

June 19, 1928.

H. E. IVES

1,673,828

TELEVISION

Filed May 20, 1926

2 Sheets-Sheet 1

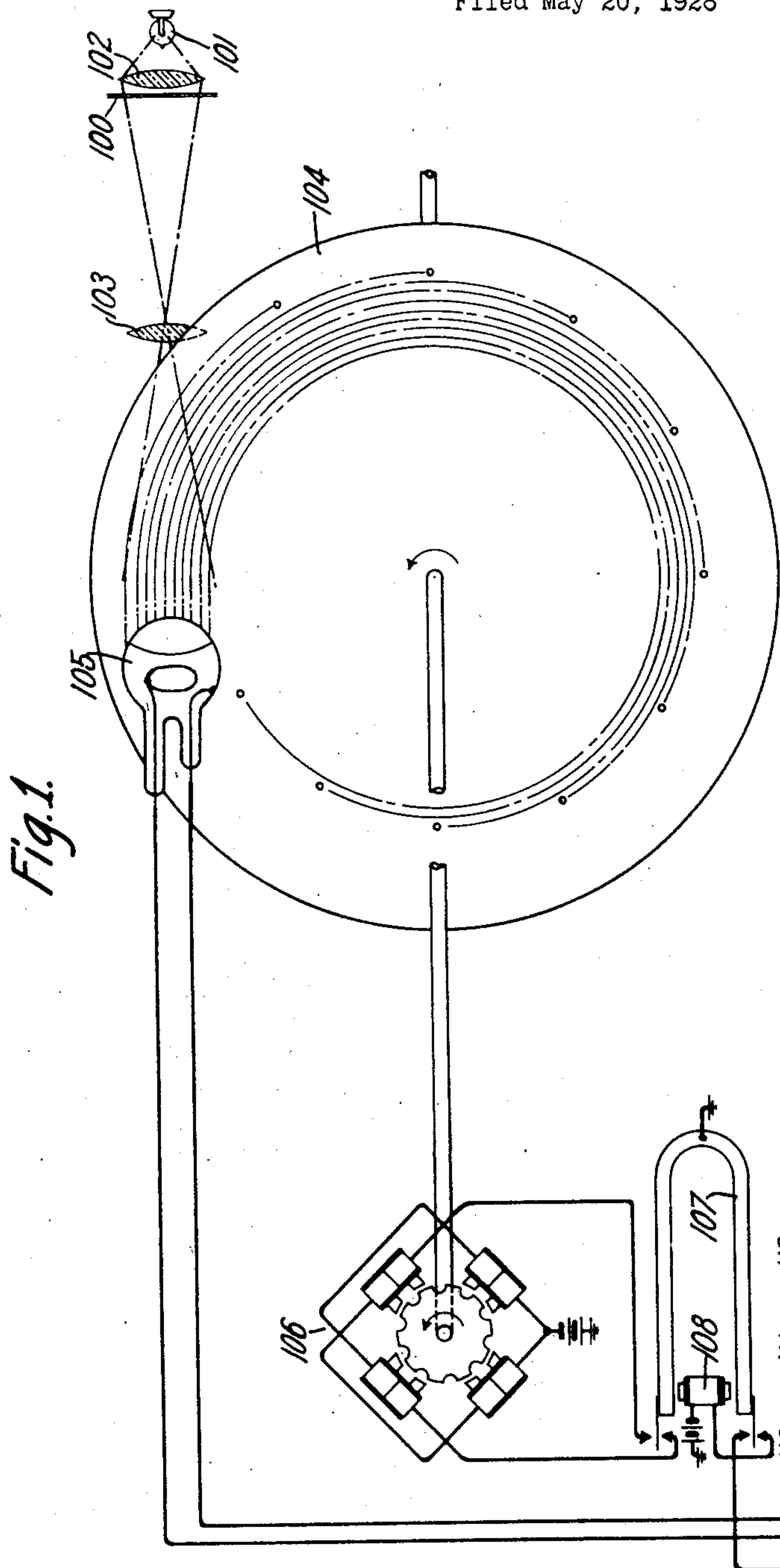
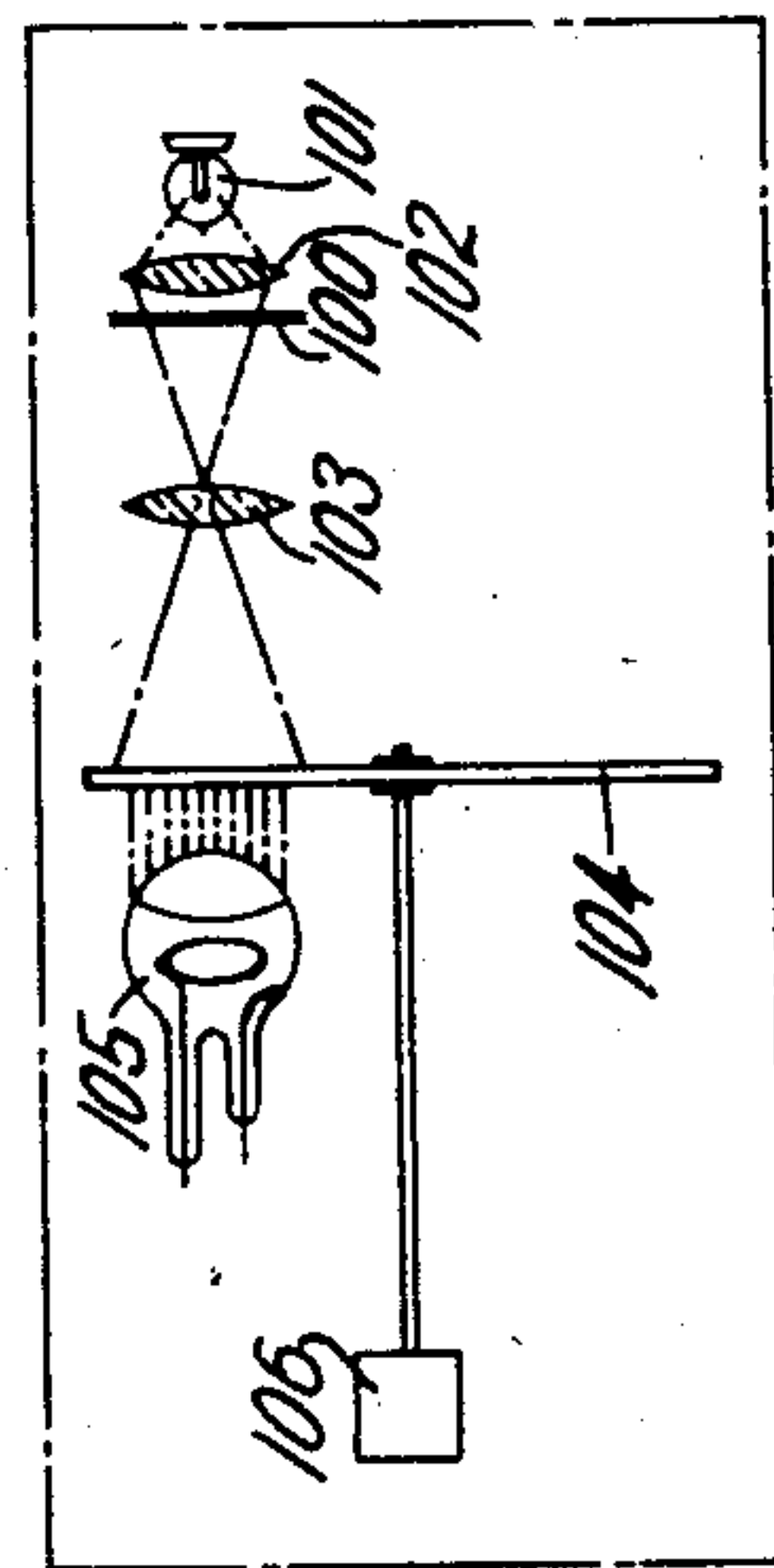


Fig. 3.



