Television

Under this heading, RADIO NEWS publishes each month descriptions of the latest developments in the extremely interesting field of television.

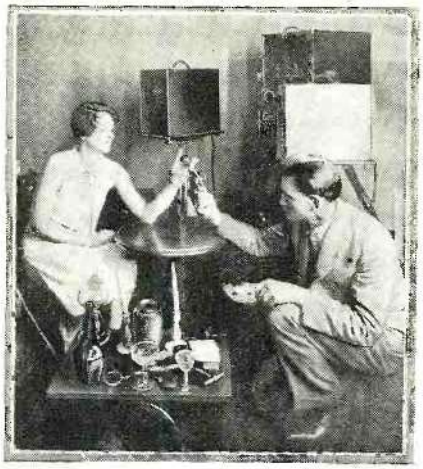
Television Makes the Radio Drama Possible

By Robert Hertzberg

TELEVISION is striding forward, and is today overcoming many obstacles that were once held insurmountable. "Sight" broadcasting is now part of the regular daily programs of a number of stations in the East and the Middle West, and many experimenters are experiencing new thrills in reproducing small, but nevertheless distinguishable, images.

The latest development, and what promises to be the most important as yet, is the successful combining of image and voice for the presentation of drama in the home, via radio. A second noteworthy achievement of the past few months is the transmission of full-length images of two people at a time, and the reproduction of those images at the receiving end to a size of twelve by twelve inches.

On September 11, 1928, WGY, the first station to organize a dramatic group and present plays regularly to the radio audience, established itself also as the first station, anywhere, to broadcast an actual drama with the aid of television; transmitting images and voice simultaneously on separate radio channels. The complete performance was witnessed by a group of newspapermen and scientists gathered in one of the buildings of the General Electric Company, at Schenectady, N. Y., at a short distance from the radio transmitters themselves. It was highly effective, and held the attention and



These two are playing the hands of the televised characters, with the "props" needed to illustrate the action of the playlet.

interest of the rather critical audience as closely as if it had been the highest-priced dramatic hit on Broadway.

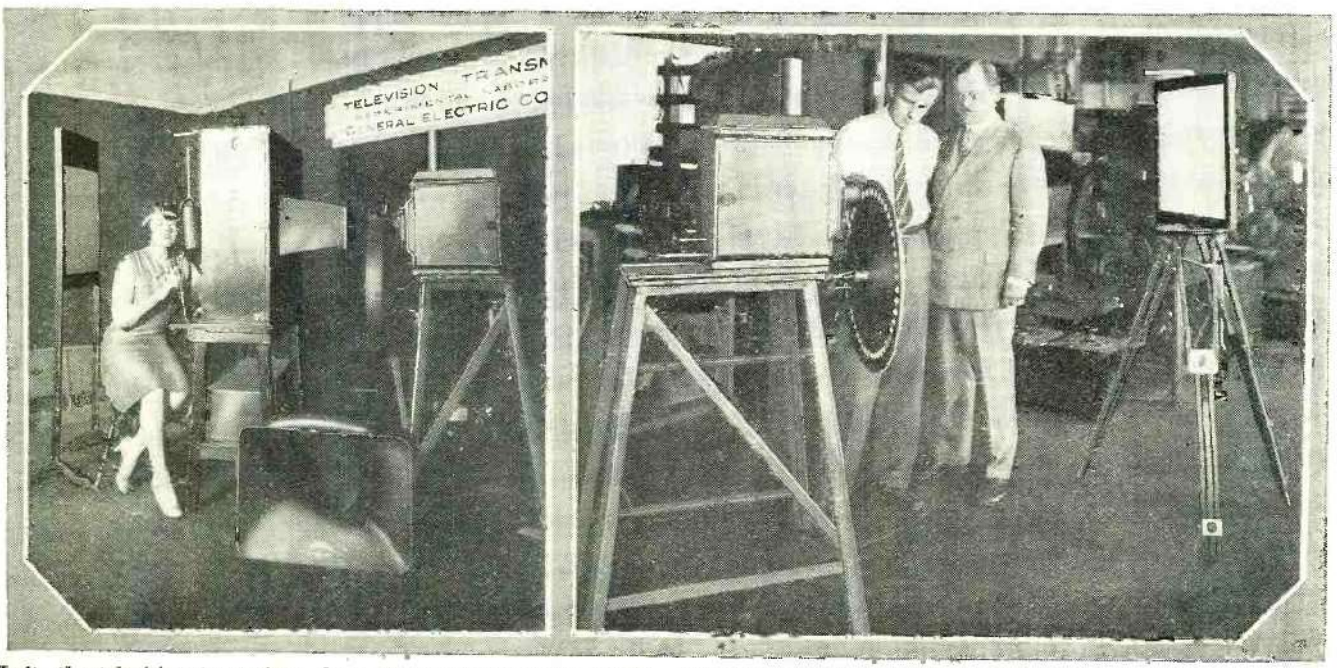
Martin P. Rice, manager of broadcasting for WGY and its associated stations, explained that, in presenting the drama through the medium of television, the staff of WGY was co-operating with the radio engineers in the development of a studio technique, far in advance of the time when it will be practicable to offer the "televised" radio drama to the public as a finished production.

