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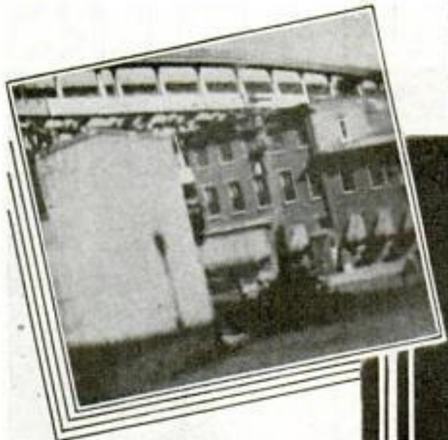
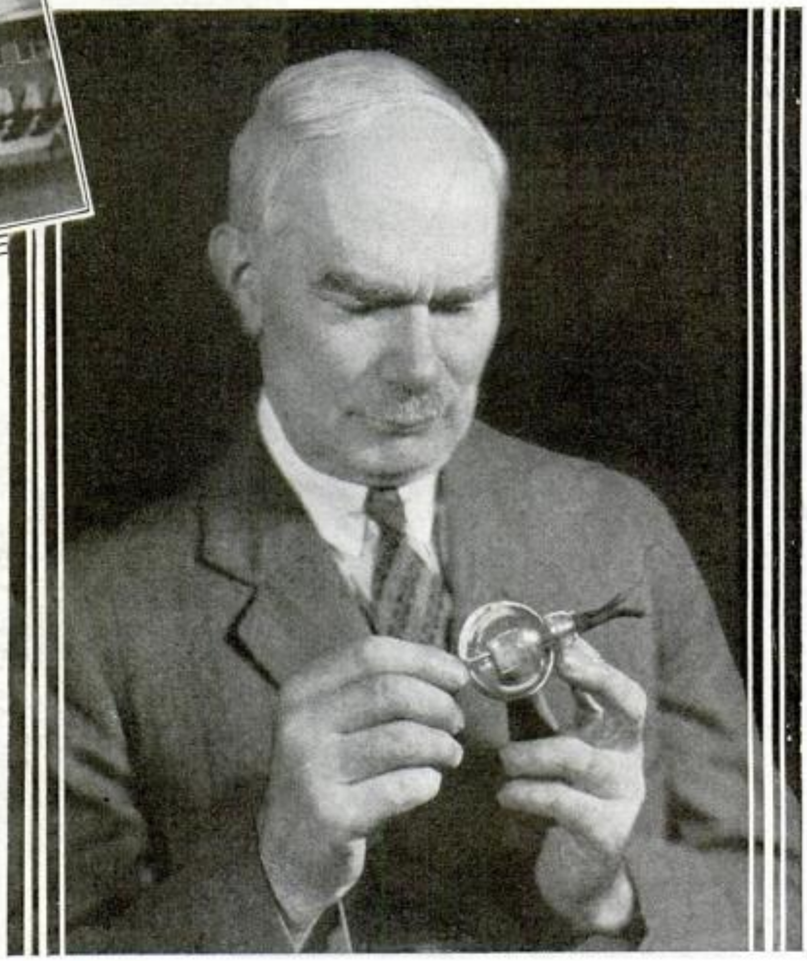
MIRACLES





Left, Television Image Reproduced on Cathode Ray Tube from Outdoor Pickup; Right, Author Holding 1908 Tube Used in Radiophone

By DR. LEE DE FOREST

TELEVISION programs are being broadcast today, many of them on regular schedules, from nineteen different stations from New York to Los Angeles.

A television motion picture has been successfully reproduced in an airplane cruising among the clouds.

Long-wave television pictures put "on the air" in Los Angeles have been received at Oakland, 350 miles distant and at Houlton, Maine, 2,500 miles distant. Regularly programs of feature film plays and short subjects go out by short wave from scattered stations. How many thousands are receiving these programs, largely with home-made receivers, no one can say. Yet we stand today at the threshold of radio's next great advance—the wedding of television broadcasting to audio broadcasting. In several laboratories scientists are perfecting methods which soon will permit "pictures" in their various forms to be broadcast to the accompaniment of sound.

