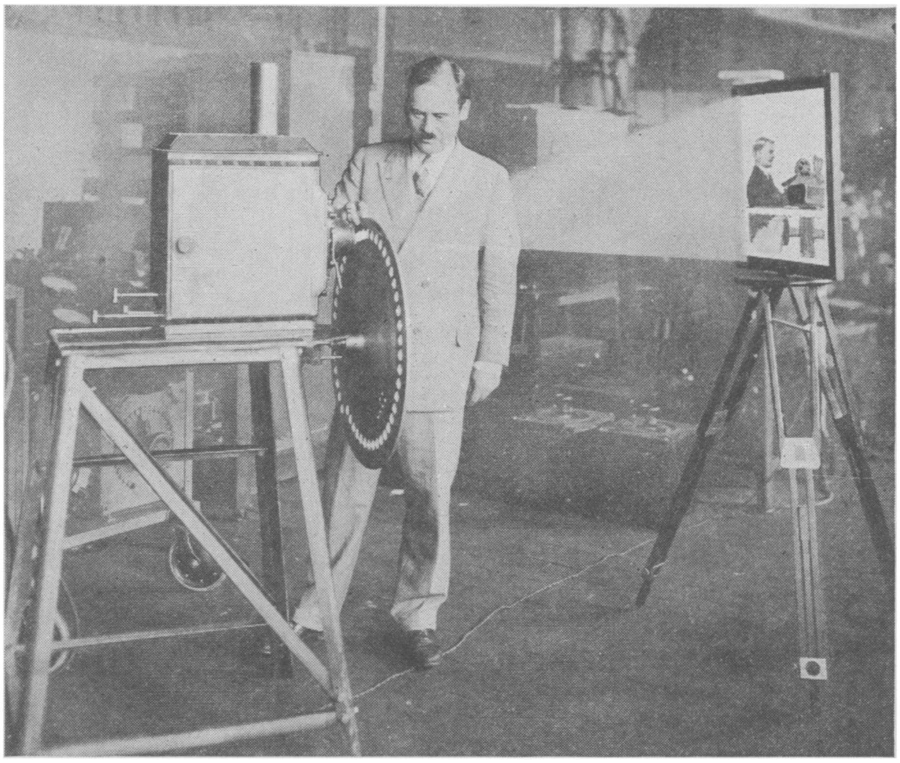
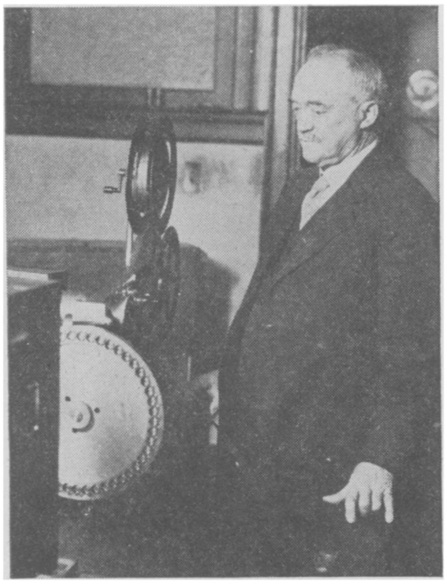
Television, Though Crude, Has Arrived

By James Stokley

Radiovision



DR. E. F. W. ALEXANDERSON, *famous radio inventor of the General Electric Company at Schenectady, with the first experimental model of the apparatus for projecting television images to a screen. The artist has indicated how it might appear if used to receive broadcasts of Mr. Hoover's inauguration on March 4, a project that may actually be carried out.*



C. FRANCIS JENKINS, *Washington inventor, with the radiomovie transmitter that he used for regularly scheduled broadcasts over station W3XK since last July 2. Mr. Jenkins is now building a 5000 watt station, to be located on the outskirts of Washington, which will be in operation soon and is expected to cover a large part of the country.*

Radiovision is here!

Despite the conflicting statements of cautious manufacturers, that seeing important events by radio is still a long way off, or of super-optimists that radiovision is now perfected, it has at least arrived. It has arrived just as much as sound broadcasting had arrived in the fall of 1920, when KDKA broadcast election returns that showed Harding was to be the next president of the United States, and followed this with daily concerts. Soon afterwards other stations were on the air, including WJZ and WOR.

At that time the relatively few people with receiving sets could pick up these programs, amid the squeals of other regenerative sets, and with the crude reproduction that was rendered with even the best of equipment.