"Such practical application affords the only reliable method of determining the future possibilities, as well as the limitations of television," Mr. Rice stated. "When television has reached that stage of perfection where 'sight' signals may be received as reliably as 'sound' signals are now received, we at WGY hope to be prepared to carry the image as well as the voice of the actor to thousands not heretofore privileged to enjoy the drama."

WHEN HISTORY WAS MADE

The first play by television was broadcast at 1:30 o'clock, on the afternoon of September 11, 1928, during the regular television period of the Schenectady station; and a second performance was given at 11:30 that same evening. The offering was "The Queen's Messenger," a one-act drama written thirty years ago by J. Hartley Manners. The televised version was the same in every respect as the stage production; but it involved many new problems in dramatic technique because of the limitations of the television "cameras," which could take in only the head and shoulders of one character at a time.

The presentation of the drama by television was made possible through the simplification, by Dr. E. F. W. Alexanderson,



Left, the television transmitter, later demonstrated at the Radio Fair. Right, Dr. Alexanderson with his assistant, R. D. Kell, with the new projecting apparatus, which throws an image a foot square on the ground-glass screen. The scanning disc contains 48 lenses.

of television transmitting apparatus which hitherto has been large and unwieldy. Readers of RADIO NEWS will recall that, early this year, Dr. Alexanderson took television out of the laboratory and put it in the home (see the article entitled "Television Comes to the Home," in the April, 1928 number). The voices and images of several performers were then broadcast by WGY simultaneously on different wavelengths, and observers stationed five miles away saw and heard the artists on television receivers of simplified design.

Dr. Alexanderson has simplified the television transmitting apparatus to such a degree that it can now be carried from place to place, almost as easily as the microphone and its associated amplifiers. The time will undoubtedly come when the televisor will be set up in the radio studio, on the lecture platform, the stage or the banquet table, as readily and as frequently as the ubiquitous microphone now appears at these places. To illustrate the portability of the outfit, WGY engineers recently set up a television "camera" on the platform in the assembly chamber at Albany, N. Y., and televised Gov. Alfred E. Smith of New York, as he delivered his address accepting the Democratic nomination for the presidency.

DETAILS OF THE "CAMERA"