By the word "pictures," I mean groups assembled in broadcasting studios as well as nearly every kind of scene viewed by theater audiences today—staged events, such as boxing, wrestling, ice hockey, operas, motion pictures, the President in his fireside chat—anything, in brief, which can be illuminated adequately and brought within range of the television camera.

Television will hook in with the present machinery of broadcasting. It can start probably before the close of 1935, in two important cities, with 1,000 receivers reproducing pictures broadcast from each station. From such a beginning, it will roll like a snowball across the continent, with transmitters in all cities now supporting radio broadcast stations.

Unlike present radio broadcasting, tele-

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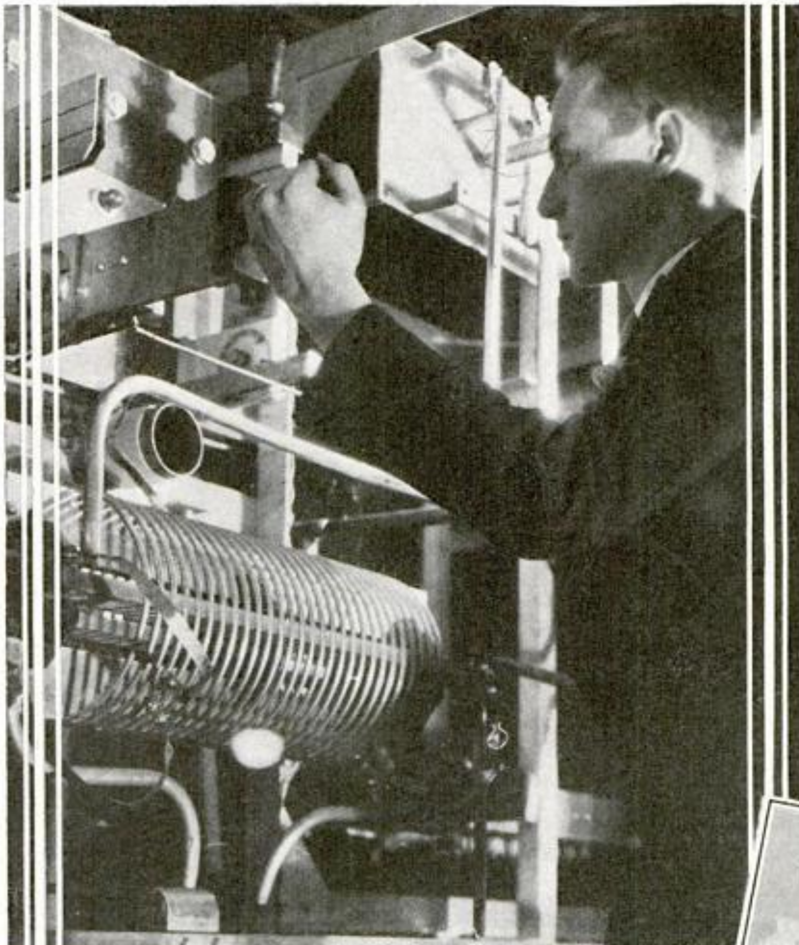
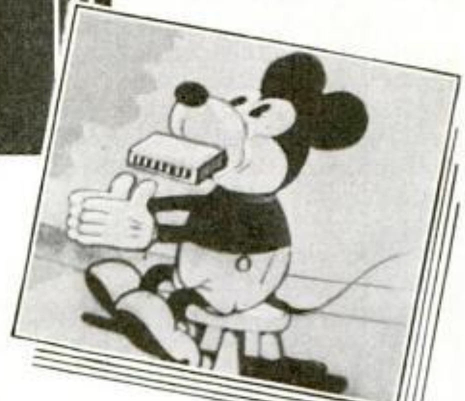
in TELEVISION



Left, Operator at Switch of WLW's 500,000-Watt Amplifier; Right, Television Image from Movie
Cincinnati



vision will have a comparatively short range. To create the illusion of motion successfully, each image must consist of no fewer than 180 parallel, shaded lines, twenty-four pictures appearing each second. This necessitates a wide band of frequencies, ranging from fifty to 1,000,000 a second, which represents such a broad range of the radio spectrum that we cannot transmit them except at high frequencies, or below ten meters.

