

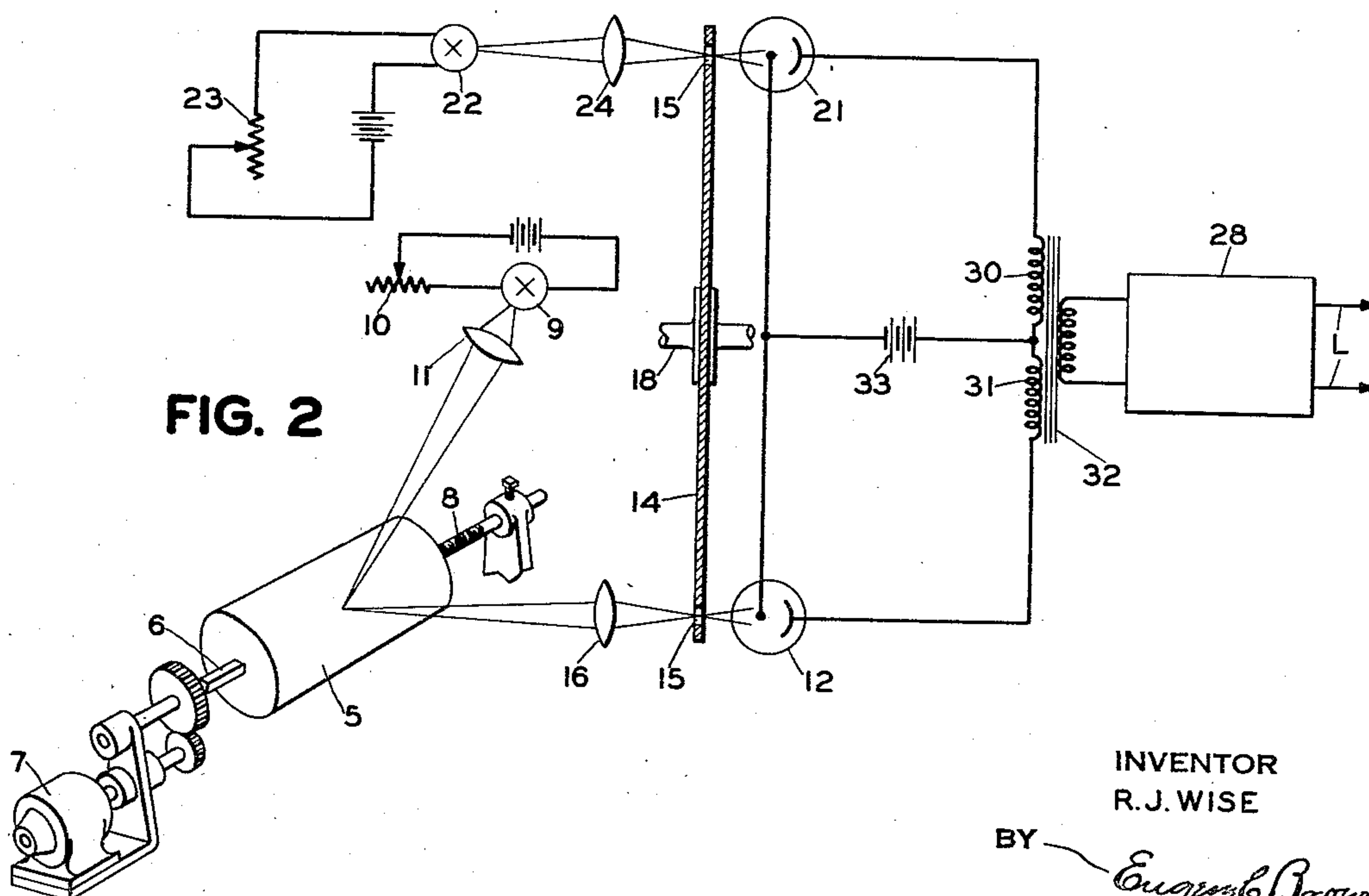