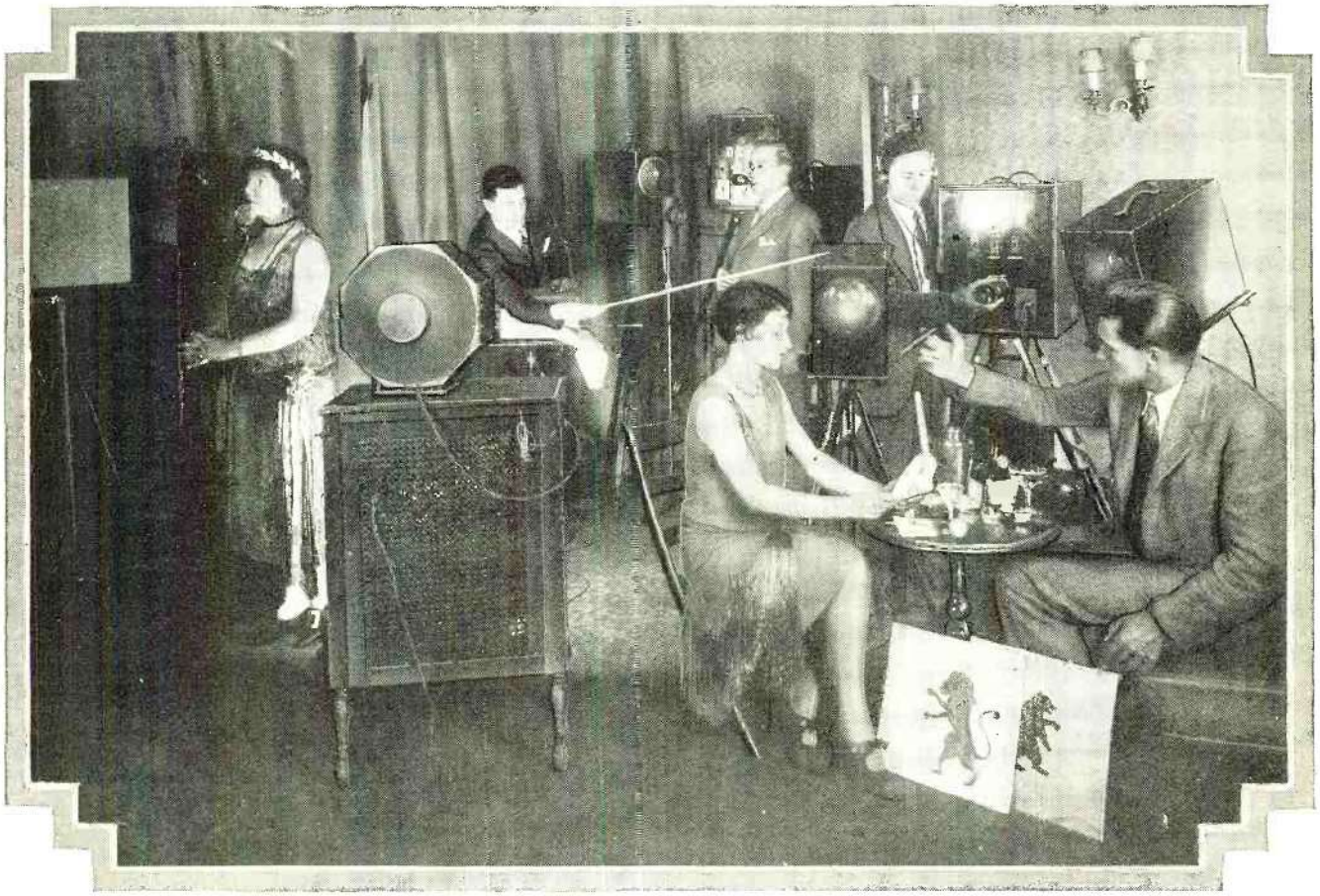
The television scanning "camera," as it is used to-day, is a wooden box about a foot square at the ends and about twenty inches long. It contains a twelve-inch 24-hole scanning disc, driven by a small synchronous motor. Behind the disc is a 1000-watt lamp, the light of which is concentrated by a lens on the area defined by the spiral of holes. A second lens on the outside of the box projects the scanning rays of light on the subject. The box itself is mounted on a regular camera tripod, and greatly resembles a large camera.

Izetta Jewel, first "leading lady" of the television stage, in "The Queen's Messenger" before the scanning camera and microphone at WGY. As only the face and voice were picked up here, another actress was required to impersonate the hands.

