreover permits fine reproduction by projecting the sources of radiating energy at a reduced scale.

Mirrors 32 and 42, defined as concave spherical mirrors, may moreover be substituted by other concave and curved mirrors, having different radii of curvature in different normal sections. Such mirrors present greater difficulty to accurate manufacture, but contain certain advantages in use, especially if the angle between the general direction of projection and of reflection is considerable, as shown in the drawings.

Transmission proper will now be described.

The picture or telegram to be transmitted is projected in a manner to be described hereafter to a light sensitive surface. A whole line of said picture or telegram is projected at the same time to said surface. Voltage is successively applied to the points of said surface to which said line is projected, in such manner that the points successively covered correspond to line 46 of the surface 48 of the original (Fig. 6). Lines 46 are preferably straight and parallel to the longer sides 50 of surface 48. The light sensitive surface is preferably embodied by a series of narrow light sensitive cells 51 (Fig. 3), which are placed side by side along a straight line 52. Each cell corresponds to a point of a line 46, and the whole line corresponds successively to the different lines 46 of the whole surface 48. A light point of line 46 corresponds to a light point or a light area projected to a corresponding cell 51. Under the influence of such light, cell 51 will change, usually reduce, its electric resistance. The cells 51 are connected on one side with a wire 53 to a pole of a source of electric voltage, such as a generator 54; and the other sides of said cells are connected with wires 55 with parts 56 of a rotary distributor 58. The rotor 60 of said distributor is connected with the other pole of generator 54, by means of a brush, a transformer coil 61 and suitable wires. Distributor 58 of the sending station, and a similar distributor 62 of the receiving station are made to run in exact synchronism. Both distributors contain parts 56 disposed on part of the circumference only, and have rotors 60 containing a plurality of contacts 63, which successively effect electric contact with the parts 56, while preferably avoiding physical contact. The number of contacts 63 is so selected, that contact is made continuously with changing parts 56 and never with two parts 56 simultaneously.

A part 56 which is just in contact with rotor 60, is in electric contact with one pole of generator 54 through coil 61, and with the other pole of said generator through wire 55, cell 51 and wire 53. Electric current will therefore flow in this circuit, the intensity of said current being determined by the resistance of light sensitive cell 51, which depends on the quantity of light projected to said cell in the time immediately preceding contact and during contact. In the same manner

electric current, of an intensity adapted to the projected light, will pass successively through the other cells 51 when contact is made. Coil 61 contains thus a current which fluctuates in correspondence with the light and dark spots of the original, which is being transmitted. This current is then transformed and suitably amplified by means not indicated, and energy fluctuating in correspondence with said current is then transmitted either by wires or by radio to a distant receiving station.

The received energy is suitably amplified at the receiving station and is then transmitted by induction to coil 65 of the receiving circuits 66. The receiving circuits are composed of coil 65, a brush, wires leading to the contacts of rotor 60, parts 56, individual means for affecting or influencing secondary electric circuits, and joint wire 67. The said individual means are contained in a casing 69 indicated by a square. A circuit established by the position of rotor 60 of the receiving station corresponds to a circuit established by the equal position of rotor 60 of the sending station. Each circuit 66 is connected to one or several secondary circuits, which in turn, if started, transmit electric energy to corresponding incandescent lights 25.

Each cell 51 corresponds to one, or if so desired to several lights 25. Line 28, which is composed of the lights 25, therefore embodies line 52 of cells 51, or also a line 46 of surface 48 of the original.

When cells 51, Fig. 3, reduce their electric resistance under the influence of light, increased electric current will pass through transformer coil 61 when light points of an original are being transmitted. If moreover the current in circuit 66 of the receiving station is made in known manner to fluctuate like the current in coil 61, so that light points of the original correspond to burning lights of line 28, a negative reproduction results, inasmuch as said burning lights are recorded as dark points. Positive or negative reproduction may be obtained at will, by simply applying customary knowledge and practice.

A sending circuit for effecting positive reproduction is diagrammatically indicated in Fig. 9. Broadly this circuit permits a reproduction opposite to the reproduction obtained from a sending circuit as indicated in Fig. 3.

