March 31, 1936. W. G. H. FINCH 2,036,128

IMAGE BROADCASTING SYSTEM

Original Filed March 26, 1934 4 Sheets-Sheet 1

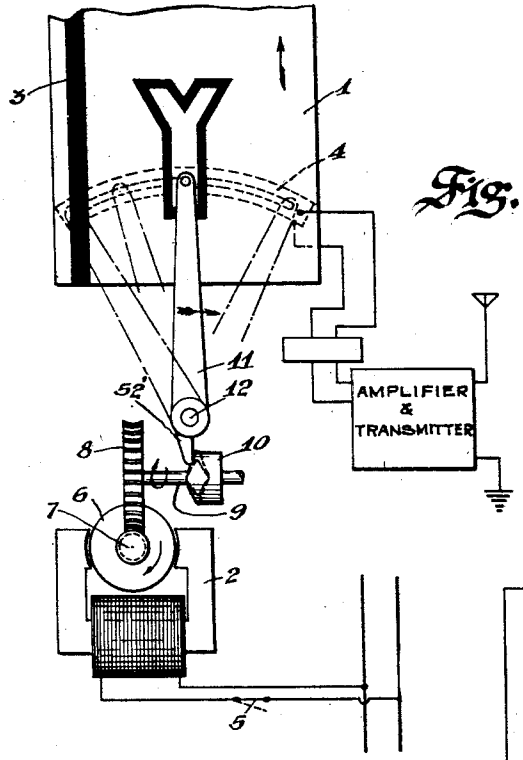


Fig. 1

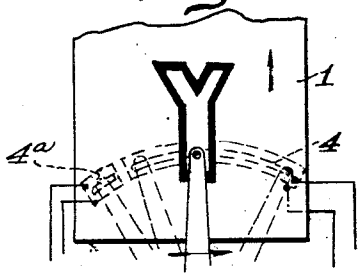
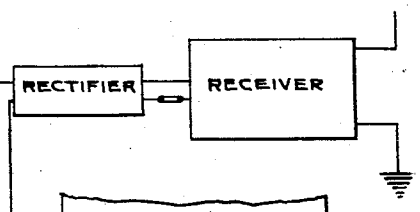


Fig. 1a.



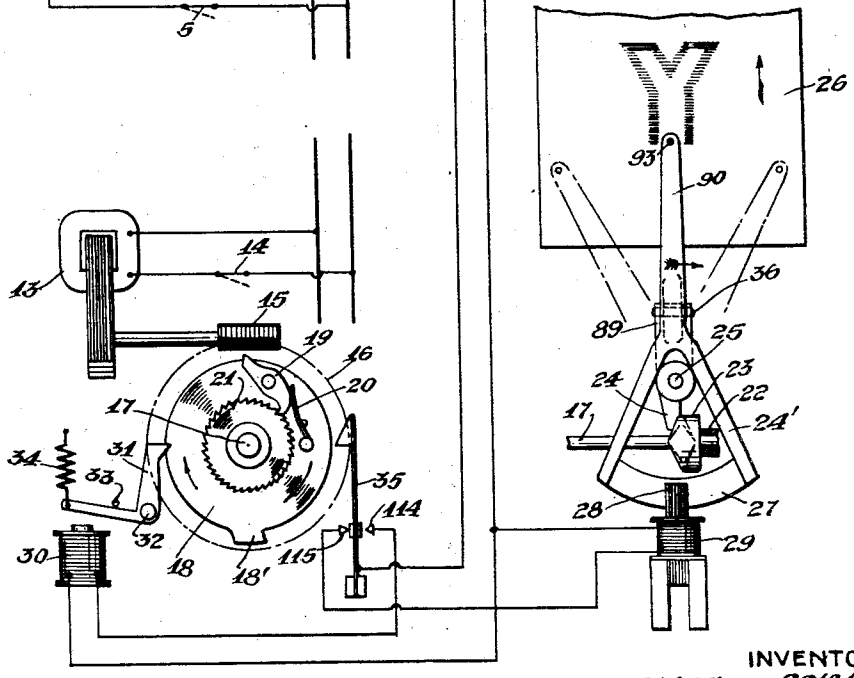


Fig. 2

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March 31, 1936. W. G. H. FINCH 2,036,128

