Above: Dr. Frank Conrad, research engineer of the Westinghouse Company, standing behind his "radio-movie" transmitter.

ON August 8 the Westinghouse Electric and Manufacturing Company demonstrated a system of "radio movies" to members of the press and a group of distinguished radio men at station KDKA, East Pittsburgh, Pa. The demonstration was very successful and convincing, but the daily newspapers which mistakenly heralded it as the "first transmission of motion pictures through the air in the history of the world," either overlooked or were in entire ignorance of the work which C. Francis Jenkins had been doing in Washington for months before the Pittsburgh showing; as they gave him no credit at all for his own previous successful broadcasting of "movies." RADIO NEWS wishes to straighten out this matter merely as a matter of historical interest, and not to disparage in any way the very admirable achievements of the Westinghouse research engineers.

The Jenkins "radio-movie" apparatus was the subject of the front-cover illustration of RADIO NEWS for August, 1928, and was described in great detail in a three-page article in that number. A member of the editorial staff who made a trip from New York to Washington, for the special purpose of examining the equipment, reported his observations in that article. The reader who is interested in the general subject of animated radio telephotography (the correct designation of "radio movies") is referred to this for the details of the Jenkins system, which works very well and which is now on the air, on short waves, three times a week.

The statement issued by the Westinghouse company at the time of the demonstration promised that regular "radio-movie" transmissions through KDKA would commence "within a few weeks," although no data concerning wavelength or details of the transmitting system were given. The New York office of the company yielded the more definite information that one of KDKA's short-wave channels will be used. This will be good news to thousands of radio experimenters all over the world, as KDKA is the most consistent and reliable short-wave broadcaster on the air today.

In the demonstration of August 8, the "radio-movie" signals traversed a distance of about four miles: two miles over wires from the television laboratory to the broadcast station proper, two miles away, and two miles back to the same laboratory by radio. They could just as well have been sent a greater distance; but the object was to show the operation of the whole system, both transmitter and receiver, to the assembled guests.

METHODS AND APPARATUS

As explained by the Westinghouse engineers, the operation of the "radio-movie" system is as follows:

Photography in its simplest form consists of the reproduction of spots of light and shadow in the same arrangement which they occupy in the subject photographed. In screening a motion picture, a roll of film is operated at a speed which sends sixteen pictures a second before a projecting beam of light. Because of the structure of the human eye, if pictures follow each other in a regular series at the rate of eight or more per second, the eye sees a single moving picture. To broadcast the "radio movies" requires all this, with the addition that the spots of light must be transformed into electrical vibrations, which are in turn caused to modulate a radio "wave." In the reception of the pictures, the process is reversed. The electrical energy representing the radio "wave" is picked up, amplified, demodulated, and the electrical vibrations are returned to the form of lights and shadows, which, when viewed by the human eye, constitute the "radio movie."

In the first step of the transmitting process, a sharp beam of light traverses each picture or "frame" on the roll of film, in parallel paths, 60 times. A sixteenth of a second, the length of time each "frame" is kept in view, is required for this scanning. A sixty-line picture is as clear as the usual good newspaper halftone.

The sharp beam of light is produced by the interposition of a scanning disc which has a series of minute square holes arranged *in a circle* near its rim. This type of scanning disc should be distinguished from the usual television disc in which the holes are

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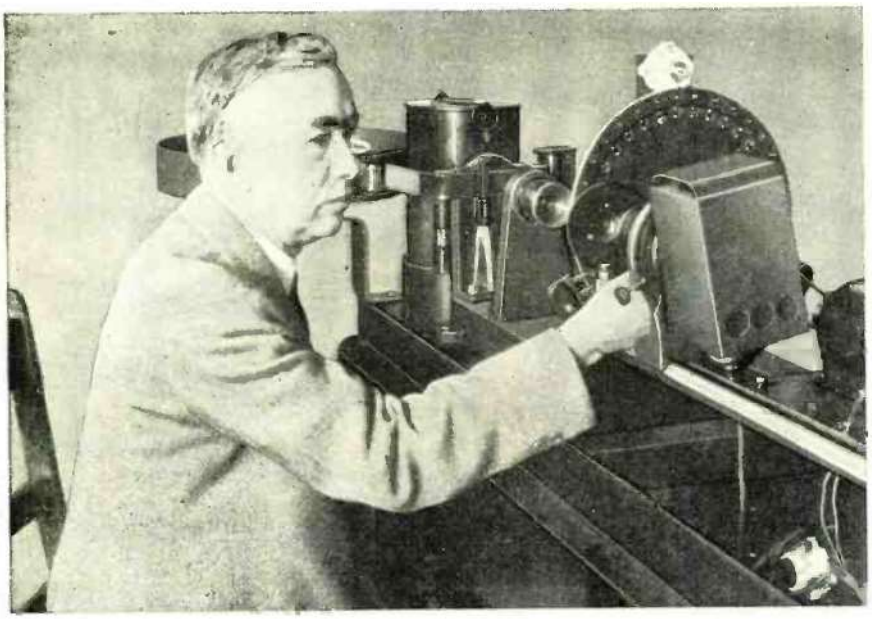


Dr. Conrad at his "radio-movie" apparatus. The square can next to his right hand contains a powerful lamp which produces the light used for "scanning" the movie film. Pictures of the receiver are not yet available.

arranged in a spiral. A circle of holes is used in the Westinghouse system, and not a spiral; because the movie film itself is steadily moving past the beams of light, and thus the whole surface of the film is scanned. In a television system such as WRNY uses, the subject (corresponding to the pictures on the film) is stationary; so the scanning holes must be arranged spirally in order to cover the subject completely.