Accompanying each "camera" is a pair of photoelectric cells, which are placed in front of and on each side of the "camera," and facing directly toward the person being televised. Each cell is about seven inches in diameter, and enclosed in a wooden box mounted on a tripod. Three outfits, comprising camera and photo-electric cells, were used in the broadcasting of the radio drama.

In the presentation of "The Queen's Messenger," the television instruments were arranged as shown in Fig. 1. One camera was used for each of the two characters in the play, and the third for the introduction of "props" and other visual effects. The play director, standing between the two "cameras" trained on his actors (positions 1 and 2 in the drawing), governed the radio output by means of a small mixing panel; similar in construction and function to the mixing panels used at all broadcast stations for the proper blending of the different instruments of an orchestra. With one knob, he brought any one of the three cameras into the circuit; and, with another, he "faded" the images in and out, very much as the "fade-out" is used in motion pictures. In front of the director was a "monitor" television receiver, in which he could see at all times the images going on the air, and check the performance. In addition to the television cameras, there were microphones at positions 1 and 2, (for the two characters) to pick up the spoken lines of the play.

The performance was broadcast on three wavelengths; the images on 379.5 and 31.4 meters, and the voice on 21.96 meters only.



The "stage" of the first televised drama; its layout can be followed by referring to the diagram at the top of page 526. Left, Izetta Jewel; Mortimer Stewart, director, with wand; then Maurice Randall. The silent parts are gesticulated by the players at the "prop" table, right, Joyce Evans Rector and William J. Toniski, whose hands are "picked up" by camera No. 3.