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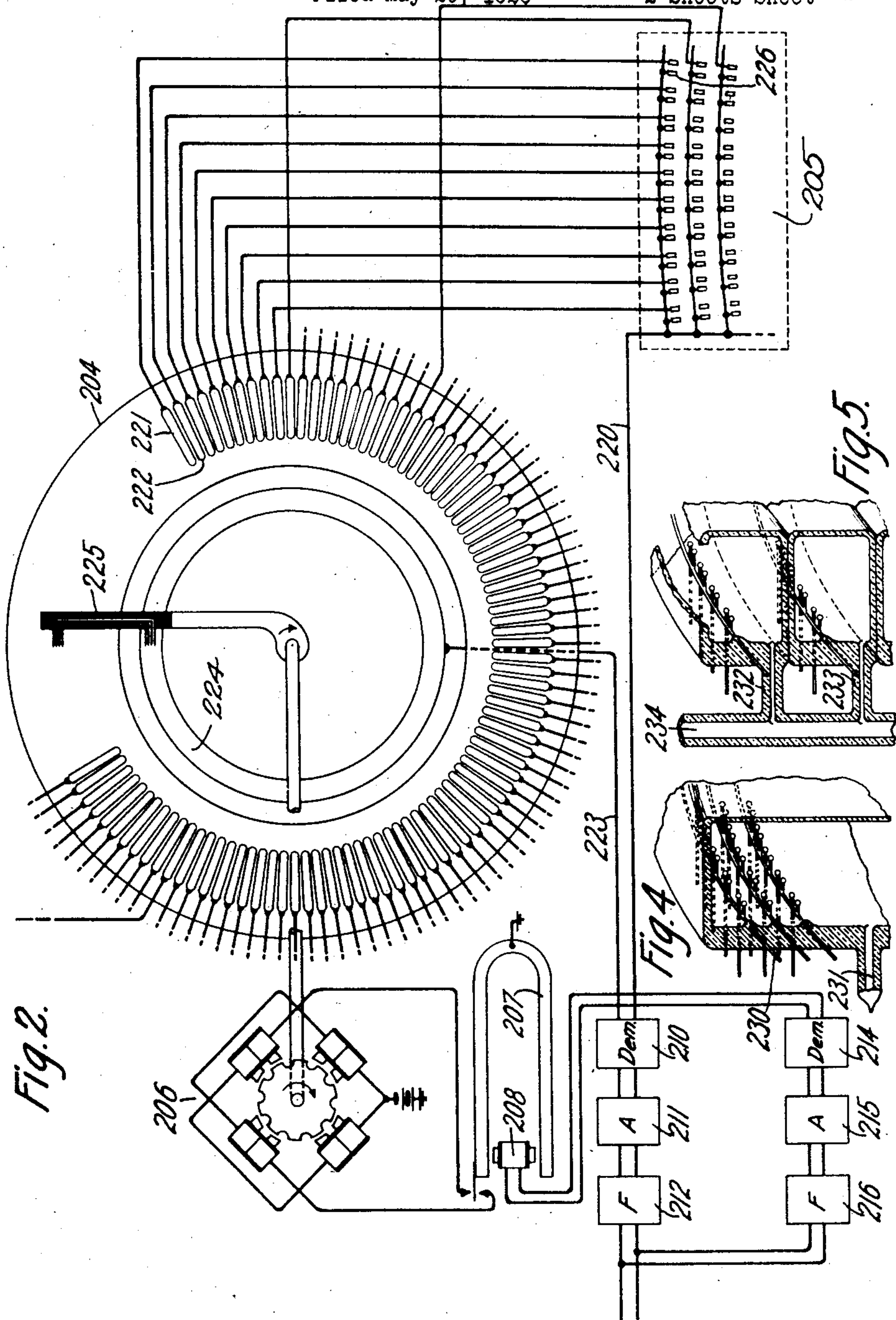
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

HERBERT E. IVES, OF MONTCLAIR, NEW JERSEY, ASSIGNOR TO BELL TELEPHONE LABORATORIES INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

TELEVISION.

