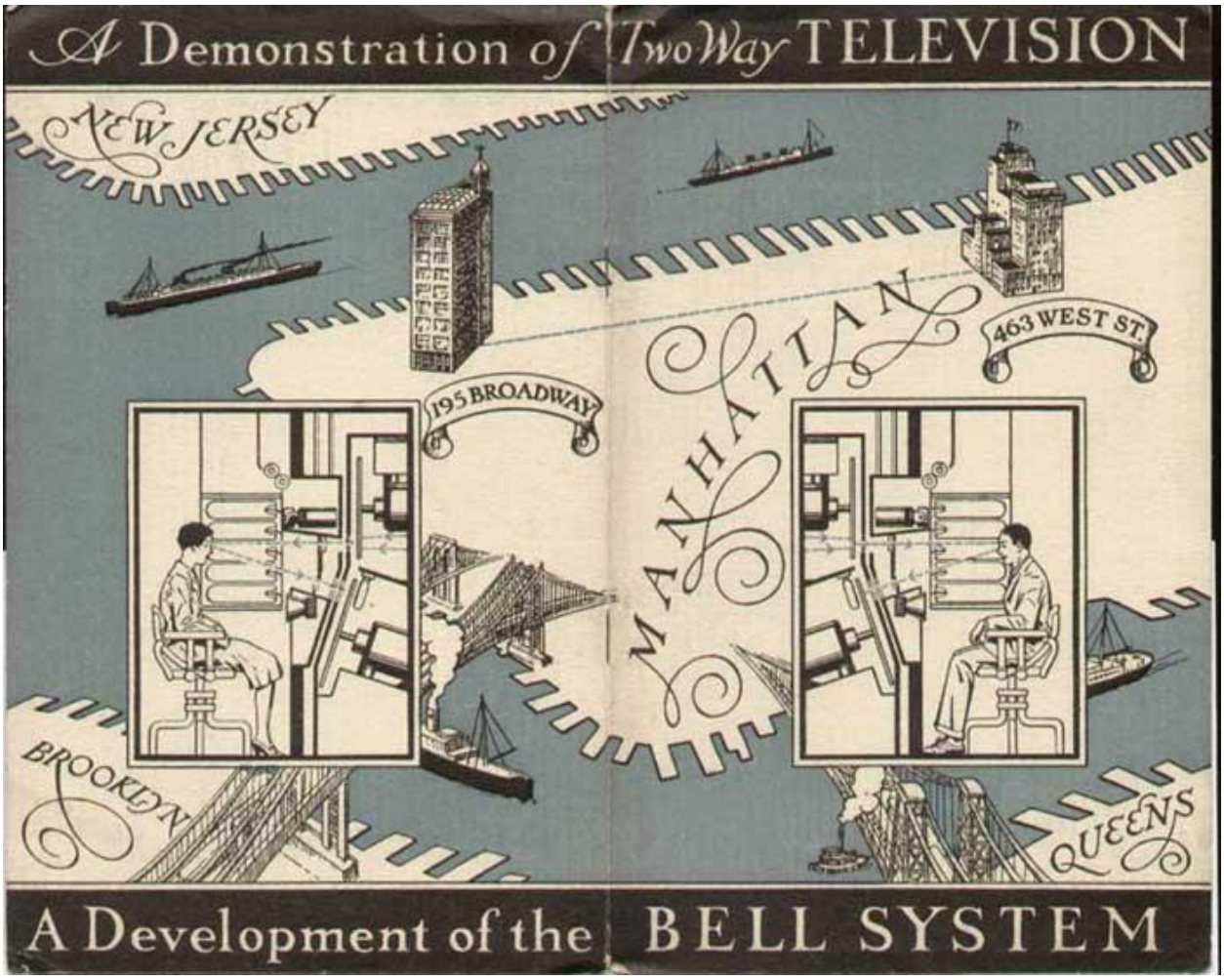

A Demonstration of Two Way TELEVISION
NEW JERSEY
195 BROADWAY
MANHATTAN
463 WEST ST.
BROOKLYN
QUEENS
A Development of the BELL SYSTEM

Two-Way
TELEVISION
and
A Pictorial Account
of Its
Background

Developed by
BELL TELEPHONE LABORATORIES

TELEVISION

FOREWORD

ON APRIL 7, 1927, there was demonstrated in Bell Telephone Laboratories the successful accomplishment by the American Telephone and Telegraph Company of operative one-way systems for television over telephone circuits and by radio. By wire there was transmission from Washington, D. C., and by radio from the Laboratories' experimental radio station at Whippany, New Jersey.