In Fig. 9 the same numerals designate the same parts as in Fig. 3. Transformer coil 61 is here connected in parallel with cells 51. As a cell 51 decreases its electric resistance when a light point of the original is being transmitted, increased current flows through said cell. The increased current which flows also through resistance 92 effects a drop of the voltage at point 93, which in turn reduces the current flowing through transformer coil 61. A light point being transmitted effects therefore a reduction of current in coil 61 and a reproduction opposite to the one obtained with the sending circuit illustrated in Fig. 3.

It is understood that all the known means and practices of the art may be utilized with my invention, without being specifically mentioned. For instance the fluctuations of electric current, due to changing resistance in the cells 51, may be superimposed to the fluctuations of a high frequency alternating current.

The secondary electric circuits which operate lights 25 will now be further explained. The object of a secondary electric circuit is to maintain a light burning long after transmission has proceeded to other lights 25. In other words energy

shall be emitted from the lights 25 during a period which is a multiple of the time allotted to a light 25 by the received electric current.

The principle of one form of secondary circuit is indicated in Fig. 10. A secondary circuit of this character consists of an incandescent lamp 95, an enclosed spark gap 96, and an induction coil 97 connected in series with two poles 98. If so desired one of the poles 98 may be grounded, as indicated in dotted lines 99. Said poles are maintained under constant voltage, which is not sufficient to start electric current across gap 96, but which is sufficient to maintain electric current across said gap once it has been started.

Additional voltage may be induced in the secondary circuit by a coil 100 of a primary circuit. Coil 100 is inductively coupled to coil 97, and the two coils are so proportioned that an impulse of the primary circuit may induce enough additional voltage in the secondary circuit to bridge gap 96, that is to say to start electric current across said gap. Once said current is started, it is maintained by the constant voltage applied to points 98.

The principle of primary circuits of a receiving apparatus is separately indicated in Fig. 11. The two points 101, 102 of the primary circuits are maintained under voltage fluctuating in accordance with the received electric energy. One of these points may be grounded, as indicated in dotted lines 103. A distributor 104 of known character, and preferably of the rotary type, serves to successively connect point 101 with individual primary circuits, which contain each an induction coil 100 already referred to in connection with Fig. 10.

Fig. 12 and Fig. 13 illustrate the general principle of an entire receiving apparatus. For convenience the individual sources of radiating energy are shown as separate lamps, but it is understood that they might be just as well disposed on a line (28) and enclosed in a common glass tube (26). Referring to Fig. 12, a motor 106 applies motion to a distributor 104 by means of gears 107. It also drives an interrupter 108 in a manner that distributor 104 and interrupter 108 are rotated at the same angular velocity. Distributor 104 serves to successively connect point 101 with individual primary circuits 109, whose ends are in constant connection with point 102. Voltage between the two points 101, 102 is made to fluctuate in accordance with the fluctuations of the received electric energy. A secondary circuit is inductively coupled with each primary circuit, by means of induction coils 97, 100.

A secondary circuit contains the elements separately recited with reference to Fig. 10 and equally denoted as in said figure. The enclosed spark gap 96 is here shown in a slightly modified structure, but follows the same principle. No current passes through a gap 96 immediately before the individual primary circuit coupled with it is closed by distributor 104. As said circuit is closed during a short period, an impulse is transmitted to the secondary circuit which may or may not be large enough to start electric current across gap 96, depending on the shade of the point being transmitted. When current across gap 96 is started, it is maintained through the constant voltage applied between the points 98.

Current in a secondary circuit and with it radiation from its incandescent wire 95 is maintained a period during which radiation is successively started from a plurality of other points.

Voltage is shut off before the coupled primary circuit is again acted upon by distributor 104. Interrupter 108, which shuts off voltage in due sequence, contains a rotating electric conductor 111, which is connected with one of the points or poles 98 by means of a brush 112. Other brushes 113 contact with the same conductor 111, and form part of the secondary circuits. Conductor 111 contains a helical groove 114, which is slightly wider in axial direction than an individual brush 113 and which is filled with non-conductive material, to form a continuous cylindrical surface with conductor 111. During rotation of conductor 111, each of the brushes passes successively over insulating groove 114, and thereby breaks electric connection with point 98. Electric current then ceases in the secondary circuits connected with said brush 113. Electric current in a secondary circuit may be started again when distributor 104 again acts on the primary circuit, which is coupled with said secondary circuit.