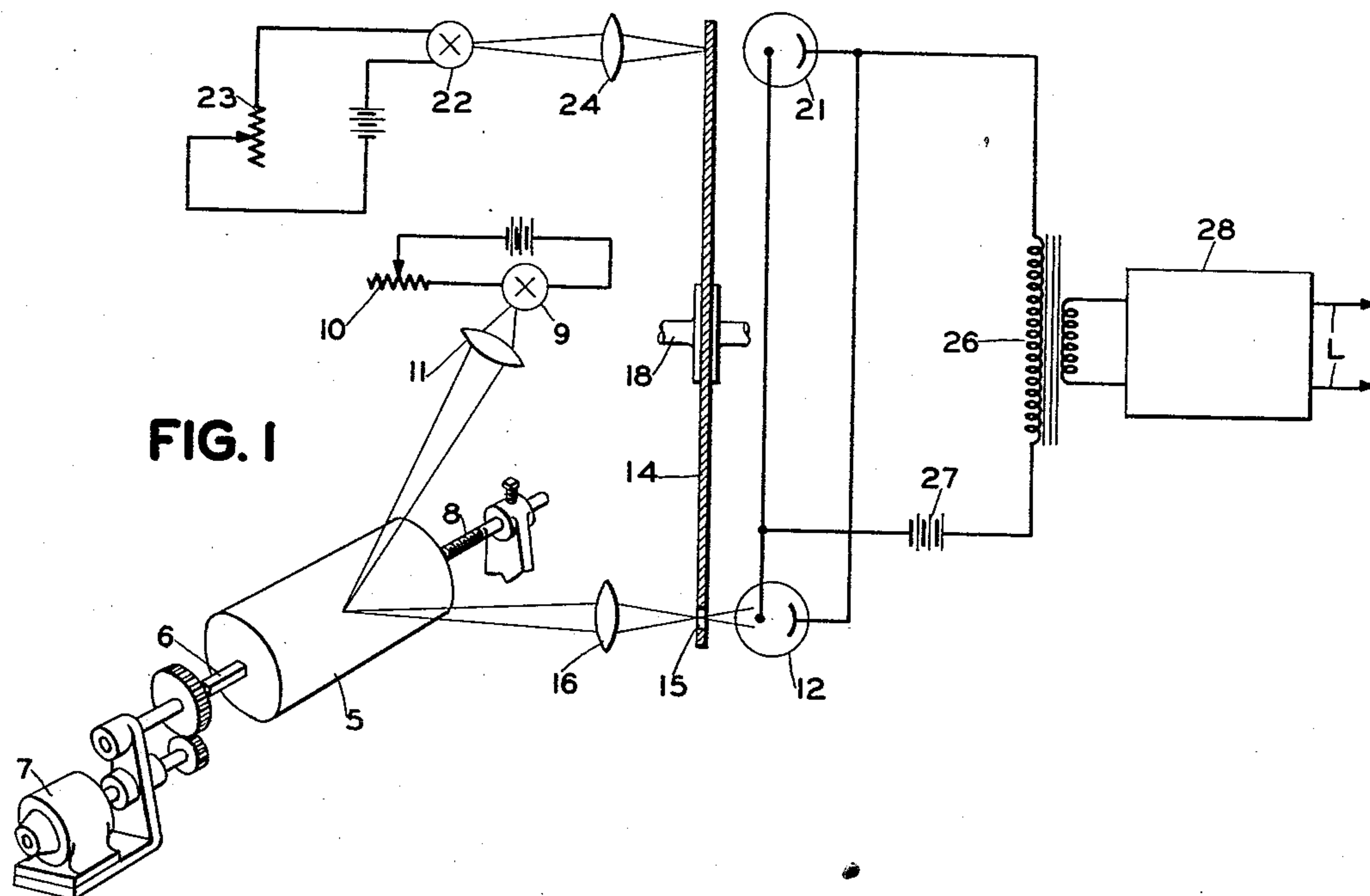
Oct. 17, 1939.