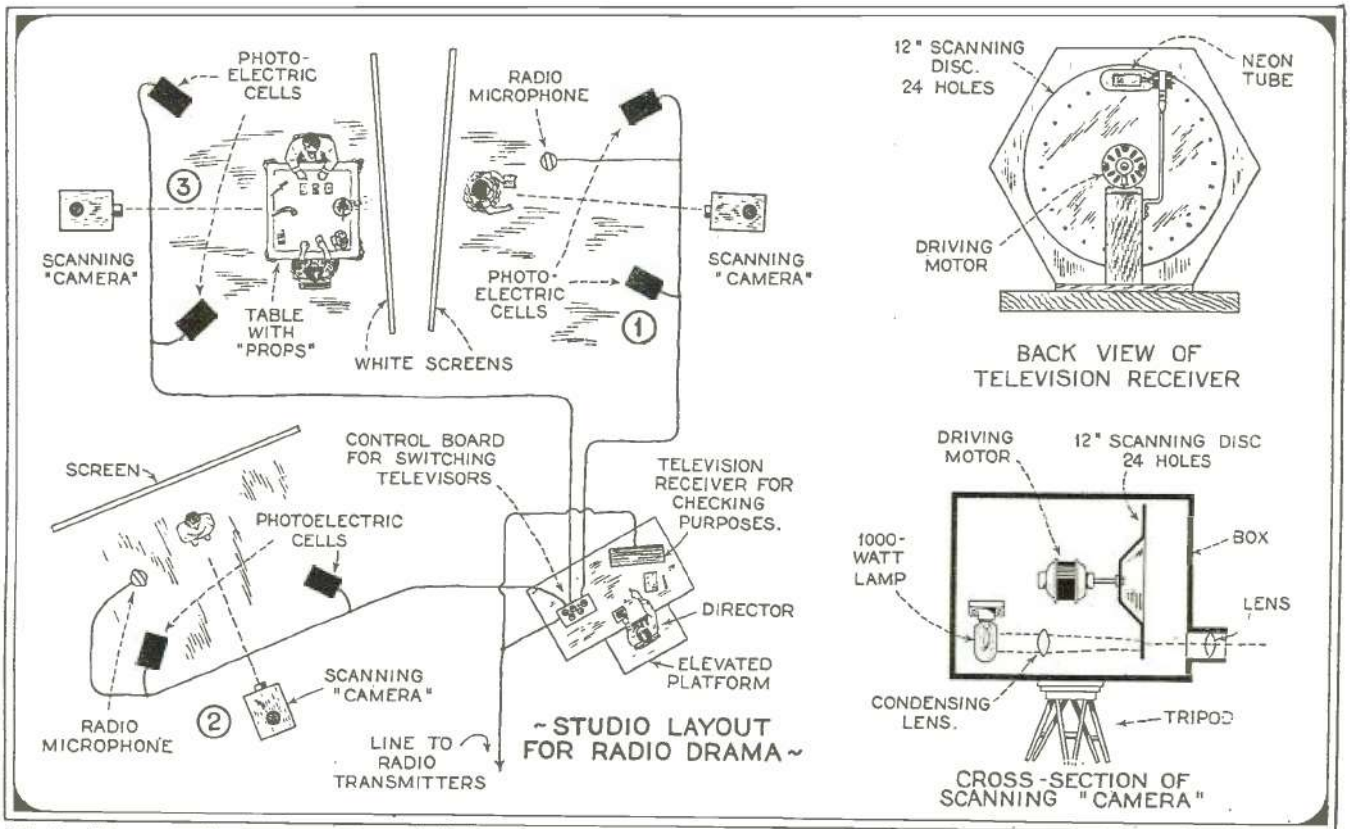


Fig. 1: Three scanning cameras and two "mikes" are controlled by the director of the radio drama, who has a monitor television receiver before him to check the results. The receiver and "camera" shown at the right are similar to those previously described here.

Reports received by WGY several days after the broadcasting of the play indicated that at least two radio experimenters on the West Coast had picked it up and reproduced it successfully.

TECHNIQUE OF THE DRAMA

Inasmuch as only the heads of the actors can be transmitted at the present stage of developments, it became necessary for the director to find some means in addition to head movements or the change of facial expression to convey action. This was accomplished by using the third television transmitter (position 3 in the diagram) for hands and "props." For example, when the lady of the play offers to pour some wine for the messenger, the third camera picked up the image of a lady's hands with bottle and glass, as she poured the wine. Keys, a ring, a pistol, a dagger, reproductions of the British and Russian royal arms, and many other "props" were thus introduced, to add to the realism of the performance and to break the monotony of the head images only.

The faces of the man and the woman handling the props at position 3 were not shown. Only their hands were televised; the "camera" being switched on at the proper moment by the play director. In this way, the voice of the lady speaking at position 1, while the television camera at position 2 transmitted hands, was heard in the loud speaker at the receiving end while the image of the hands flashed on the television screen.

Because of the limited range of the "camera," great pains were taken to keep the actors "framed," that is, within the small area in which the scanning rays of light might find them. Each character worked in front of a white screen, which gave definition to the features. Borders were established within which the actor had to stand, or be lost to the camera.

The performing artists were confronted with special problems in "make-up;" both because the color-response characteristics of photoelectric cells are altogether different from those of the usual motion-picture camera, for instance, and because the images at the receiving end have the pinkish-red background characteristic of the neon gas used in the glow lamps. The make-up technique of both the stage and the screen was drawn upon, and an effect different from either was finally obtained. The eyes of the actors were accentuated to the point of exaggeration, and the mouth and nostrils were sharply defined with strong color. The skin was softly shaded and blended in an effort to remove the shiny effect. It was

The television stage director is a busy man. Here we have Mortimer Stewart of WGY at his control box, which will "fade" one image into another, movie style.