To simplify explanation distributor 104 of Fig. 12 and Fig. 13 is supposed to be so proportioned as to close each primary circuit once per revolution. Broadly distributor 104 and interrupter 108 are so timed up with one another, that electric connection of a secondary circuit is disrupted by interrupter 108 as often as a primary circuit has been closed by distributor 104 during the same period. If so desired an individual brush 113 may be provided for each secondary circuit. Preferably, however, a plurality of secondary circuits are connected with each brush 113 for reasons of economy. In practice, the number of secondary circuits as well as the number of brushes 113 is much larger than indicated in the drawings.

While I have particularly referred to sources of radiating energy of the form containing incandescent wires, it is clearly understood that other sources may also be used. An embodiment of such other sources of radiating energy is indicated in Fig. 14, where the numeral 116 denotes individual small electrodes insulated from each other and suited to cooperate with corresponding projections of a joint electrode 117. Electrodes 116 and 117 may be enclosed in a glass tube of the character referred to in Fig. 1 and Fig. 3, which may be filled with a suitable gas. When an individual circuit is closed, light and heat is radiated from a point 118 between the protruding portions of an electrode 116 and electrode 117. This point forms a radiating point of a line 28, whose function is the same as described with reference to Fig. 1 and Fig. 3.

A modified type of secondary circuits will now be explained here. It may be employed in connection with direct current and makes use of static electric charges. Static electricity is used to affect a secondary current in a degree depending on the voltage of said static electricity.

In the embodiment of an individual secondary circuit shown in Fig. 7, a plurality of thin and elastic electric conductors 70 of the form of diaphragms are placed a distance apart and are electrically connected with one of the parts 56 (Fig. 3). Other conductors 71 of equal form alternate with the conductors 70 and are insulated therefrom, in a manner not further indicated. Conductors 71 are connected with a point 77, and may be grounded, as indicated in dotted lines 72. The two sets of conductors form a condenser 73. The spaces intermediate adjacent conductors 70, 71 are filled with grains of suit-

able material 74, such as carbon, the conductors being insulated from the filling. All the fillings are connected in parallel and form part of a secondary electric circuit, which is kept under constant voltage, and which contains an electric lamp or incandescent wire 25.

In the embodiment referred to in Fig. 7, each primary circuit of the receiver contains a condenser (73) disposed in series in said circuit. Said condensers are successively charged to voltages corresponding to the fluctuations of the received electric energy. A charge given to an individual condenser stays there as a static electric charge until the condenser is again acted upon by the rotary distributor referred to.

When condenser 73 is without charge, filling 74 presents ample resistance and confines the current of the secondary circuit to a small amount. When however the condenser 73 is charged in a quick pass of a contact of rotor 60, the elastic plates 70, 71 will tend to approach one another under the electric charge, and will deflect sufficiently to compress the filling 74 so that it reduces its electric resistance. The action of the filling is similar to its action in a microphone, where the filling constitutes a changing resistance of an electric circuit, the change being effected through the minute deformations of a diaphragm under the influence of sound. In the present case deformations are effected through a static charge of the condenser which the conductors or diaphragms 70, 71 constitute. These deformations last as long as the static charge, and affect therefore the secondary current during said time, which is a multiple of the time allotted to a primary circuit by the received electric current. When a contact of rotor 60 comes around again and establishes electric contact, it will have either a larger, or an equal, or a smaller voltage than the remaining charge of the condenser, and correspondingly the charge in the condenser will be either increased, or maintained the same, or reduced. When the charge is increased, then an increased secondary current will be established in the subsequent interval between contacts. If the charge is reduced, a reduced secondary current will be established. And if the charge remains the same, no change takes place. Lamp 25 will then continue to burn with the same intensity without any interruption; or stay dark, when it was dark before.