R. J. WISE

2,176,442

SIGNAL PRODUCING MEANS

Filed Dec. 31, 1935



INVENTOR
R. J. WISE

BY *Eugene L. Brown*
ATTORNEY

UNITED STATES PATENT OFFICE

2,176,442

SIGNAL PRODUCING MEANS

Raleigh J. Wise, Dunellen, N. J., assignor to The
Western Union Telegraph Company, New York,
N. Y., a corporation of New York

Application December 31, 1935, Serial No. 57,019

1 Claim. (Cl. 178—7.1)

The present invention relates to optical signal producing arrangements and more particularly to novel arrangements for reversing the effect of light incident upon a photosensitive device to permit reception of a positive record from a positive representation of a picture or message.

The primary object of this invention is to provide a transmitting arrangement employing photoelectric cells in a novel manner whereby the light values of successive elements of a scanned field acting on one of the photosensitive devices serve to produce a signal output suitable for reproduction of a positive image.

Optical transmitting arrangements employing two photocells as disclosed in the prior art for producing an inverted picture modulated output do not provide for independent adjustment of the amount of light incident on each cell to compensate for unavoidable differences in the cells. Accordingly, another object of the present invention is to provide a novel arrangement employing two photocells to enable reception of a positive record from a positive representation of an image to be transmitted and for independent regulation of the light incident on each photocell.

Still another object of the present invention resides in the provision of coupling means employed in a novel manner between a photoelectric scanning device and a circuit in communication with a receiving device.

Other and more specific objects of the invention will appear from the following detailed description of two illustrative embodiments:

Fig. 1 is a diagrammatic illustration of a photoelectric pickup system embodying the invention in its preferred form; and

Fig. 2 is a view similar to Fig. 1 illustrating a modification.

The optical pickup arrangement of the present invention is particularly adapted for facsimile picture or message transmission when a positive record is desired and therefore the invention will be described as applied to this use. Referring to Fig. 1 of the drawing, the subject matter to be scanned may conveniently be mounted upon a drum 5 which is rotated through a suitable driving connection 6 by a motor 7. Means 8 are provided for advancing the message drum axially as it rotates so that the entire field will be covered by the scanning beam of light. Light from a suitable source 9 is concentrated by the lens 11 upon the surface to be scanned and is reflected into the photosensitive device 12, the latter being suitably supported in a housing or the like (not shown) at a proper distance from the outer

periphery of the cylinder 5. The light source 9 is preferably of adjustable intensity and the rheostat 10 provides a simple means for securing adjustment of the light intensity; however, any means giving an equivalent result may be used. The spot of light projected upon the surface of the cylinder 5 by the lens 11 is caused to traverse the cylinder in a longitudinal direction as the cylinder rotates by reason of the axial movement of the cylinder, the means 8 determining the extent of movement of the cylinder during each rotation. In this manner the spot of light will follow a helical path as the cylinder 5 is rotated, thus producing a scanning action.

The foregoing method of obtaining a scanning movement per se is well known, as are various other methods of scanning a given field, and it is to be understood that any of the known methods of scanning may be employed in practicing the invention.

The light which is incident upon the photocell, is interrupted by a shutter or light chopper 14 which may be a disc as illustrated, having a series of equally spaced openings or notches 15 adjacent its outer edge. Where the reflected beam is to be interrupted, a lens 16 serves to bring the reflected light beam to a focus substantially in the plane of the disc 14 so that it may pass through the openings 15 in succession. The disc 14 is secured upon a rotatable shaft 18 which is driven in any suitable manner either from the motor 7 or a separate source of mechanical power. The number of holes in the disc and the speed of rotation of the shaft may vary within wide limits, depending upon the desired rate of scanning, the constants of the communication circuit employed between stations, and other factors. The output appearing across the terminal of the photocell 12 is of such a character as to cause reproduction of a negative record in the usual receiver employed in facsimile systems. As stated above, the present invention is concerned with providing a pickup system furnishing an output suitable for the reproduction of positive record and this purpose is efficiently accomplished by employing a second photocell 21 connected in parallel with the cell 12.

A second source of light 22 adjustable in intensity as by the rheostat 23 is provided to illuminate the photocell 21. A lens 24 corresponding in function to the lens 16 serves to bring the light beam from the source to a focus substantially in the plane of the disc 14 so as to facilitate chopping of the beam. The source 22 is so positioned that when the picture modulated beam

from the source 9 is incident on the cell 12, through an opening 15 in the chopper, the unmodulated beam from the source 22 is cut off. It will be understood that it is within the scope of my invention to use separate light interrupters or shutters before each of the cells 12 and 21 and to arrange for operation of the light interrupters to produce alternate illumination of the cells from their respective light sources. A chopper or choppers may be dispensed with if light sources of the glow type illuminated intermittently are employed. Such sources if used may conveniently be supplied with alternating currents of a selected frequency and proper phase displacement to secure alternate illumination of the photocells.