IMAGE BROADCASTING SYSTEM

Original Filed March 26, 1934 4 Sheets-Sheet 2

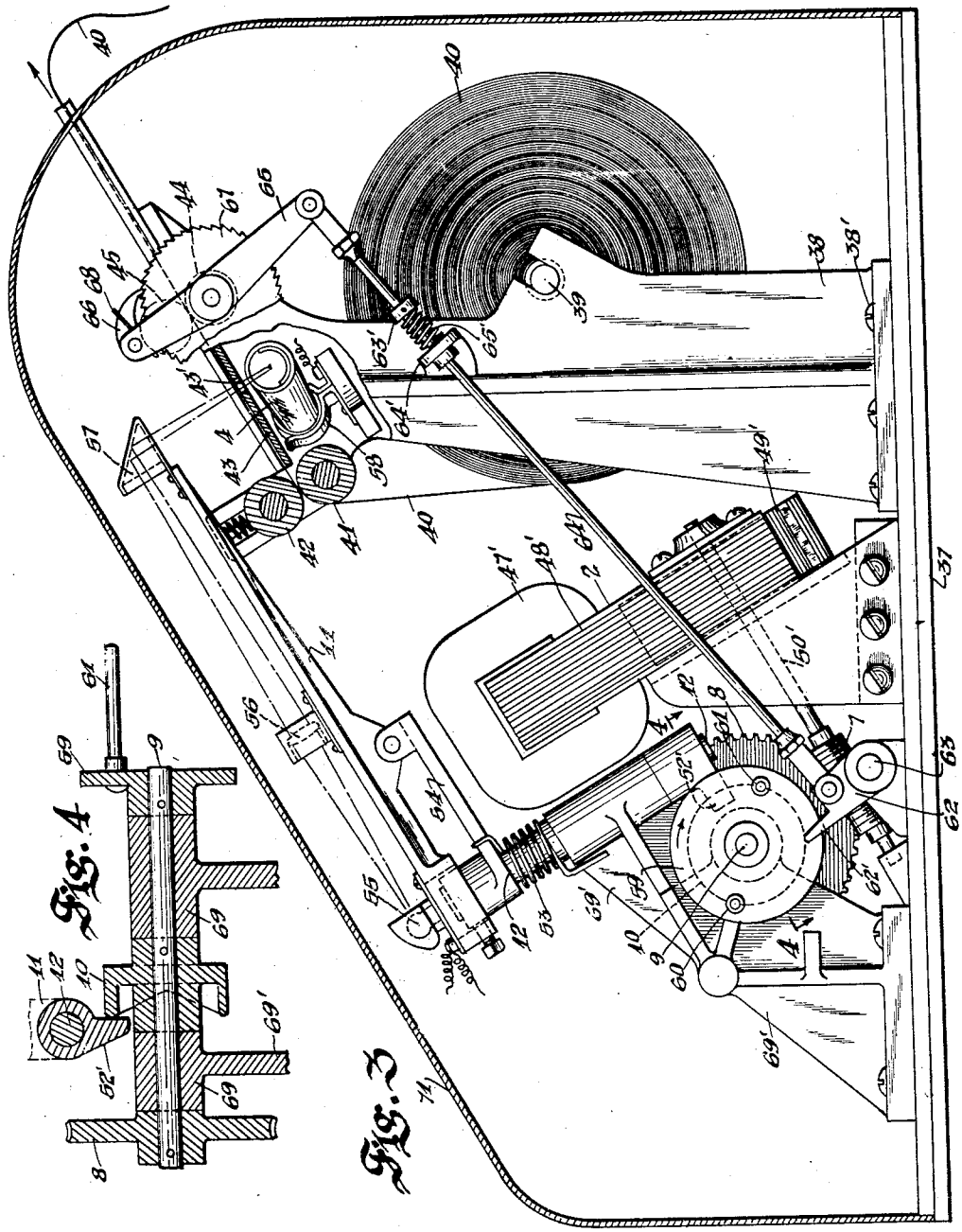


Fig. 3

Fig. 4

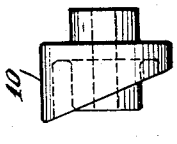


Fig. 5

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March 31, 1936. W. G. H. FINCH 2,036,128

IMAGE BROADCASTING SYSTEM

Original Filed March 26, 1934 4 Sheets-Sheet 3

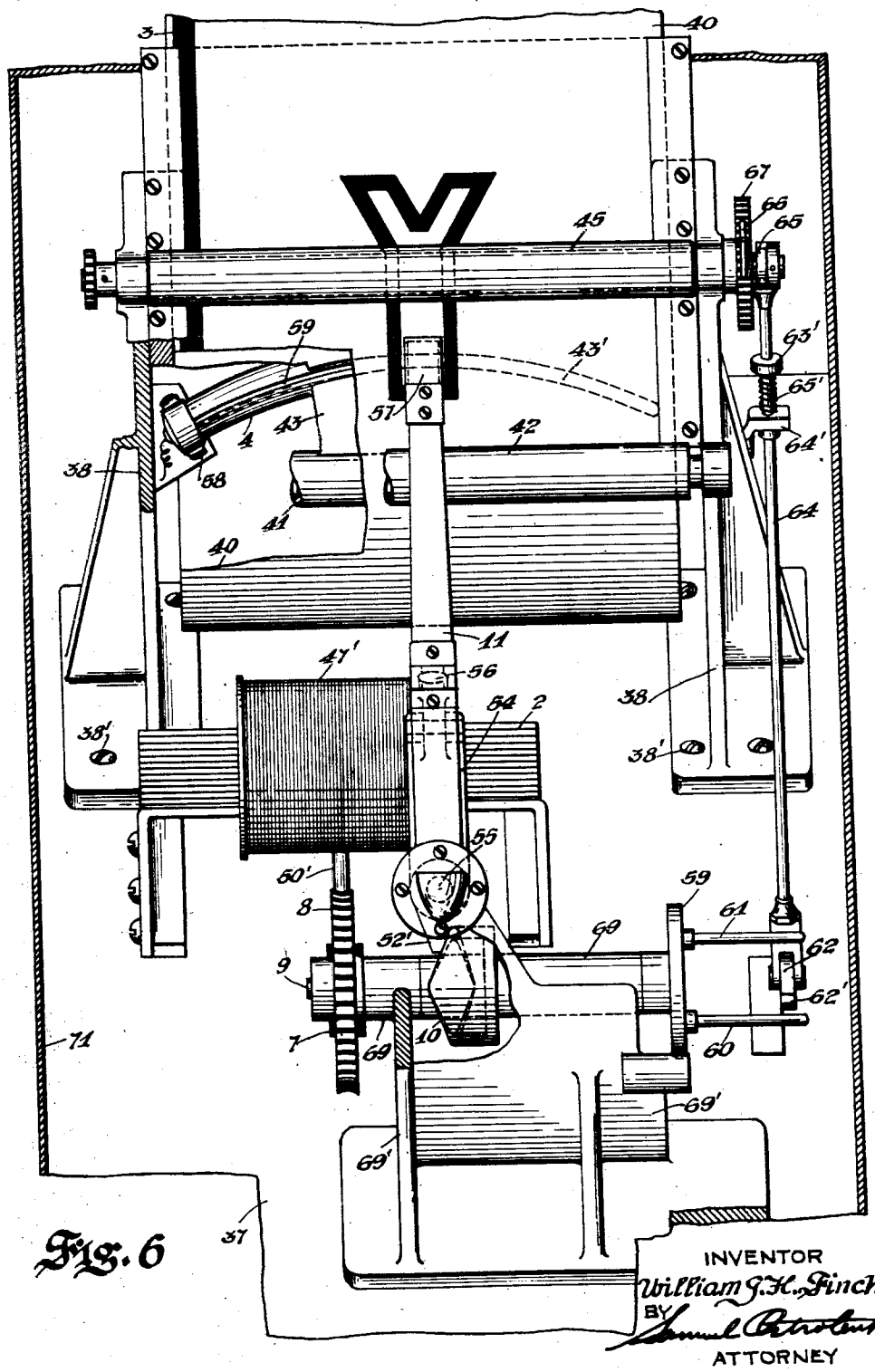


Fig. 6

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March 31, 1936. W. G H. FINCH 2,036,128