It is also noted that the intensity of the primary circuit is reflected in the secondary circuit. The graduations of bright, medium and dark points of an original, which are reproduced by the voltage of the charge applied to a condenser 73, are also reproduced in the secondary circuit and are evident in the degree of brilliance of the corresponding light (25). A very good reproduction of pictures or sights may therefore be obtained, reproducing not only light and dark spots, but also half tones.

A received electric current, as used in the foregoing, and hereafter, is understood to be the electric current obtained at the receiving station, either directly, or by reception of energy transmitted in the form of electromagnetic waves. The expression should not imply that transmission was necessarily made by wires, and is being used to designate a primary current either before or after amplification.

Secondary electric circuits, and their connection with primary circuits, as described, are broadly applicable to any kind of transmission and television.

The operations and arrangements for sending out telegrams and pictures will now be explained with reference to Fig. 8. A roll 80 of suitable width is turned at a uniform velocity. If full size reproduction is provided, then the peripheral velocity of roll 80 and the peripheral velocity of roll 14 at the receiving station (Fig. 1) are made equal, and in any case they correspond to one another.

The sheets of paper, whose contents are to be transmitted are placed on roll 80 and are fed with it in direction 83. Suitable means are provided in order to secure good adherence of such sheets to roll 80. For instance the surface of roll 80 may be provided with a system of fine openings, and may be subjected to air suction, on part of its circumference, similar to the suction of a vacuum cleaner, in such manner that air is drawn in through said openings in such places, where good adherence of the said sheets is required.

A brilliant line of light 84, seen as a point in Fig. 8, is preferably embodied by an incandescent lamp, containing an incandescent wire (84) which extends parallel to axis 85 of roll 80. Line of light 84 is projected through lens 86 to roll 80, in such manner that an image of line 84 is formed at 87, along a line parallel to the axis 85. Lens 86 is preferably made cylindrical, the straight lines of the lens being parallel to axis 85. Projection is effected at an angle 88 to normal or radius 89, as indicated in the drawings.

A line 52 of light sensitive cells 51 (as described with reference to Fig. 3) is disposed parallel to axis 85. The cells 51 are so placed, that the general direction of the rays of light from line 87 is inclined at the above said angle 88 to radius 89. In other words the cells 51 are in the direction of natural reflection of light 84. A spherical lens 90 provides an image of line 87 on the light sensitive cells 51.

Inasmuch as an image of a line (84) is formed at 87, the parts of an original which coincide with said line 87 are under extremely concentrated light. White paper will reflect a great part of said light, especially at the angle 88 provided. White parts of line 87 on the original will therefore project strong light to corresponding cells 51, whereas dark parts and especially black parts will absorb a greater part of the projected light and project less to their corresponding cells 51. It is particularly noted how intensely the points of the original can be lighted, which are just being transmitted. The intensity of light, at the points which react upon the light sensitive cells 51, is many times larger than could be provided by uniformly flooding an object with light, and consequently the reactions of the cells are that much faster and stronger.

The connections of cells 51 with the parts 56 of a distributor, have been previously explained.

A number of modifications may be made of my invention by simply applying the customary practice of the art, and without departing from its spirit. For definition of the scope of my invention I rely upon the annexed claims.

What I claim is:

1. The method of recording transmitted pictures and telegrams, which consists in providing a receiving surface and a color surface, in radiating heat from a point outside of said surfaces, in collecting heat rays emitted from said point and projecting said rays to corresponding points of said color surface, and in printing said points to a receiving surface.

2. The method of recording transmitted pictures and telegrams, which consists in successive-

ly starting heat radiation from a plurality of points, in collecting radiation and projecting said radiation to corresponding points of a relatively moving color surface, in thereby affecting the consistence of color in points subjected to strong radiation, and in printing the affected points on a receiving surface.

3. The method of recording transmitted pictures and telegrams, which consists in successively starting heat radiation from a plurality of points in correspondence with a received electric current, in collecting radiation and projecting said radiation to corresponding points of a color surface, in maintaining said radiation a multiple of the time allotted to a point by the received electric current, in thereby affecting the consistence of color in points subjected to strong radiation, and in printing the affected points on a receiving surface.