These are known as "quasi optical" waves, which travel only about as far as the eye can see, or in the neighborhood of fifty miles. These ultra-short waves, unlike long waves, are not reflected downward by the heaviside layers, those mysterious strata about fifty miles above the earth from which certain types of electrical impulses are turned back toward this planet. Also it will be impracticable for wires to carry these short-wave programs from coast to coast. Thus we must depend upon numerous local programs, sound and picture being broadcast simultaneously on long and short waves, respectively.

First television programs will adapt the present experimental method of motion pictures. In the homes, the television receivers will be located near present radio receivers, thus preserving the illusion of sound and picture emerging from a common source.

Eventually, television cameras will be pointed toward scenes in and out of doors. I have picked up outdoor scenes, including games of quoits and baseball. Wires

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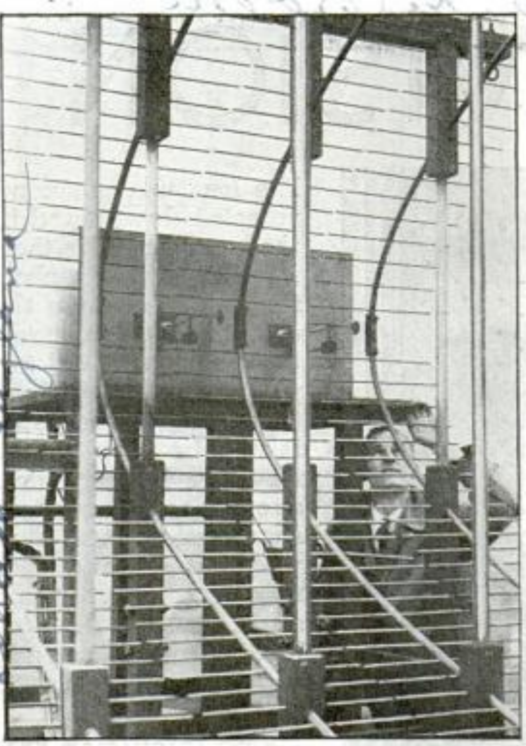
in roof of Electra House
Victoria Embankment.
London



Marconi Micro-Wave Aerial System with Parabolic Reflectors; It Is Used in Experimental Work

carried the impulses from the camera to an indoor receiver. Reproduction of great spectacles, such as parades and naval reviews, are not yet possible, as our picture of the amateur ball game proved. I planted the camera near the home plate and found we could catch the pitcher winding up and throwing the ball, the batter hitting out a two-bagger and running to first base. But the camera could see clearly no further than 100 feet, for the distance between lines forming the picture increased as it encompassed a broader scene, resulting in a blur.

In early broadcasts on a brightly illuminated stage, the actors suffered under the intense heat, but now we have improved photoelectric cells for the pick-up apparatus. The scanning disc pick-up with a single photo-electric cell has been superseded by a multiple-cell plate known as V. K. Zworykin's iconoscope, and the electron picture of Philo T. Farnsworth.

The iconoscope is a vacuum tube containing an electron gun and a photosensitive surface consisting of millions of microscopically tiny droplets of caesium-oxide-silver on a sheet of mica. Though thicker than frost crystals on a window pane, each droplet not only is separated, but is also insulated from its neighbors. A lens in the camera focuses the image on the droplets, which in turn free electrons

(Continued to page 130A)

Center, Dr. Zworykin with the Kinescope, "Heart" of Latest Television System; Bottom, Power Control Desk at NBC's Headquarters in Radio City