This demonstration, which was the first to take place over considerable distances, indicated several advances arising from an elaborate and highly coordinated series of researches. In the telephone conversations between guests at Washington and those in the Laboratories at New York the television equipment permitted an individual listener in New York to see as well as to hear the person in Washington with whom he was conversing.

Another development, in the form of a large television receiver, permitted the entire audience of guests to observe the speaker at Washington while they heard his words over the loud speaker. This same receiver was also used for the demonstration of television by radio at which time there was presented to an audience the first instance of a complete radio broadcast program of sound and scene.

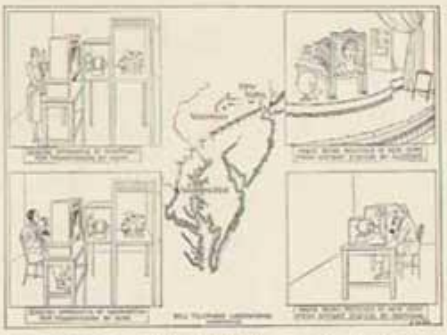
In his remarks at the opening of these demonstrations of television, President Walter S. Gifford of the American Telephone and Telegraph Company described the developments as the "fruition of years of study on the problem of seeing at a distance as though face to face." Mr. Gifford also said, "In connection with our constant aim to furnish this country with the most complete telephone service possible, we endeavor to develop all forms of communication that might be supplementary to the telephone. With that in view we shall continue our work on television."

WALTER S. GIFFORD before the television receiving apparatus during the 1927 demonstration. On the left is Dr. Herbert E. Ives of Bell Telephone Laboratories.

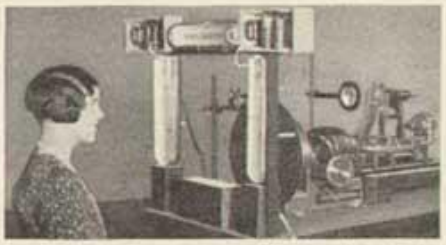
BEAM SCANNING

Demonstrated April, 1927

THE process employed in the 1927 demonstrations over electrical circuits involved an intense beam of light, which scanned the object. Reflected light was picked up by a bank of large photo-electric cells, and converted into variations of electric current. Sufficiently amplified, this current controlled the brightness of a neon lamp at the receiving station. The neon lamp when scanned by a moving aperture in synchronism with the initial beam of light appeared to the observer to re-create the original object.



A GENERAL schematic of the 1927 demonstration of television.



THIS transmitting apparatus includes three photo-electric cells which respond to light reflected from the scene. Light from the arc lamp at the right passes through a lens to the scanning disc which sweeps the beam across the scene.

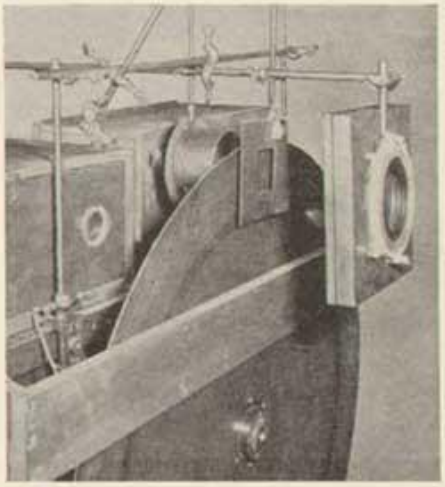
MECHANICAL details of the television receiver. Viewed through the aperture of the metal plate, the holes in the disc form moving spots of varying brightness which paint a picture on the retina of the eye.