4. The method of recording transmitted pictures and telegrams, which consists in providing a receiving surface and a color surface, in successively starting to apply heat to points of said color surface in correspondence with the fluctuations of electric energy received from a sending station, and in continuing to apply heat to said points while heat application to a plurality of other points of said color surface is successively started.

5. The method of recording transmitted pictures and telegrams, which consists in successively starting heat radiation from a plurality of points, in collecting radiation and projecting said radiation to corresponding points of a relatively moving color surface, said corresponding points being disposed along a single and substantially straight line, in thereby affecting the consistence of color in points subjected to strong radiation, and in printing the affected points on a receiving surface.

6. The method of recording transmitted pictures and telegrams, which consists in placing a receiving surface in contact with a color surface, in radiating heat from a point outside of said surfaces, in collecting heat radiation and projecting said radiation to points of said color surface adjacent its contact with said receiving surface, heat radiation to said points being successively started, in affecting the consistence of color in points subjected to strong radiation and thereby printing the affected points to the contacting receiving surface.

7. The method of recording transmitted pictures and telegrams, which consists in placing a color surface in contact with a receiving surface, in radiating heat from a plurality of points, the number of said points being smaller than the number of points to be transmitted, in collecting heat radiation and projecting said radiation to corresponding points of said color surface adjacent its contact with said receiving surface, in thereby affecting the consistence of color in points subjected to strong radiation and printing the affected points to the contacting receiving surface, and in moving said contacting surfaces relatively to the area of projected heat.

8. The method of recording transmitted pictures and telegrams, which consists in providing a source of radiant heat, in collecting heat radiated from said source and projecting said heat to points of a surface, heat radiation to said points being successively started, the duration of

radiation and the intensity of heat being such that a lasting change is effected at points subjected to strong radiation.

9. The method of recording transmitted pictures and telegrams, which consists in successively starting heat radiation from a plurality of points, in collecting radiation and projecting said radiation to corresponding points of a relatively moving surface, and in maintaining radiation long enough that a lasting change is effected at points subjected to strong radiation.

10. The method of recording transmitted pictures and telegrams, which consists in successively starting heat radiation from a plurality of points, in collecting radiation and projecting said radiation to corresponding points of a relatively moving surface, and in maintaining radiation at a point a period during which radiation is started from a plurality of other points.

11. The method of transmitting pictures and telegrams, which consists in projecting a continuous line of light to the surface of an original, said line extending through a plurality of adjacent points to be individually transmitted, in moving said original relatively to said line of light, in forming a real image of the lighted line of the original on a row of light sensitive cells, in successively and periodically connecting said cells with an electric circuit, thereby obtaining an electric current of an instantaneous strength depending on the light projected to a cell, in operating corresponding sources of radiation at the receiving station, said sources of radiation being arranged in a line, in forming images of said sources adjacent a strip moving relatively to said images, and in thereby printing said images of the radiating sources as permanent dark points.

12. In a device for receiving and recording pictures and telegrams, a color strip and a receiving strip, a roll, a source of radiant energy, means for forming an optical image of said source substantially on said roll, and means for continuously feeding said strips in contact with each other to said roll and over said roll.

13. In a device for receiving and recording pictures and telegrams, a source of radiant energy, optical means for projecting radiated energy to a surface containing color, thereby melting color to a certain degree, and means for transmitting the affected color to a receiving strip.

14. In a device for receiving and recording pictures and telegrams, a color strip and a receiving strip, means for leading both strips over a cylindrical roll, sources of radiant energy disposed in a line, means for successively starting radiation from said sources in correspondence with the fluctuations of electric energy received from a sending station, means for maintaining radiation from an individual source a period during which radiation is started from a plurality of other sources, and optical means for forming images of said sources on said color strip adjacent said cylindrical roll.

15. In a device for receiving pictures and telegrams, a condenser having resilient plates, means for charging said condenser, granulated conductive material forming part of a secondary electric circuit, and means for controlling the resistance of said granulated material with the deflection of said resilient plates under the electrostatic charge of said condenser.

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