IMAGE BROADCASTING SYSTEM

Original Filed March 26, 1934 4 Sheets-Sheet 4

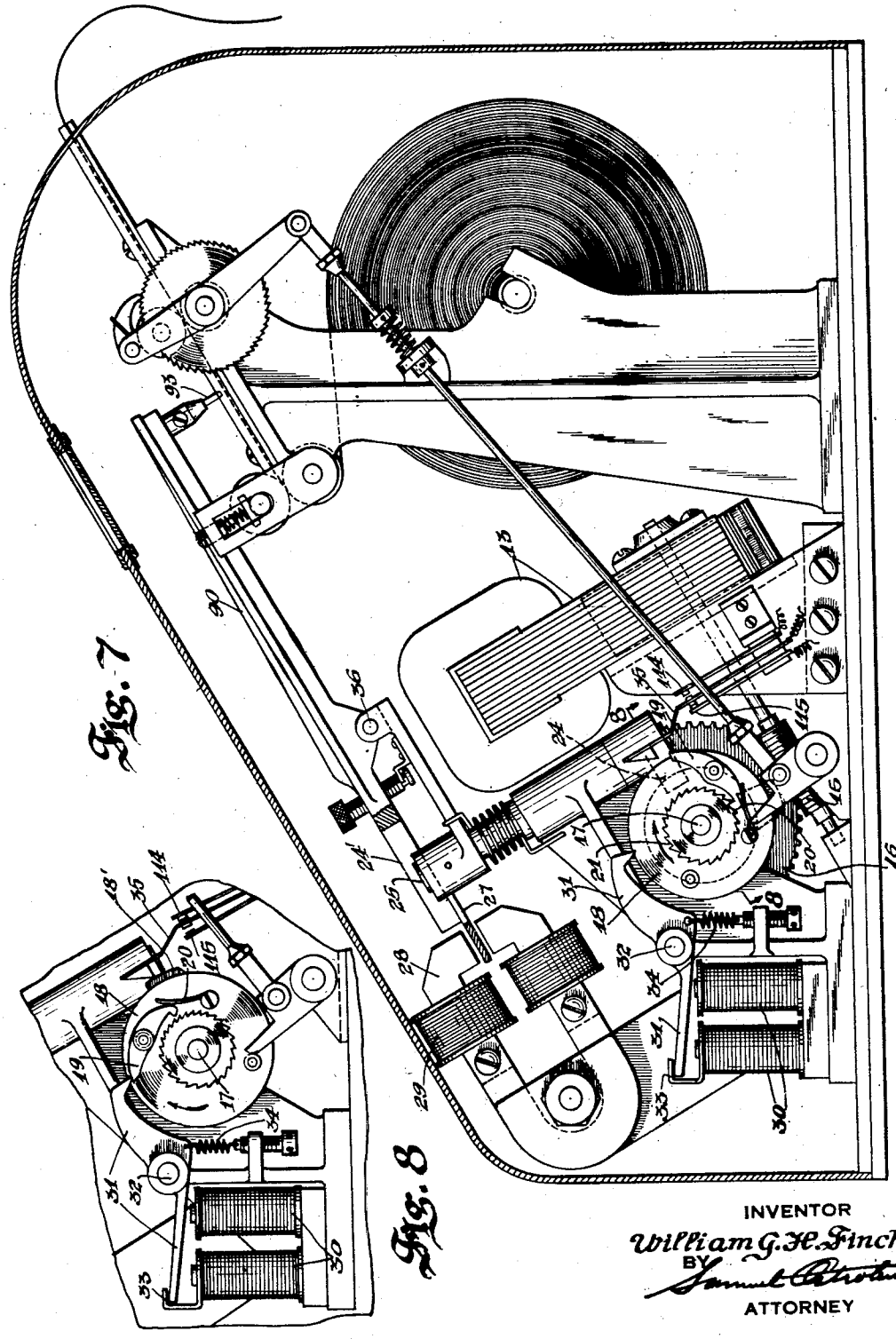


Fig. 7

Fig. 8

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Patented Mar. 31, 1936 2,036,128

UNITED STATES PATENT OFFICE

2,036,128

IMAGE BROADCASTING SYSTEM

William G. H. Finch, New York, N. Y.

Original application March 26, 1934, Serial No. 717,304. Divided and this application December 18, 1934, Serial No. 757,994

27 Claims. (Cl. 178—11)

My invention relates to novel apparatus for and methods of transmitting signals and more particularly relates to novel apparatus for and methods of visual broadcasting, such as disclosed in my application Serial No. 717,304, filed March 26, 1934, of which this application is a true division.

In the transmission of facsimile signals, it has heretofore been the practice to employ a cylindrical member on which the picture or object to be transmitted by facsimile was mounted. The cylinder was scanned by rotating the cylinder past a pointer and at the same time moving the cylinder with respect to the pointer in a longitudinal direction by means of a worm mounting. An electrical contactor mounted on a stylus was employed for detecting the light variations of the image on the cylinder.

The obvious defect of such a system was that it could transmit only the image mounted on the cylinder and was not adapted for the continuous transmission of messages.

For the purpose of transmitting any relatively long messages by facsimile, it has been proposed to oscillate an arm carrying a stylus over a moving sheet on which the message which is to be transmitted by facsimile is recorded. In this type of arrangement, no practical photoelectric cell arrangement which is operated in accordance with variations of the image for transmitting facsimile signals has heretofore been developed, nor has it been possible in the systems heretofore used to employ the same system and apparatus for the transmission either of black and white pictures or half tones, as desired.

Moreover, the mechanisms proposed were complicated, requiring many parts which were heavy and no practical construction has been suggested for facsimile transmission which would be adaptable for mobile use, as on automobiles, airplanes, ships and the like.

I have invented a novel adaptation of the photoelectric cell arrangement and simple synchronizing arrangement, requiring a mechanism light in weight, inexpensive and easy to operate for the broadcasting of images, the apparatus being operated either by wire or by radio.

Accordingly, an object of my invention is to provide novel apparatus for and methods of transmitting pictures.

A further object of my invention is to provide novel methods of and apparatus for transmitting either black or white pictures, as desired.

Another object of my invention is to provide a novel image broadcasting system which may be operated either by radio or by wire circuits.

Still further another object of my invention is to provide a novel construction of photoelectric cell.

Another object is to provide novel image broadcasting system operated by photoelectric cell.

I have discovered that detail is not consequential in image transmission of words and that by a sacrifice of detail I can provide a word transmitting system operating at even higher speeds than now obtainable by telegraphy.