Application filed May 20, 1926. Serial No. 110,379.

This invention relates to the electrical transmission of views or pictures to a distant point and particularly to television.

It is the general object of the invention to improve the operation of television and picture transmission systems employing a picture or scene reproducing field made up of a plurality of light sources under control of transmitted currents.

Electro-optical systems such, for example, as television systems have heretofore been designed in which a plurality of light sources have been utilized to produce the image at the receiving point, the light sources being successively associated with the transmission line by communicating means so that the lights are actuated in synchronism with the scanning at the transmitting point.

In accordance with the present invention a lamp bank of this general type is used at the receiving station and the light producing elements are arranged to conform in shape to that of the lines along which scanning is taking place at the transmitting point. This lamp may have a single chamber or a plurality of chambers united for the purpose of maintaining uniform gas pressure. In the particular system hereinafter described in detail the scanning is produced by a large scanning disc having a plurality of spirally arranged apertures each of which passes across the field in succession in arcuate lines. The current transmitted over the line is directed by a commutating device to pairs of electrodes in the lamp bank in the same order as the scanning. The rows of light producing elements are arcuated in shape to conform to the lines of scanning at the transmitting point.

In the drawings Fig. 1 represents a sending station and Fig. 2 a receiving station in a television system.

Fig. 3 shows a side view of the optical system of Fig. 1.

Fig. 4 gives a detail of a possible arrangement of the electrodes in a single evacuated vessel.

Fig. 5 shows a possible arrangement of a plurality of evacuated vessels.

At the sending station film 100 represents a picture or image to be transmitted, illuminated by lamp 101 and lens 102. The lens 103 focuses an image of film 100 on the scanning disc 104. This disc is of large size so that scanning may be rapid and so that the curvature of the line of scanning will be reduced. The photoelectric cell 105 is also of large size and receives the beams of light from the disc 104 directly.

The disc may be driven in any desirable manner, a LaCour motor 106 being shown under the control of a tuning fork 107. The fork 107 is driven by a self-interrupting circuit through magnet 108 and, in addition to driving motor 106, sends out synchronizing impulses to control the apparatus at the receiving station. An oscillator 113, modulator 114, amplifier 115 and filter 116 are employed to transmit the synchronizing impulses to the receiving station. Similarly an oscillator 109, modulator 110, amplifier 111 and filter 112 transmit a current wave, which is modulated by the photoelectric current from the cell 105, to the receiving apparatus. For a complete description of suitable apparatus for this purpose reference may be made to United States application, Serial No. 681,347, of Maurice B. Long, filed December 18, 1923.

At the receiving station filter 216, amplifier 215 and demodulator 214 transmit the synchronizing impulses to magnet 208 which drives tuning fork 207. Similarly filter 212, amplifier 211 and demodulator 210 reproduce the photoelectric current to control the multi-electrode lamp 205. The tuning fork 207 is shown driving a LaCour motor 206 or any other suitable driving means.

The lamp 205 consists of a large evacuated vessel containing a large number of pairs of terminals. One terminal of each pair is connected to conductor 220 which extends to demodulator 210. The other terminal of each pair is connected to a conducting strip in a

commutator device 204. For convenience in drawing, the terminals have been shown parallel with one another although in practice and for compactness one electrode might be in the form of a cylinder surrounding the other. Similarly the limitations of the drawing accentuate the arcuate arrangement of the electrodes. The arrangement is preferably arcuate since the scanning apertures scan the image in concentric arcs.

The commutator arrangement has been shown in the form of a disc corresponding in size to the scanning disc. In this disc are arranged a plurality of commutating strips 221, 222, etc. Conductor 223 from the demodulator is extended to the ring 224, a brush 225 serves to connect ring 224 with the segments 221, etc. A typical circuit may therefore be traced from the demodulator over conductor 220 through a pair of electrodes such as pair 226, a commutator strip such as 221, brush 225, ring 224, conductor 223, back to the demodulator. Successive connections extend over strip 222, etc.