The interconnected terminals of the photocells are connected to the primary of a transformer 26, the connection between the cathodes and the transformer primary including a source of potential illustrated as the battery 27. It will be understood that the battery 27 may be placed in either connection to the primary provided that the negative terminal of the battery is in communication with the cathodes of the photocells. The transformer 26 is preferably of special design having a relatively large number of turns, and it is to be noted that the entire primary is utilized. The combined output of the photocells is impressed on the amplifier 28 from the secondary of the transformer 26. The amplifier 28 in turn is connected to communication L over which the signals are to be transmitted to a remote facsimile receiver (not shown) of a suitable kind.

In operation of the arrangement described, the light from the source 9 is projected upon the background or lightest area of the positive subject matter on the drum 15 and with the chopper 14 rotating, the intensity of the beam from the source 22 is regulated so that the combined output of the two cells is substantially constant. As the beam from the source 9 traverses the subject matter on the peripheral surface of the drum 5, the record as reproduced at the receiver will show dark portions when the darkest portion of the subject matter to be transmitted is scanned and proportional gradations for different light values of the original.

If a received record is desired having less contrast than the original, an adjustment may be made with the light from the source 9 incident on the lightest portion, or example, of the scanned field, and the light from the source 22 may be adjusted so that any desired amount of alternating current output is derived from the cells 12 and 21. In this condition of the system, the amount of unbalance as the scanning proceeds is determined by the contrast desired. The light value, therefore, of the background of the received record can be readily controlled.

The ease of adjustment of the amount of light in either beam affords a ready means of compensating optically for differences in the characteristics of the photocells 12 and 21.

In the modified form of the invention illustrated by Fig. 2 of the drawing, the light sources and the general optical arrangement are similar

to that already fully described in connection with Fig. 1 and like elements have been given similar reference characters. The photocell 21 and the light source 22 are arranged with respect to the perforations 15 in the disc 14 in a manner to provide simultaneous illumination of the cells 12 and 21. These cells are connected in a bridge circuit and form two arms thereof. The remaining two bridge arms are the primary sections 30 and 31 of the transformer 32. A battery 33 furnishes the operating potential for the two photocells and it is connected with the cells and the transformer primaries in such a manner that the photoelectric current from one cell opposes that from the other cell permitting the cells to be simultaneously rather than alternately illuminated. Light interruption may be accomplished by substituting for the disc 14 the means set forth above.

In operation, the beams from the sources 9 and 22 are chopped in phase and the light from the source 22 is adjusted so that the photoelectric currents from the two cells are equal and magnetically opposite while scanning the lightest portion of the subject matter on the drum 5. As the darker portions of the subject matter are scanned, an alternating current appears in the secondary of the transformer 32. This secondary current for a given portion of the scanned field corresponds in wave form to the wave form of the combined output of the photocells of Fig. 1 appearing in the secondary of transformer 26. As stated in connection with Fig. 1, the optical arrangement disclosed permits ready adjustment of the two light beams to compensate for differences in the characteristics of the two cells.

While I have described and explained my invention in detail in connection with two illustrative embodiments thereof, it is to be understood that the invention may be embodied in other forms, and, therefore, the invention is not limited except as indicated by the terms and scope of the appended claim.

I claim:

In a photoelectric pick-up arrangement for producing an inversion of picture currents, two photoelectric cells each comprising a plurality of electrodes, a light source, means to supply intermittent light from said source and means for modulating said light in accordance with a positive copy of given subject matter, means for projecting said intermittent modulated light onto one of said cells, an independent light source, means to supply intermittent light from said independent source for illuminating the other of said cells simultaneously with picture modulated illumination of said first cell, a direct current source, means connecting corresponding electrodes of said cells with one terminal of said source, a transformer having a primary winding provided with a center tap connected to the remaining terminal of said source, and means connecting the terminals of said primary winding with other corresponding electrodes of said cells whereby the output of said cells is combined in said primary 180° out of phase to effect an inversion of picture currents.

RALEIGH J. WISE.