In accordance with my invention, I contemplate reducing the image to be transmitted a number of times to an image which is a small fraction in size of the original image; scanning this reduced image for transmission; receiving the image reduced; and thereafter enlarging it. In a modified form I contemplate operating the receiver scanner to produce a direct enlargement.

Accordingly a further object of my invention is to provide novel apparatus for and methods of broadcasting word images.

A further object of my invention is to provide novel apparatus for and methods of broadcasting images by reducing the size of the image to be broadcasted; receiving the reduced image; and enlarging it.

There are other objects of my invention which, together with the foregoing, will appear in the detailed description which is to follow in connection with the drawings in which:

Figure 1 is a circuit diagram of the transmitter;

Fig. 1a shows a modification of the arrangement in Fig. 1;

Figure 2 is a circuit diagram of the receiver;

Figure 3 is a detailed view of the right hand side elevation of the transmitter;

Figure 4 is a cross section of the main shaft;

Figure 5 is a detailed drawing of the cam;

Figure 6 is a top view of the transmitter;

Figure 7 is a right hand side elevation of the receiver;

Figure 8 is a detailed view of synchronization mechanism.

Referring to Figure 1, I have shown a developed positive film or similar band 1 moving in the direction of the arrow at a predetermined speed controlled by synchronous single phase motor 2 in a manner to be described hereinafter. Motor 2 may be driven from a standard source such as a sixty- or twenty-five cycle line. Upon film 1, the image to be transmitted appears in black and for purposes of illustration, I have shown

on Figure 1, a relatively wide black line is drawn, which is shown at 3 in Figure 1, for synchronizing purposes to be explained hereinafter.

Behind the picture bearing transparent band 1, a photoelectric cell 4, shaped as a section of an arc, is suitably mounted and connected to a suitable amplifier which in turn is connected to the transmitter for transmitting signals. The transmitter for radio broadcasting may be an oscillator of carrier frequencies modulated by the picture currents generated by the photoelectric cell as the image to be transmitted is scanned in a manner to be described hereinafter. For wire transmission, a similar arrangement or just an impulse transmitter may be used.

When the single phase motor 2 is set in motion by closing switch 5, its armature 6 revolves in the direction shown by the arrow and the worm mounted at 7 on the armature shaft meshes with and drives worm gear 8. Gear 8 is mounted on and rotates shaft 9 in the direction of the arrow. Shaft 9 carries secured thereto a cam 10 which, in revolving, controls cam follower 52', carrying an image scanning device 11, pivoted at 12 to oscillate. Cam follower 52' is held against cam 10 by a spring 53 (Figure 3) so that as shaft 9 rotates, arm 11 is swept back and forth over and scans the photograph appearing on band 1.

For purposes of simplicity, the mechanism which steps the photographic band 1 forward is not shown in this figure (to be described in connection with Figure 3), but at the completion of each cycle of scanning arm 11, the picture containing film is fed forward a predetermined amount, depending upon the quality of the picture desired, so that on each swing of arm 11, a new line of image points is scanned. All of this will be shown and described in greater detail hereinafter. It will now be clear that as motor 2 rotates, arm 11 oscillates in a sweeping movement back and forth over the picture to be transmitted and at the completion of every oscillation, a different line of the picture to be transmitted is scanned.

A suitable lighting system comprising a source of light of constant intensity, an objective lens and a reflector, capable of bending the light beam 90 degrees, is focused through the picture upon the photoelectric cell 4. It will be clear that whenever a dark or black portion of the image to be transmitted interposes the light beam between its source and the photoelectric cell 4, a variation in the current generated by the photoelectric cell in its circuit occurs. In the case of black and white transmission, only two current variations are produced. For transmitting shades between black and white a corresponding number of current variations result. In half tone transmission it would be necessary to break up the picture into sections in the manner well known in the art.

When these current variations are amplified and applied to the transmitting equipment, they will be radiated through the air or transmitted by wire to the receiving circuit and related apparatus shown diagrammatically in Figure 2.

Referring now to the receiving circuits shown schematically in Figure 2, a synchronous single phase motor is set in motion by closing the local circuit switch 14. This motor is preferably driven from a source of alternating current tied into the system supplying power to the transmitting motor 2. These two motors are thus driven in synchronism. To the armature of motor 13 is secured a worm 15 suitably mounted in bearings and driving gear 16, secured to shaft 17, in the direction indicated by the arrow. A synchronization disc 18, free to rotate about shaft 17, is located so that a pawl 19, under the action of spring 20, normally engages ratchet wheel 21, which is securely fastened to shaft 17. The synchronization disc 18 is secured to the hollow shaft 22 which is shown diagrammatically for simplicity at right angles from disc 18. Upon the hollow shaft 22 is secured a cam 23, shaped substantially like cam 10 in Figure 1, which in turn actuates cam follower arm 24, pivoted at 25, causing stylus 90 to oscillate back and forth over a suitable image retainer shown at 26, which travels in the direction of the arrow at a predetermined speed under control of motor 13.

The cam follower 24 actuates an arm 89 upon which is pivoted at 36 the stylus 90, the end of which is forked as at 24' and supplied with an arcuate iron armature 27 to cooperate with the pole piece of a polarized magnet 28 having windings 29. When the magnet winding 29 is deenergized, the pole pieces act upon the armature 27 to hold the marker carried by stylus 90 out of contact with the signal recording band 26. When magnet winding 29 is energized by a signal, the armature 27 moves upwardly and causes stylus 90 to rotate about pivot 36 and thereby cause marker 93 to record the signal on band 26. By pivoting stylus 90 on the oscillating arm 89, a signal may be recorded by a mark corresponding to said signal at any position of said arm as it sweeps from side to side of its path of movement.

When switch 14 is closed, motor 13 is set in motion, thus imparting an oscillatory movement to stylus arm 90, said movement being in unison with the motion of arm 11 of the transmitter shown in Figure 1, so that arm 90 is at every instant in position to operate in response to a received signal. As soon as the styluses 11 and 90, now operating in synchronism, are also in proper phase relation, the system will be in condition for the transmission and reception of visual signals.

Synchronization and phase relation is accomplished by means of the synchronization slow-to-energize magnet 30 which actuates the armature and pawl 31 pivoted at 32 and held against stop 33 by tension spring 34 when the magnet is deenergized. Switch arm 35 is actuated by a projection on the periphery of synchronization disc 18 and is capable of closing its right or left contact, thus switching the incoming signal from visual signal responsive magnet 29 to the synchronizing magnet 30 and vice versa, according to the position in which arm 35 is located.