DIRECT SCANNING

Demonstrated July, 1928

IN THE original television system, the subject was scanned by a beam of light and the reflected light was employed to actuate the photo-electric cells. This method had the decided advantage that artificial light could be used at an intensity which would be decidedly uncomfortable for the subject were his whole face illuminated at once. With the development of photo-electric cells of greater sensitivity, it became possible to illumine the subject broadly by daylight, and allow the photo-electric cell to "behold" only one small area of the picture at a time. This method is called "direct scanning."

PHOTOELECTRIC cell used for direct scanning.

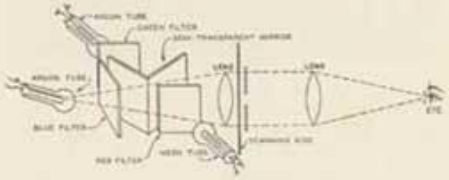


Disc and lens system for direct-scanning. An image formed by the photographic lens (right) on the aperture plate is scanned by the holes on the disc. Light transmitted through each hole in turn is collected by the condensing lens and thrown into a photo-electric cell just inside the box. Illuminated by the lamp in the foreground, black and white sectors on the rear edge of the disc throw a flickering light into a photo-electric cell in the box below the lamp. Output of this cell, amplified, is used for synchronizing the receiving disc.

TELEVISION IN COLOR

Demonstrated June, 1929

CONTINUOUS progress in the development of photo-electric cells sensitive at the red end of the spectrum, and in glow-discharge tubes whose light is rich in blue and green rays, made possible a television system whose image would be in color. The beam-scanning method was used, and following the principles of color photography, three complete systems of photo-electric cells, amplifiers, and glow-tubes were provided. Each system had color filters—red, blue, or green—at each end; and a system of mirrors superposed the three monochromatic images to form a single colored image.



ONE semi-transparent mirror reflects red light from the neon tube; one reflects green light from one argon tube; and through both mirrors passes blue light from the other argon tube.

OPEN doors yield a view of the working parts of the color-television system. From the arc at the right a beam of light is thrown through the scanning disc (center). Reflections from the subject are picked up by the photo-electric cells. The connections to some of these (left) indicate how they are divided into groups for the three colors.

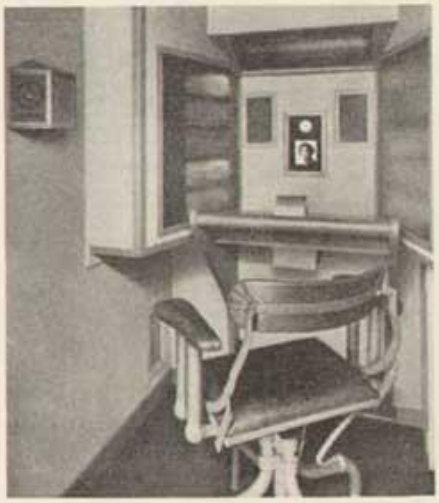
Reception room at 195 Broadway with door to the television booth open.

TWO-WAY TELEVISION

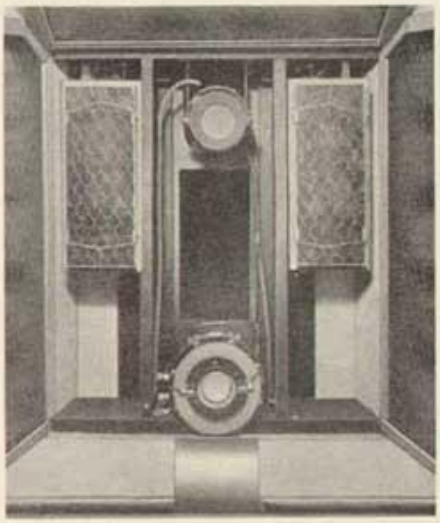
First Demonstrated in April, 1930

DEVELOPMENT of television as an adjunct to telephony entered a new epoch when an experimental two-way system was demonstrated between the Laboratories and the Telephone Headquarters building. Seated in booths, people conversed while they saw each other. During subsequent months, improvements have been added to give a more faithful rendition of tone-values and to increase the stability and service-life of certain elements.