The present status of television is almost identical. A half-dozen or so stations are now putting on regular programs. A number of amateurs in all parts of the country are now equipped with radiovisors, as the television receivers are called. Many more are making these receivers, just as in the broadcasting days of the early twenties they made their own sound receivers, because the present-day complete sets were not on the market.

Of course, present-day television is crude, just as 1920 broadcasting was crude, but the rate at which television is developing is much faster than was the development of broadcasting. It seems quite certain another year will bring a considerable degree of perfection. Probably never before has such a new thing come into being so rapidly. It was only in 1923 that the first moving shadows were sent across space by C. Francis Jenkins, Washington inventor. The same year the English experimenter, John L. Baird, succeeded in the same field.

By 1927 television had developed so far that on April 7, 1927, the Bell Telephone Laboratories gave the first satisfactory demonstration of seeing both by radio and over telephone wire. Secretary Hoover and other notables sat before a machine in Washington, and were seen and heard at the same time in New York, the connection being by the long-distance telephone lines. At the same time a group of entertainers in a New Jersey radio station were also seen and heard in New York.

Two of the latest television achievements have emanated from the research laboratories of the General Electric Company at Schenectady. One was the broadcasting of a complete playlet. The voices and faces of the characters, carried by radio, were heard and seen not only by groups of scientists and newspaper men around Schenectady, but by experimenters on the Pacific coast, 2300 miles distant. Another important development of the same organization had its debut to the public at the New York Radio Show, where, for the first time, an audience saw projected on a screen, just like movies, the life-sized images of people in another part of the building, at the same time hearing their voices.

So in five years television has developed from a dream of the future, thought by (*Turn to next page*)

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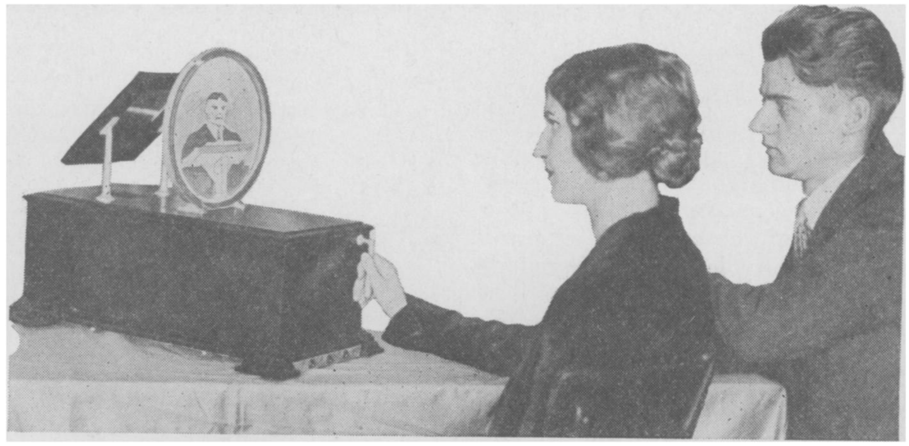
many to be impossible of attainment, to a successful process, capable of being used commercially and regularly. Rapid as the rise of audible radio was, it was much slower than this. From 1896, the year of Marconi's first success over short distances, through 1902, when the first transatlantic radiotelegram was sent; 1914, when consistent radiotelephony was established over a distance of 18 miles; 1920, when broadcasting began, and up to the present, when daily conversations across the Atlantic by radio are taking place, and nation-wide broadcasting is a common occurrence, represents over thirty years. Of course, this radio development, in providing a channel over which to send television, has largely been responsible for the latter's rapid development. But, in view of the speed with which it has come into being, and present success, one would indeed be rash to predict that fully successful and perfected television for the home is still many years distant.



A HOME RADIOVISOR like this will soon be on the market, according to promises. It is connected to the radio set in place of the loudspeaker or head phones, and makes use of a drum scanner, the invention of C. Francis Jenkins. The artist has indicated how it might look receiving a radiovision broadcast of Mr. Hoover's inauguration.

Though successful television is only about five years old, the idea is much older. In fact, a patent issued in 1884 described a method that is essentially the same as that now in use. The idea was sound enough and only the lack of modern equipment prevented it from working.