Assuming that the transmitter is in motion and is scanning the picture appearing on band 1 shown in Figure 1, each time arm 11 reaches its extreme left, an extra long impulse will be transmitted due to the black band 3 appearing in that location throughout the length of the transmitted picture. As explained hereinbefore, the black band is wider than will be obtained at any part of an image being transmitted, these images being usually word images. This results in the transmission of a synchronizing impulse or an impulse of extra long length, the results of which will be described hereinafter.

As the motion of arm 11 continues from left to right, and vice versa, the variations of light striking the photoelectric cell 4 due to the varied intensity of the picture interposed between the source of light and the photoelectric cell will be transformed into electrical impulses and

no impulses which are transmitted by the transmitter and associated equipment.

It will be understood, of course, that the light rays are so directed that no light is impinged on the photoelectric cell except the light beams coming directly toward it at right angles to its plane. Accordingly, in the illustration given, when arm 11 is directly opposite the dark portion or outline of the figure Y so that the direct light beam normal to the plane of the film 1 is interposed by a portion of the figure Y, no light reaches the photoelectric cell, since there are no light beams at any angle other than at right angles.

The result is that as the arm 11 scans the image, variable amounts of light are impinged on the photoelectric cell, all directly in proportion to the variations in the shades of the image, opposite the image at successive scanned portions of the image. Accordingly, currents varying in accordance with the shade variations flow in the circuit in which the photoelectric cell is connected and these currents are either radiated by modulating a carrier to a receiving station or are transmitted by wire.

Assuming now that motor 13 of Figure 2 is set in motion by closing switch 14, said motion will be transmitted through gear 16, shaft 17, ratchet 21, pawl 19, to synchronizing disc 18. This motion will continue in the direction of the arrow until that portion of pawl 19 which extends beyond the periphery of disc 18 will come in contact with the tongue of pawl 31, thus disengaging ratchet 21 from synchronizing disc 18. Disc 18 will be brought to a stop, in turn stopping hollow shaft 22 and the oscillating motion of arm 24' at the extreme left hand side of the receiving mechanism.

The position of pawl 31 with respect to pawl 19 is such that when pawl 19 engages the tongue of pawl 31, hollow shaft 22 rotates until arm 24' is at its extreme left position ready to sweep to the right. Inasmuch as arms 52' and 24 are driven by motors in substantial synchronism, arm 52' is similarly in its extreme left position for sending a prolonged or synchronizing impulse.

With arm 11 on the synchronization band 3, a synchronizing signal is transmitted as previously described. At this time not only is pawl 19 engaged by the tongue of member 31, but the projection 18' has engaged the tooth of switch 35 which is sprung to the right (Figures 7 and 8) to engage its alternate contact. Accordingly the synchronizing signal received by the receiver is directed to the circuit including the slow-to-energize magnet 30 which thereupon is energized to actuate armature and pawl 31. Pawl 31 rocks about its pivot 32 against the action of spring 34, disengaging the tongue of member 31 from pawl 19, which will immediately fall into one of the teeth of ratchet wheel 21, thus imparting an oscillating motion to receiving arm 24, so that the two arms 52' and 24 are now not only oscillating in synchronism but are also oscillating in proper phase relation in respect to their angular motion.

At the end of each revolution of the receiver synchronization disc 18, the pawl 19 is about to disengage itself from ratchet 21 by striking pawl 31. However, at this moment and just before such possible disengagement, the transmitting arm 11 is entering the synhronization band 3, thus transmitting a synchronization impulse, and inasmuch as switch arm 35 is at this time thrown so as to close its right hand contact 114, Fig. 7, due to the pressure of the cam extension 18' on the periphery of synchronization disc 18, it will switch the incoming synchronizing signal into synchronizing magnet 30, allowing the pawl 19 to remain in mesh and to continue its rotary motion until transmission ceases.

The stylus 90 which rotates about pivot 25 in order to sweep from right to left over the picture retaining band, is also pivoted at 36 at right angles to its other pivot 25, so that the fork 24' is also permitted to oscillate up and down within the pole pieces 28 of polarized magnet 29.

It is therefore evident that as the receiving stylus 90 oscillates and the picture retainer 26 is moved along, every time arm 11 in Figure 1 passes over a dark portion of a photograph such as the one shown, it will transmit a facsimile signal which, when received at the receiving end, will act upon stylus 90 in such a way as to cause the marking end to come in contact with picture retainer 26, thus producing a marking in the same respective location as the dark portion on the transmitted photograph in a manner to be shown hereinafter. I therefore produce a picture identical to the one which is being transmitted but composed of lines closely grouped together, the quality of the picture depending upon the number of these lines per linear inch covered by the scanning arm of the transmitter and receiver.

In the system described above, receiver magnet energizing circuit flows to energize the image receiving magnet 29 or the synchronizing magnet 30 only when light is intercepted by a dark spot.

In a modified form of my invention, I contemplate having current flowing in the output of the photoelectric cell to actuate the transmitter, that current flowing to energize the synchronizing magnet 30 or signal magnet 29, as the case may be, when light is impinged on the photoelectric cell. As the receiver, a spring normally tends to operate stylus 90 into engagement with the paper, but is prevented from doing so by the energizing current in magnet 29. When a dark spot of the image is reached at the transmitter, an interruption in the signalling system occurs, resulting in a deenergization of magnet 29 and the consequent operation of stylus 90 against film 26 under action of its spring.

If it is preferred, the spring may be replaced by having the normal position of stylus 93 against film 26 and the energization of the magnet withdrawing the stylus from the film, as will be understood by those skilled in the art.

Or, if preferred to have a negative at the receiver, the stylus may, as in the present case, be operated into engagement with the film by energization of the magnet 29, in which case the light portions of the transmitted image will appear as dark portions and vice versa.

In this system, I may use a synchronizing impulse of different amplitude than any image impulse. In that case the band 3 is not needed, as shown in Fig. 1*a*. Instead I may extend the photoelectric cell 4 beyond the edge of the picture as at under the present band 3, replacing band 3 with a complete transparency greater than exists at the most transparent portion of the image film 1 so that when this portion is scanned, an increase in the photoelectric cell output current results in a corresponding increase in the receiver current amplitude. Relay 30 instead of being a slow-to-energize relay is responsive only to currents of this increased amplitude of the

synchronizing current. If, therefore, the synchronizing current is received, relay 30 will operate in response thereto.