The distance between successive apertures of the scanning disc 104 is sufficient to insure that only one aperture sweeps across the image focused on the disc 104 at a time. As each aperture passes across the image a current is generated in the photoelectric cell representing the variations of light intensity in the image. Each row of electrodes in lamp 205 corresponds to the strip of the image scanned by a single aperture. Having determined the size of the lamp to be used, as many pairs of electrodes will be included in a single row as possible in order to give as accurate detail in the reproduction as possible. As many commutator strips 221, 222, etc. are provided on disc 204 as there are pairs of electrodes in the lamp 205. In the arrangement shown these are distributed along the arc of a circle. The closeness of these strips is varied slightly since the actual length of the scanning arc varies slightly with the distance from the center of the scanning disc. Brush 225 is rotated over the strips 221, 222, etc. at the same rate as the scanning disc is rotated. Hence the pairs of electrodes will be connected with the transmission line at the same speed as the original image is scanned. The light produced by each pair of electrodes will be proportional to the photoelectric current due to the scanning of the corresponding portion of the image and since both scanning and reproduction take place at high speed, a composite image will be produced due to the visual lag of the observer which will correspond very closely to the image at the sending station.

Fig. 4 shows a portion of a suitable lamp 205. One terminal of each pair of electrodes is shown connected to a common conductor such as 230 while the other electrode of each

pair is carried through the glass directly. An exhaust tube 231 is shown by means of which the vessel is evacuated.

Fig. 5 shows a large lamp made up of a plurality of similar vessels each vessel containing a single strip of electrodes. Each vessel is provided with an evacuating tube 232, 233, etc., all of which are sealed into a common tube 234 by means of which the vessels may be evacuated simultaneously.

As indicated above, the lamp to be used in this system is a glow discharge lamp which may have been filled with any desired gas such as neon and then evacuated to the glow discharge stage. If a plurality of single electrode tubes were used it is extremely unlikely that the pressure would be the same in all the tubes. This would lead to the result that the color might vary from tube to tube and the amount of glow for a given exciting current might vary considerably, distorting the image. By the use of the multi-electrode lamp the gas pressure is the same for all electrodes, and the color and current response will be the same.

What is claimed is:

1. A lamp bank for use as an image producing means in an electro-optical system comprising a plurality of substantially parallel non-rectilinear rows of light producing elements, the shape of said rows corresponding to the shape of the lines along which the object is scanned.
2. An electro-optical system comprising means for scanning an object along a non-rectilinear line, means for transmitting the resultant image current to a receiving point, and means controlled by said current for producing an image of the object comprising a source of light producing elements in a row conforming to the shape of the scanning line.
3. An electro-optical system comprising means for scanning an object along a plurality of non-rectilinear lines, means for transmitting the resultant image current to a receiving point, and means controlled by said current for producing an image of the object comprising a plurality of rows of light producing elements, each row corresponding in shape to one of the scanning lines at the transmitting point.
4. An electro-optical system comprising a scanning disc having a spirally arranged row of apertures, means for transmitting the image current to a receiving point, and means controlled by said current for producing an image of the object comprising a bank of light producing elements arranged in a plurality of arcuate rows.
5. An electro-optical system in accordance with claim 2 comprising an evacuated vessel supporting said light producing elements and within which the light is produced.
6. An electro-optical system in accordance with claim 2 comprising a plurality of similar vessels each containing a single strip of electrodes, each vessel being provided with an evacuating tube, all of which are sealed into a common tube by means of which the vessels may be evacuated simultaneously.

ance with claim 3 in which said light producing means comprises a plurality of communicating evacuated vessels, one for each row of light producing elements, each vessel supporting the light producing elements in that row and the light being produced within said vessel.

7. An electro-optical system comprising a scanning disc containing a plurality of spirally arranged apertures, means for trans-

mitting the image current produced by scanning to a receiving point, and means controlled by said current to produce an image of the object comprising a plurality of light producing elements positioned in arcuate rows, each row being under the control of currents produced by one of said apertures. 15

In witness whereof, I hereunto subscribe my name this 19th day of May, A. D. 1926.

HERBERT E. IVES.