The Westinghouse disc is so arranged that all light is excluded from the film, except that which comes through the square holes. The disc turns very fast and, as it turns, flings the beams of light across each frame *from top to bottom* (side to side of the picture), so that the whole is "scanned."

The beam of light passing through the film falls into an "electric eye," or light-sensitive cell, which is not unlike an oversized incandescent lamp in external appearance. Within the cell is a thin coating of caesium, a rare "alkaline" metal. The amount of light falling on this cell determines the amount of current passing through it; the result is that each individual beam of light produces an electrical impulse which varies in intensity directly in proportion to the amount of light (or shade) at the point of the film through which it is passing. The impulses are amplified and then conducted to the broadcast transmitter.

According to Dr. Frank Conrad, who designed the Westinghouse "radio-movie" apparatus, the frequency of the picture impulses thus obtained ranges from 500 to about 60,000 cycles. The width of this band makes the application of the present system to the regular broadcast band out of the question; on the short waves, of course, transmission can be handled more easily.

THE RECEIVER

The receiving end of the system appears to be practically identical with other existing disc systems. The received impulses are detected and amplified and then led to a mercury-vapor lamp, which corresponds to the neon-gas glow-lamp of less expensive receivers. The mercury lamp goes bright or dim as fast as the current changes, and its light at any instant is in proportion to the light that the electric eye "sees" in the same instant at the transmitter. To return the dots of light to their original pattern, a revolving scanning disc is used. This disc must, of necessity, contain its holes in a spiral arrangement, in order to build up the necessary 60 lines corresponding to the scanning lines at the transmitter; and the lamp is mounted, presumably, at the top, in order to obtain proper scanning of the reproduced image.

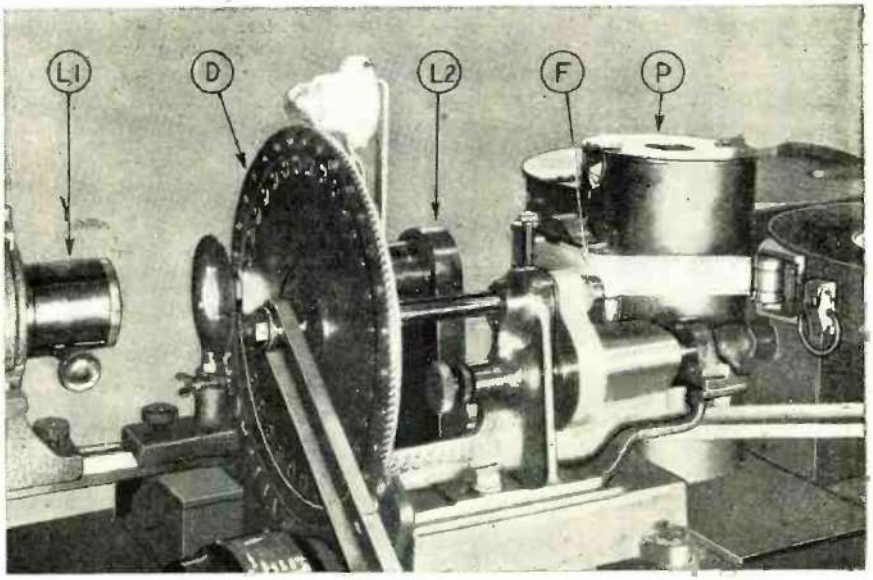
According to the statement released by the Westinghouse company, the use of a "mercury arc" lamp permits the received images to be projected upon a ground-glass screen. As the company is decidedly reticent about divulging the details of the receiver, we cannot give the exact dimensions of the received images in this article; but, as soon as the information is forthcoming, Radio News will publish it.

The accompanying illustrations give a good idea of the construction of the transmitting apparatus; the picture bearing title shows Dr. Conrad standing behind the machine, while the lettered picture on this page shows a close-up of the parts. L1 is a powerful lens which concentrates the light from an incandescent lamp (contained in the square-shaped can in front of Dr. Conrad's arm in the title cut). The light beam passes through the square holes of the scanning disc D and, after coming out on the other side of the disc, is further concentrated by a second lens, L2. The tiny "pinhead" beam from this lens sweeps across and through the film F, which is moved horizontally from one reel to the other by a suitable ratchet mechanism which engages the slots in its sides. The photoelectric cell P is contained in a shield can, located between the film reels.

The construction of the scanning disc may furnish home television experimenters with an idea. The minute scanning holes are drilled, not directly through the disc itself, but through little individual metal tabs which are adjustable and attached to the disc. Of course, a circle of larger holes is first drilled into the disc, and these allow the light from the tiny square holes to pass through.

The Westinghouse company is definitely contemplating the manufacture of commercial "radio-movie" receivers, according to its announcement; when these are ready they will be sold through the Radio Corporation of America. A Westinghouse official, when questioned by Radio News, stated that no one in the company has any idea when the instruments will be ready, as the experimental work on them has not yet been completed and much remains to be done.

At present station 8XAV, using one of the several short-wave transmitters at East Pittsburgh, is transmitting these "radio movies," though as yet not on any regular schedule. Owners of short-wave receivers can probably pick up the signals if they will tune to 62.5 meters.



A close-up of the "radio-movie" transmitter: L1, lens concentrating a powerful beam of light on the scanning disc D; L2, second lens producing sharp "pinpoint" of light on the film F. P is the photoelectric cell.

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