In another form, as shown in Fig. 1*a*, this increased synchronizing current may be obtained by terminating the photoelectric cell 4 just before the portion of strip 3 and placing a second photoelectric cell 4*a* under present strip 3 more sensitive than cell 4 and therefore having a larger current output than the latter.

In the above I have not attempted to describe the details of the apparatus for carrying out my invention. Figures 1 and 2 are merely schematic circuit diagrams which illustrate in a general way the principles of my invention.

I shall now describe the various parts in detail.

In Figure 3 I show a detailed drawing of the right hand side elevation of the transmitter. Upon a frame 37 two uprights 38 are suitably mounted and are so shaped as to support a mandril 39 upon which the picture to be transmitted consisting of a roll 40 is mounted, free to rotate around the mandril 39.

The film roll 40 consists preferably of a translucent substance which will permit variable amounts of light to pass through at different points, depending on the picture but may, if preferred, merely consist of a roll on which an image is printed and which reflects varying quantities of light, depending on the image. Roll 40 passes between rollers 41 and 42, hence over platen 43 and is propelled forward in the direction shown by the arrow by rollers 44 and 45 in a manner to be described hereinafter. Upon the same frame 37 the synchronous motor 2, of any well known construction consisting of a field winding 47', core 48' and armature 49', is shown and is located so that its driving shaft 50', suitably supported in bearings, has secured thereto the worm 7 rotated by the drive shaft. Worm 7 is in proper mesh with worm gear 8. Gear 8 is secured to and imparts rotary motion to shaft 9 upon which cam 10 is securely fastened.

Bearing against cam 10 is a cam follower 52' (Figure 4) secured to and driving shaft 12. Coiled about shaft 12 is a spiral spring 53, one end of which is secured to arm 54 and the other end bearing against the bracket 69. Cam follower 52' is thus normally held in engagement with cam 10 by the action of coil spring 53.

At the other extremity of shaft 12, arm 54, securely connected to the shaft, carries the optical system of the device consisting of a source of light 55 mounted in a light beam reflector or director which limits the beam to light rays in a single direction as shown. These light rays are properly focused by objective lens 56 into a prism 57 which in turn reflects the single pencil of light rays at right angle to photoelectric cell 4 which, together with a portion of the platen 43 and rollers, is shown in cross-section.

Before impinging on the photoelectric cell, the ray of light must first pass through the image containing film and through the slit 43' of platen 43 provided for the purpose. By reason of the construction of reflector 57 and its relative position to the film, all of the light passes at right angles to the film and only through that portion of the film directly opposite the light reflector 57.

The operation of scanning should now be clear. With the armature shaft 50' of motor 2 rotating, worm 7 drives gear 8 to in turn rotate shaft 9 and cam 10.

As cam 10 rotates, cam follower 52' is oscillated back and forth, in turn rocking shaft 12. The source of light 55 and its associated mechanism is correspondingly oscillated, providing a sweeping movement for reflector 57 and thus moving the light beam from point to point on the image from one edge to the opposite edge, scanning a single arc line of the image.

Following the scanning of an arc line of the image, the film is stepped a sufficient distance to present a new arc line for scanning. This will now be described.

The film feeding mechanism comprises disc 59 which is secured and rotatable with shaft 9 and therefore revolves with worm gear 8. Upon disc 59 two pins 60 and 61 are secured and as the disc revolves, they come in contact with the projection 62' of arm 62 pivoted at 63. As the pins continue to rotate they impart a reciprocating motion to connecting link 64 secured at one end to arm 62 and at its opposite end to arm 65. As link 64 reciprocates, it in turn actuates arm 65 upon which pawl 66 is held under tension against a tooth of ratchet 67 by spring 68.

As shown, link 64 has secured thereto the collar 63', and slides in bracket 64' fastened to upright 38. When link 64 is moved to the left in the manner described above, collar 63' compresses the spring 65' interposed between the collar 63' and bracket 64' so that when pin 61 passes beyond and releases arm 62, link 64 is returned to the position shown. Reciprocating motion is thus imparted to link 64, resulting in moving pawl 66 to turn ratchet wheel 67 and then returning the pawl 66 to engage a new tooth.

It will be understood from the description to this point that the position of pins 60 and 61 is such that they respectively engage arm 62 when the arm 11 has been swung to either of its extreme positions and is about to return so that the roll is fed one step and the return of the scanner stylus is affected over an adjacent line to be scanned.

In Figure 4 I show a section through the main shaft 9 of the transmitter mounted in the bearing 69 formed in a bracket 69' and I show in detail worm gear 8 secured to and rotating shaft 9 to which is also secured for rotation therewith cam 10 and paper feed disc 59. In the same figure, finger 52' is shown in its respective location with cam 10.

Figure 6 is a top view of the transmitter with portion of it cut away to show the respective position of the photoelectric cell to the platen and the film.

Upon base 37, the two uprights 38 are securely mounted at 38'. The roll of film containing the image to be transmitted is also shown at 40 while rollers 42 and 45 are shown in their respective location. The main bearing 69 supports shaft 9 upon which worm gear 8, cam 10 and film feed disc 59 are secured. The scanning arm 11 carried by arm 54 is shown in a central position while the optical system, consisting of a source of light 55, objective lens 56 and prism 57, is shown mounted thereupon in the proper location.

Under platen 43, a portion of the photoelectric cell 4 is shown together with suitable mounting means. The photoelectric cell 4 is arcuate in shape and is supported at its extreme ends in fittings 58 by means of which circuit connections are made from the photoelectric cell to the transmitter. As shown, a slot 59 permits the narrow pencil of rays equal to the thickness of the line to be scanned to impinge upon the photoelectric cell. It will be noted that the arc covered by the arm 11 is the same as the arc of the photo-

electric cell, so that in every position of the reflector 57, it is opposite a point of the photoelectric cell. The operation of the transmitter is as follows:

When the circuit of the synchronous motor 2 is closed, its armature rotates, which in turn will drive worm 7. The worm gear 8, therefore, will rotate in the direction shown by the arrow, carrying with it its cam 10, and inasmuch as finger 52' bears against it and is held in that position by spring 53 (Figure 3), it is evident that arm 11 will oscillate from left to right at a speed determined by the synchronous motor.