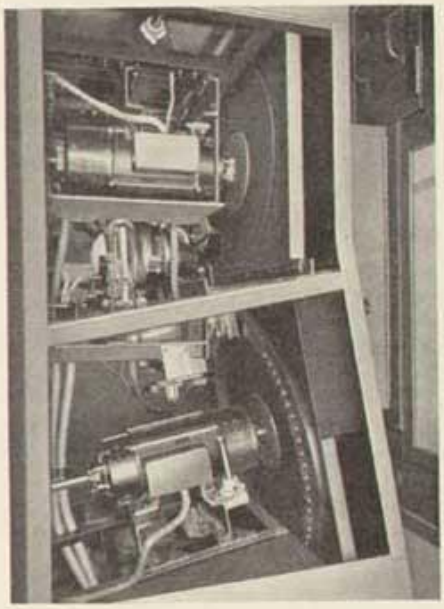
In the neon tube, the crater may be seen near the junction of the cylindrical portion with the spherical end. Hydrogen in the lower bulb is admitted into the upper portion from time to time to assist the neon to follow rapid signals.



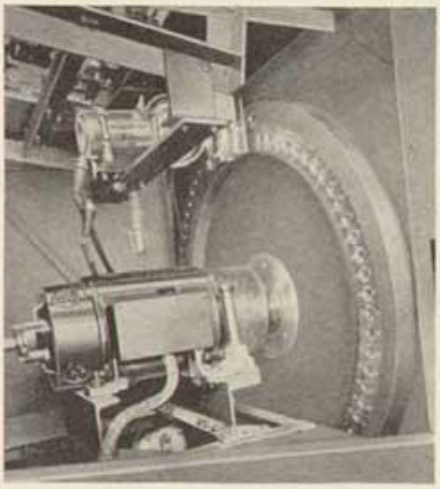
SEATED in the chair, one sees the television image in the place now occupied by the girl's picture, and apparently of the same size. The scanning beam flickers through the circle just above.



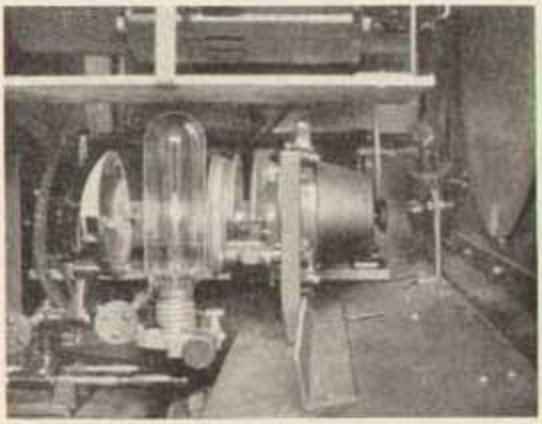
WHEN THE cloth screen is removed, one sees the microphone (above) and the loud speaker through which conversation is carried on. Two photo-electric cells, of a newly-developed type especially sensitive to red rays, are behind the smaller glass panels at right and left of the avenue for the scanning beam. Behind the larger windows at sides and top are twelve photo-electric cells sensitive to blue light.



The scanning discs—above, that for sending; below, that for receiving.



Lenses on the scanning disc in combination with a fixed lens in front of the neon tube form an image of the glowing crater of the tube on each scanning hole as it passes across the field of view. Since the brightness of the crater corresponds to the brightness of the corresponding part of the original scene, the rapid procession of the scanning holes across the field creates a picture of the original. Perfect synchronism of the discs is maintained by special design of the driving motors, one of which is seen in the lower part of the picture.



A CLOSER view of the sending disc reveals in the foreground, the source of light—a projection lamp; its lens system; and at the right, the disc with its spiral of holes. Near the disc is a neon tube connected to the outgoing television channel. Seen through the holes of the disc, this lamp gives an image for monitoring the transmission.