There are two possible ways of obtaining television. One is to imitate nature directly. This provided the original television transmitter in our own eyes! The lens of the eye forms an image on the retina, which consists of a mosaic of light-sensitive cells, called rods and cones. Each rod or cone is connected by means of a separate nerve fiber to the brain, through which the picture is sent. The scientist has light-sensitive cells also. These are the photoelectric cells which give off a minute electric current when light shines on them. This current can be amplified as much as desired and made to light a lamp. The most obvious method of televising is to use a bank of hundreds of photoelectric cells, connect each one by its own wire through an amplifier to a lamp in a corresponding bank. Then, if a lens forms an image of a scene on the photoelectric "retina", current will flow from the cells on which light falls, the corresponding lamps will light, and the picture will be reproduced. Such a system was actually experimented with nearly a quarter of a century ago, but the difficulty was with the huge number of elements and wires that would be needed to get a reasonably good picture.

There is another method. It is to use a single light sensitive cell, and to pick up separate parts of the image in rapid succession with a photoelectric cell. This cell connects with a single light source, and by some mechanism corresponding to the transmitter, a moving spot of light, constantly varying in intensity, reconstructs the picture. Here only one set of wires, one photoelectric cell and one light is needed. The persistence of vision in the eye, by which we continue to see a thing for about a tenth of a second after it has disappeared, enables us to see a continuous picture, if it is repeated at least ten times a second.

The system used first in the Bell Laboratory's method, and now employed by the General Electric Company, and most of the other American stations broadcasting television programs, is a good example of the second method. If you have ever laid a piece of paper on a coin, then rubbed a soft pencil over the paper and obtained a reproduction of the coin, you are familiar with the way in which it works. The pencil traces a series of parallel lines. When it comes to a high spot on the coin, some of the graphite is rubbed off onto the paper, while in the low spots the pencil passes over lightly, and leaves no impression. When the coin has been completely covered, the long and short lines make up a picture reproducing the image on the coin.

In television a pencil of light takes the place of the one of graphite. A powerful source of light, such as an electric arc, shines on a disc, around the edge of which is a spiral row of holes. A lens forms an image of one hole at a time on the object whose image is being transmitted. Perhaps it is a face. When the disc turns this spot of light travels across the subject. Then the next hole comes into position, and another spot of light moves across the subject, just below the first. This is repeated perhaps 48 times, the 48 lines of light completely covering the subject. The light is reflected from the subject back to a photoelectric cell. When it encounters a light part of the face most of the light is reflected and a relatively large current flows from the cell. From a darker part there is less reflected light and so a smaller current from the cell.

The resulting current is amplified, then carried by wire or wireless to the receiving set. There it lights a special lamp, a neon tube. This glows with a pinkish light over an area a couple of inches square, and the light from the entire area fluctuates as the spot of light at the transmitter shines on lighter or darker areas. But still something is lacking to give a picture. This is a disc like the one at the transmitter, with the spiral row of holes. It turns in synchronism with the first one, and reveals a part of the luminous area corresponding to the part of the subject then lighted.

Such is television as it was first successfully demonstrated, as it is now being transmitted by numerous stations, and as thousands of amateur experimenters are (*Turn to page* 67)

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receiving it. But it still leaves a lot wanting. For one thing, the receiving process is extremely inefficient. The entire area of the neon tube, perhaps three square inches, is lighted, but only the light which shines through a hole about a twenty-fifth of an inch can be seen at once. The result is that about 249/250ths of the light is wasted. Whenever the scientist sees waste it makes him feel badly and so he has sought for ways to use more of the light from the neon tube.

One way of doing this, which points the way to the time when we shall see televised programs on the screens of motion picture theaters, is the invention of Dr. D. MacFarlan Moore, of the General Electric Laboratory. This was the method demonstrated at the New York Radio Show. He uses a neon light, but one of his own invention, and in which the light is concentrated in a spot about the size of a pinhead. Revolving in front of it is a disc containing, instead of a spiral row of holes, a spiral row of lenses, the invention of C. Francis Jenkins, of Washington. Each lens forms an image of the light spot on the screen as it comes into position First one lens sweeps across the field, and the spot of light on the screen crosses in a corresponding manner. Then the next lens comes into position, and the next spot appears as a line of light on the screen, below the first. Finally, all 48 lines have crossed, and the entire picture area has been covered, then the whole process is repeated 15 times a second. With the light spot varying according to the brightness of the original, the head of the subject is reproduced plainly and life-size. So far, it has not proven possible to make the light brilliant enough to give a picture larger than a couple of feet square, but this will doubtless be done before long, and images can be made to cover the entire area of a large motion-picture screen.