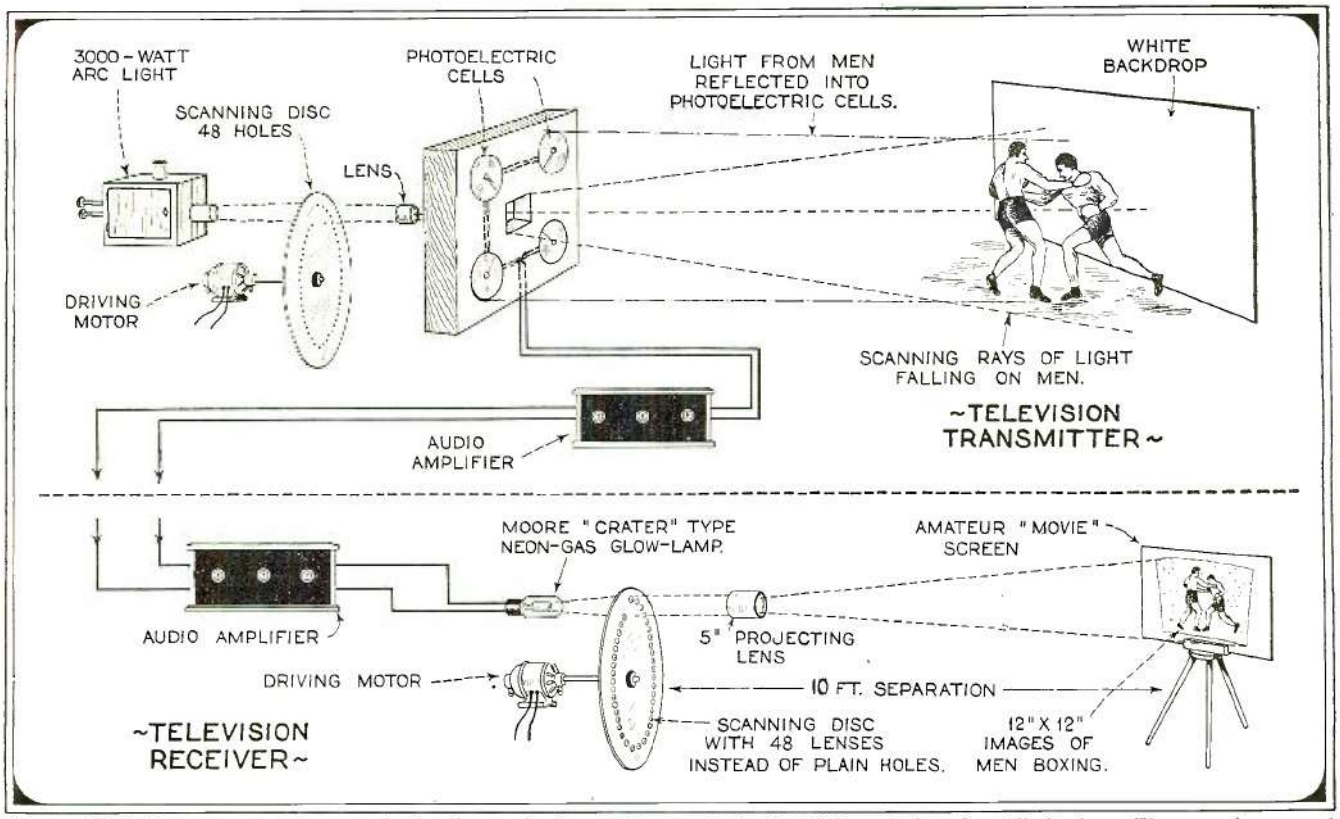


Fig. 2. With the apparatus shown and wire lines, a boxing match was televised to a small screen: though the image frequencies went outside the 5,000-cycle broadcast limitation. The neon lamp used, a special new device, is not available to amateur experimenters.

found that diamonds or other bright stones could not be used on the hands, because they caught the scanning light strongly and produced a disturbing glare on the image.

The actual adaptation of the television apparatus to the play was made by Mortimer Stewart, who is known to many radio listeners as the producer and director of a series of radio plays broadcast by WGY and of numerous dramatic offerings from the New York stations of the National Broadcasting Company. Mr. Stewart's problem was not only the development of a technique for a new dramatic form, but he also had to work with apparatus that was crude and admittedly inadequate.

"The Queen's Messenger" has but two characters. The lady was played by Izetta Jewel, a former stage star and now the wife of Professor Hugh Miller of Union College. Maurice Randall, veteran member of the WGY Players, was cast for the messenger. Joyce Evans Rector and William J. Toniski *"doubled"* for Miss Jewell and Mr. Randall; that is, they "doubled" for their hands and, at the third television camera (position 3), handled the various "props" such as cigarettes, glasses, keys, dispatch case, etc.