As shaft 9 revolves, pins 60 and 61 will come in contact with arm 62 and will rock it in the direction of their motion, carrying with it connecting rod 64 and rocker arm 65 (Figure 3) so as to impart an intermittent rotating motion to ratchet 67, causing the film to advance a predetermined amount.

If the circuit controlling the source of light is closed a very sharp beam of light will be focused upon the photoelectric cell 4 and as this beam is intercepted by the dark portion of the picture appearing on film 40, a corresponding change will occur in the amplifying circuit to which the photoelectric cell is connected, thus transforming light changes into electrical changes. It is obvious that the entire transmitting unit is to be light tight and therefore a cover 71 protects the entire unit from external light and dust.

I claim:

1. In a facsimile transmitter, a scanner arm, a source of power, a cam, a cam follower, an oscillating member secured to said cam follower, an arm extending from said oscillating member and oscillating therewith, said scanner arm being pivotally supported on said arm, a light source, an oscillating reflector for throwing the light from said light source to successive points of a line of the image, said reflector being mounted on said oscillating member and an arc-shaped photo cell in the path of the light from said light source.

2. In a facsimile transmitter, a scanner arm, a source of power, a cam, a cam follower, an oscillating member secured to said cam follower, an arm extending from said oscillating member and oscillating therewith, said scanner arm being pivotally supported on said arm, a light source, an oscillating reflector for throwing the light from said light source to successive points of a line of the image, said reflector being mounted on said oscillating member, an arc-shaped photo cell in the path of the light from said light source, a record sheet in operative relation with said scanner arm, the image being scanned being on the recording sheet.

3. In a facsimile transmitter, a scanner arm, a source of power, a cam, a cam follower, an oscillating member secured to said cam follower, an arm extending from said oscillating member and oscillating therewith, said scanner arm being pivotally supported on said arm, a light source, an oscillating reflector for throwing the light from said light source to successive points of a line of the image, said reflector being mounted on said oscillating member, an arc-shaped photo cell in the path of the light from said light source, a record sheet in operative relation with said scanner arm, the image being scanned being on the record sheet, said sheet having a synchronizing signal control portion periodically scanned by said scanner arm.

4. In a facsimile transmitter, a scanner arm, a source of power, a cam, a cam follower, an oscillating member secured to said cam follower, an arm extending from said oscillating member and oscillating therewith, said scanner arm being pivotally supported on said arm, a light source, an oscillating reflector for throwing the light from said light source to successive points of a line of the image for scanning, said reflector being mounted on said oscillating member, an arc-shaped photo cell in the path of the light from said light source, a record sheet in operative relation with said scanner arm, a feeder for said sheet, the image being scanned being on the recording sheet, said sheet having a synchronizing signal control portion periodically scanned by said scanner arm.

5. In a facsimile transmitter, a scanner arm, a source of power, a cam, a cam follower, an oscillating member secured to said cam follower, an arm extending from said oscillating member and oscillating therewith, said scanner arm being pivotally supported on said arm, a light source, an oscillating reflector for throwing the light from said light source to successive points of a line of the image for scanning, said reflector being mounted on said oscillating member, an arc-shaped photo cell in the path of the light from said light source, a record sheet in operative relation with said scanner arm, a feeder for said sheet, the image being scanned being on the record sheet, said sheet having a synchronizing signal control portion, a reciprocating arm for operating said feeder, a pawl and ratchet connection from said source of power to said cam, a member driven by said motor when said pawl engages said ratchet for reciprocating said arm once for each scanning cycle to feed said sheet to successive lines.

6. In a picture transmitter, a record sheet having a record thereon adapted to be scanned; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed in cooperative relationship with respect to said record sheet and said light ray adapted to be controlled by said ray at any point of its scanning travel; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

7. In a facsimile transmitter, a translucent record sheet adapted to be scanned having a record thereon and permitting varying amounts of light to pass therethrough in accordance with the different light permeabilities of the record sheet; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed adjacent said record sheet adapted to be controlled by said light ray passing through said record sheet and impinging thereupon at any point of the scanning travel of said ray; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

8. In a facsimile transmitter, a translucent record sheet adapted to be scanned having a record thereon and permitting varying amounts of light to pass therethrough in accordance with the different light permeabilities of the record sheet; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed adjacent said record sheet adapted to be controlled by said light ray passing through said

record sheet and impinging thereupon at any point of the scanning travel of said ray; a supporting platen for said record sheet, said supporting platen having a slit therein for permitting the passage of said light ray through said record sheet onto said light-sensitive cell; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

9. In a facsimile transmitter, a translucent record sheet adapted to be scanned having a record thereon and permitting varying amounts of light to pass therethrough in accordance with the different light permeabilities of the record sheet; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed adjacent said record sheet adapted to be controlled by said light ray passing through said record sheet and impinging thereupon at any point of the scanning travel of said ray; means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto; a supporting platen for said record sheet, said supporting platen having an arc-shaped slit therein conforming to the path of travel of said light ray for permitting the passage of said light ray through said record sheet onto said light-sensitive cell, said cell also being arc-shaped and in alignment with said slit.

10. In a picture transmitter, a record sheet having a record thereon adapted to be scanned; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a curvilinear light-sensitive cell conforming to the arcuate path of the scanning travel of said light ray disposed in cooperative relationship with respect to said record sheet and said light ray adapted to be controlled by said ray at any point of its scanning travel; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

11. In a picture transmitter, a record sheet having a record thereon adapted to be scanned; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet comprising an objective lens and a prism for focusing the light therefrom onto said record sheet; a linear light-sensitive cell disposed in cooperative relationship with respect to said record sheet and said light ray adapted to be controlled by said ray at any point of its scanning travel; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

12. In a picture transmitter, a record sheet having a record thereon adapted to be scanned; a scanning unit adapted to move in a plane substantially parallel to the plane of said record sheet at the scanning portion thereof including a pivoted arm having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet, said last-mentioned means comprising a lens system including a prism for directing said concentrated ray onto said record sheet substantially perpendicularly to the plane thereof; a linear light-sensitive cell disposed in cooperative relationship with respect to said record sheet and said light ray adapted to be controlled by said ray at any point of its scanning travel; and means for angularly rocking said arm to impart a to-and-fro pivotal scanning movement.