Still another method of increasing the light is now being tried out by C. Francis Jenkins. This discards the neon tube altogether, and makes use of incandescent lamps. The image is seen on a screen made of 2304 small flashlight lamps, forming a square with 48 on a side. Each lamp is connected with a revolving contact called a commutator. This spins around like the scanning disc, connecting each lamp in succession, and each lamp lights according to the brightness of the corresponding parts of the subject. But after the commutator has passed, the lamp continues to glow for an instant, until the connection is made again a 15th of a second later. Under similar circumstances, a neon light would only shine while it was actually connected, or 1/2304th of the total time. The lamps would not give the full theoretical advantage, of 2304 times as much light as the neon, unless the lamp continued to glow at full brilliancy for a fifteenth of a second, then went out instantly. Actually, they start to diminish as soon as the current is off, but do not completely darken until an instant later. However, there is still a great advantage, and, as the incandescent lamp is intrinsically much brighter, the image will be many thousand times as brilliant. So far, this idea has not been tested in operation, and until it is its success is conjectural. But at least it indicates what may be expected. And with this brilliant picture, a lens can be placed in front of the glowing bank of lamps, and an image projected on a large screen.

So with all these developments already accomplished and with others around the corner, there is no doubt that radiovision is "here". Perhaps the 1929 world series games will be broadcast to televisors as well as by sound; the same may even be true of the inauguration ceremonies that will take place on the steps of the United States Capitol in Washington on March 4. Or possibly the first important television broadcast may be a little later. But that it is coming, and within the next few years, there is no longer any possible doubt.

Science News-Letter, February 2, 1929

WHAT TO SEE BY RADIO

Stations on Regular Schedule

LEXINGTON, MASS., W1XAY, Lexington Air Station, 300 watts, 4800-4900 kc. or 62 m. Standard scanning.* Daily, 3 to 4 p. m., and 7:30 to 8 p. m. Will soon be equipped to broadcast voice and vision simultaneously.

PITTSBURGH, PA., W8XAV, Westinghouse Electric and Manufacturing Co., 2000 watts, 4700-4800 kc. or 63 m. 20 frames per second, 60 lines per frame. Transmitting television programs, generally motion picture films, Monday, Wednesday and Friday, 5:10 to 6 p. m., Eastern Standard Time.

SCHENECTADY, N. Y., W2XAF and W2XAD, General Electric Co., 24 lines, 20 frames per picture. Sunday, 11:15 to 11:45 p. m., W2XAD, 19.56 meters or 15340 kc. Tuesday, 12 to 12:30 p. m., W2XAF, 31.48 m. or 9530 kc., Tuesday, Wednesday and Friday, 1:30 to 2 p. m., W2XAD.

WASHINGTON, D. C., W3XK, C. Francis Jenkins, 250 watts, 6415-6425 kc. or 47 m. and 1600-1610 kc. or 187 m. Standard scanning.* 8 to 9 p. m., Eastern Standard Time, Monday, Wednesday and Friday. Radiomovies.

On Irregular Experimental Schedule or Under Construction

BEACON, N. Y., W2XBU, H. E. Smith, 100 watts, 4500-4600 kc. or 66 m. Standard scanning.* (Under construction.)

CHICAGO, ILL., W9XAA, Chicago Federation of Labor, 500 watts, 4560 kc. or 66 m. Standard scanning.* "At present standing by awaiting sanction from Federal Radio Commission."

LONG ISLAND CITY, N. Y., W2XBT, Frank L. Carter, 8190-8200 kc. or 36.6 m. Irregular nightly experimental broadcasts.

LOS ANGELES, CALIF., W6XC, Pacific Engineering Laboratory Co., 500 watts, 4500-4600 kc. or 66 m. Will start on definite schedule within next six weeks.

MEMPHIS, TENN., W4XA, WREC, Inc., 5000 watts, 2400-2500 kc. or 122 m.

NEW YORK, N. Y., W2XBW, Radio Corporation of America, 5000 watts, 15100-15200 kc. or 20 m. The corporation also has been granted construction permits for W2XBV, 4500-4600 kc. or 66 m. and for W2XBS, 4600-4700 kc. or 64 m.

NEW YORK, N. Y., W2XAL, Experimenter Publishing Co., Radiovision broadcasting suspended pending hearing by Federal Radio Commission.

WASHINGTON, D. C., C. Francis Jenkins, 5000 watts (under construction).

*Standard scanning refers to the standard adopted by the Radio Manufacturers Association. This is 48 lines per picture, 15 frames per second, with scanning consecutive from left to right and top to bottom as one reads the page of a book.

The population of Melbourne, Australia, has reached one million.

A huge variety of lemon sweet enough to be eaten with a straight face has been developed in Porto Rico.