THE RECEIVING EQUIPMENT

The General Electric engineers constructed a number of special television receivers for use at the demonstration on September 11. In external appearance and over-all size these greatly resembled loud speakers of the cone type, for which they were mistaken at first. Each is about 14 inches high and six deep, and hexagonal in shape. Within the case is a scanning disc 12 inches in diameter, and cut with a spiral of 24 square holes. A neon-gas glow-lamp is supported in back of the disc in a horizontal position. The images as reproduced on the disc are less than an inch square; but they are enlarged to an apparent size of three inches square by means of a magnifying lens placed on the front of the case. A number of views of this machine are shown in the illustrations accompanying this article.

A back view of the television receiver is shown in Fig. 1, which includes also a cross-sectional view of the television scanning "camera." The discs used at both transmitters and receivers were not actually flat discs, but looked like large soup plates, with scanning holes cut in the flat rim. This method of construction makes the discs very rigid and prevents them from wobbling as much as ordinary discs do.

The people watching and hearing the performance of the play, as it was reproduced on the radio receivers, had to sit about ten feet away from the television instruments, in order to distinguish a clear image. At closer distances the coarse lines of the scanning disc were too plain, and the images appeared to be built of little squares of black and pink. The definition of the images was quite good, in spite of the fact that the television impulses were confined to 5,000 cycles, the modulation limit prescribed by the regulations.

TELEVISION ON A SCREEN

A very interesting laboratory development, demonstrated by Dr. Alexanderson after the broadcasting of the radio play, is the apparatus he now uses experimentally over wire lines, for the transmission of full-length images and their reproduction over a screen area twelve inches square, on a screen ten feet from the projector. The layout of the apparatus is shown in Fig. 2.

In general design, the transmitter is identical with other disc systems, except, of course, for the quality of the parts and the sensitivity of the photoelectric cells, in particular. A 48-hole disc, about two feet in diameter, is driven by a synchronous motor, and breaks up into thin scanning rays the light from a 3000-watt arc directly behind it; the rays are projected forward by a powerful lens. When only his head is to be transmitted, the person televised sits about fifteen inches from the front of a large wooden frame holding an extremely sensitive photoelectric cell in each corner. The scanning rays fall on him, and are reflected into the cells, which respond in the usual manner by producing varying electric currents.

At the receiving end, a similar scanning disc is used; however, the usual plain holes are replaced by 48 powerful lenses, each only about half an inch in diameter. The glow lamp is a special neon-gas bulb, developed by Dr. D. McFarlan Moore, the renowned scientist whose achievements have done much to make television practical. This lamp, instead of containing the two flat plates found in common neon tubes, uses a small metal cylinder within which is a small, thin electrode. An intense light, hundreds of times more powerful than that produced by any other glow lamp, is thrown out from the cylinder. The light is concentrated by the lenses in the scanning disc, and then thrown on the screen, ten feet away, by a five-inch projecting lens.

To begin the demonstration of this apparatus, a man sat down before the photoelectric cells at the transmitter and his image, fully life-size, appeared on the screen in an adjoining room. Speaking over a wire circuit connected to a loud speaker in the projection room, he maintained a running line of chatter, describing his actions in detail so that no one would miss

(*Continued on page* 587)

Television Makes the Radio Drama Possible

(*Continued from page 527*)

them. He opened his mouth, and the teeth, tongue and throat were plainly visible. The definition was remarkable; certainly the best that has ever been shown in television. The image was as good as the average motion picture produced by an amateur cinematographer with a hand camera. At a distance of ten feet from the screen, the observers could distinguish the scanning lines only by looking hard for them.

THE TELEPUGILISTS

The real thrill came when the subject announced, jocularly, that he had been insulted by a co-worker, and was going to settle with him before the televisor. He then turned his head, walked back about ten feet and pulled another man into view. This whole operation appeared on the receiving screen as plainly as if it had been taken with a movie camera! The images of the two men, engaged in a mock boxing match, were reproduced at full length in a twelve-inch square, with every detail of their fistic maneuvers plainly discernible.