13. In a facsimile transmitter, a translucent record sheet adapted to be scanned having a record thereon and permitting varying amounts of light to pass therethrough in accordance with the different light permeabilities of the record sheet; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet comprising a lens system including a prism for directing the light ray onto said record sheet substantially perpendicularly to the plane thereof; a linear light-sensitive cell disposed adjacent said record sheet adapted to be controlled by said light ray passing through said record sheet and impinging thereupon at any point of the scanning travel of said ray; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

14. The combination set forth in claim 6 wherein said last-mentioned means comprises a source of motive power, a cam driven by said source of power, and a cam follower connected to said pivoted carrier controlled by said cam.

15. The combination set forth in claim 7 wherein said last-mentioned means comprises a source of motive power, a cam driven by said source of power, a post member having said pivoted carrier attached to one end thereof, a cam follower attached to the opposite end of said post member, and resilient means associated with said post for maintaining said cam follower in contact with said cam.

16. In a picture transmitting system, a record sheet having a record thereon adapted to be scanned and an allotted portion for controlling the production of a synchronizing impulse; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed in cooperative relationship with respect to said record sheet and said light ray adapted to be controlled by said ray at any point of its scanning travel to effect at least a scanning of the record on said record sheet; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

17. In a picture transmitting system, a record sheet having a record zone bearing a record adapted to be scanned and a synchronizing zone for controlling the production of a synchronizing impulse; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed in cooperative relationship with respect to said record sheet and said light-ray adapted to be controlled by said ray at any point of its scanning travel in accordance with the light variations of said record; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

18. In a facsimile transmitter, a translucent record sheet having a record thereon adapted to be scanned and an allotted portion for controlling the production of a synchronizing impulse, said record sheet permitting varying amounts of light to pass therethrough in accordance with the different light permeabilities of the record sheet; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed

adjacent said record sheet adapted to be controlled by said light ray passing through said record sheet and impinging thereupon at any point of the scanning travel of said ray in accordance with the different light permeabilities of said record sheet; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

19. The combination set forth in claim 18 wherein is provided a supporting platen for said record sheet, said supporting platen having a slit therein for permitting the passage of the light ray through said record sheet onto said light-sensitive cell.

20. In a facsimile transmitter, a translucent record sheet having a record zone bearing a record adapted to be scanned and a synchronizing zone for controlling the production of a synchronizing impulse consisting of an extra long signal period, said record sheet permitting varying amounts of light to pass therethrough in accordance with the different light permeabilities of the record sheet; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed adjacent said record sheet and extending opposite both said record and synchronizing zones of said record sheet adapted to be controlled by said light ray passing through said record sheet and impinging thereupon at any point of the scanning travel of said ray in accordance with the different light permeabilities of said record sheet; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

21. The combination set forth in claim 20 wherein is provided a supporting platen for said record sheet, said supporting platen having an arcuate slit therein for permitting the passage of the light ray through said record sheet onto said light-sensitive cell.

22. In a facsimile transmitter, a translucent record sheet having a record zone bearing a record adapted to be scanned and a synchronizing zone for controlling the production of a synchronizing impulse consisting of a signal of higher amplitude than the normal record signals, said record sheet permitting varying amounts of light to pass therethrough in accordance with the different light permeabilities of the record sheet; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed adjacent said record sheet adapted to be controlled by said light ray passing through said record sheet and impinging thereupon at any point of the scanning travel of said ray in accordance with the different light permeabilities of said record sheet; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

23. In a facsimile transmitter, a translucent record sheet having a record zone bearing a record adapted to be scanned and a synchronizing zone for controlling the production of a synchronizing impulse consisting of a signal of higher amplitude than the normal record signals, said record sheet permitting varying amounts of light to pass therethrough in accordance with the different light permeabilities of the record sheet; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed adjacent said record sheet opposite said record zone adapted to be controlled by said light ray passing through said record sheet and impinging thereupon at any point of the scanning travel of said ray in accordance with the different light permeabilities of said record; a second light-sensitive cell disposed adjacent said record sheet within the field of said synchronizing zone adapted to be impinged upon by said light ray passing through said record sheet, said second cell having a higher sensitivity than said first cell whereby an impulse of greater amplitude is produced thereby than the normal record signals from a record sheet of substantially uniform texture; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

24. In a picture transmitter, a record sheet having a record thereon adapted to be scanned; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed in cooperative relationship with respect to said record sheet and said light ray adapted to be controlled by said ray at any point of its scanning travel; means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto; and means operative concomitantly with said last-mentioned means for successively feeding said record sheet for cooperation with said scanning unit.

25. In a facsimile transmitter, a translucent record sheet adapted to be scanned having a record thereon and permitting varying amounts of light to pass therethrough in accordance with the different light permeabilities of the record sheet; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed adjacent said record sheet adapted to be controlled by said light ray passing through said record sheet and impinging thereupon at any point of the scanning travel of said ray; driving means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto; and a line-by-line feeding mechanism for said record sheet actuated by said driving means synchronously with the pivotal scanning movement of said carrier comprised in said scanning unit for presenting successive lines of said record sheet for cooperation with said scanning unit.

26. The combination claimed in claim 25 wherein said line-by-line feeding mechanism for said record sheet comprises a disk rotatably actuated by said driving means, pin means on said disk, an arm in the path of said pin means adapted to be engaged periodically thereby for imparting a reciprocating motion to said arm, and means controlled by said reciprocating arm for feeding said record sheet line by line.

27. In a facsimile transmitter, a record sheet having a record zone bearing a record adapted to be scanned and a synchronizing zone for controlling the production of a synchronizing impulse consisting of a signal of higher amplitude than the normal record signals, said record sheet permitting varying amounts of light to pass therethrough in accordance with the different light permeabilities of the record sheet; a scanning unit comprising a pivoted carrier having thereon a light source and means for concentrating a

light ray emanating therefrom onto said record sheet; a linear light-sensitive cell disposed adjacent said record sheet opposite said record zone adapted to be controlled by said light ray passing through said record sheet and impinging thereupon at any point of the scanning travel of said ray in accordance with the different light permeabilities of said record; a second light-sensitive cell disposed adjacent said record sheet within the field of said synchronizing zone adapted to be impinged upon by said light ray passing through said record sheet to produce the synchronizing impulse; and means for oscillating said carrier to impart a to-and-fro pivotal scanning movement thereto.

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