Dr. Alexanderson exhibited this same apparatus at the Radio World's Fair, which was held in New York the following week. However, he did not then show full-length images, but merely gave short passages from "The Queen's Messenger." The screen on which the images were projected was a regular silvered motion-picture screen about two feet square, of the kind supplied to amateur photographers for home "movies."

It is not likely that radio experimenters will be able to reproduce full-length images for some time to come; as the frequency band covered by the 48-line transmitter ran well up into 20,000 cycles. The general broadcasting of television on such an ambitious scale awaits the development of more advanced broadcast transmitting equipment and the clarification of a horribly muddled broadcasting situation.

At the time of the Schenectady demonstration, Dr. Alexanderson issued the following statement, which contains some interesting facts:

ODDITIES OF TELEVISION

"In order to avoid any widespread misunderstanding, it should be made clear that this demonstration is conducted over a short wire line, and that we are not prepared to transmit television of the same quality over any considerable distance. The television system of the future will consist of the television camera, the radio transmission, and the television projector. In addition to these three essential elements there will in most cases be a fourth element—a wire connection between the studio and the radio station.

"Each of these elements will be improved as time goes on. We are looking forward to more sensitive photoelectric cells for the camera and a more brilliant source of light for the projector. The principal difficulty, however, which limits the use of television at the present day is in the unknown factors of radio transmission; and constant efforts are being made to solve the new radio problem introduced by television.

"For this reason we are broadcasting television regularly from Schenectady five times

a week. These television broadcast programs are being sent out both on the regular wave of 390 meters and one of the short waves (22 meters or 32 meters) which is used for international broadcasting. In this way our own investigators are able to make their observations while at the same time we are enlisting the co-operation of many amateurs. I have been making systematic observations for some time at my summer home at Lake George, which is at a distance of 50 miles from the transmitting station. These observations have been intensely interesting from a scientific point of view; but not encouraging if we were looking for immediate practical results from television. On the other hand, we have had consistent and encouraging reports from amateurs in Los Angeles.

"A difficulty particularly brought out by the Lake George observations is a phenomenon which may be described as "mirage.' It is analogous to the mirage that can be seen over a lake in the morning and evening, and results in the distortion of images and sometimes in the appearance of several interwoven images. It appears as if the reflecting Kennelly-Heaviside layer (which we assume to be located about one hundred miles over the earth) were broken up sometime into several layers at different heights; each reflecting a separate image and sometimes giving an irregular and blurred image.

"The radio waves travel at the velocity of light and, though we are in the habit of thinking of this velocity as being almost infinite for anything that occurs on the earth, we find that these rays are too slow for television.

"Light travels at the rate of 186,000 miles per second and, yet, we find that light will travel only about 200 miles in the time required for tracing one line in a television picture and only 50 miles in the time required to trace one quarter of a line in a picture. Thus, if two rays have travelled from the transmitting to the receiving station through different paths, and the length of these paths differs by only 50 miles, they will register separate images differing as much as one quarter of the width of the picture. Each of these rays will then trace its own picture and we will have two pictures displaced by that amount. On the other hand, a multiplicity of rays may arrive after having traversed different paths, each tracing its own picture; with the result that all the details of the picture appear blurred.

"This is a pessimistic view of the situation, but these mirage effects are not always present. It is also probable that some wavelength may be selected which will not produce these mirage effects. Our efforts at present are to gather all the facts and in this the co-operation of the skilled experimenters all over the world is valuable. The history of radio in the past has shown that obstacles that appeared insurmountable have been overcome in this way. Static, which for years made radio communication extremely unreliable, has been conquered to such an extent that transoceanic radio communication is never interrupted. Similarly, the difficulties of fading on short waves has been practically overcome. Our conclusions regarding television are that it is a subject which should be of intense interest to the skilled experimenter at the present time; although there will be some time before it will be available as an entertainment for the general public."