New Disc Keeps Down Image-Frequency

Sanabria System Uses a Spiral Divided Into Three Sections to Scan Television Subjects and Obtains Sharp Detail and Clear Distinct Signals Within 5000-Cycle Band

By Robert Hertzberg

One of the main attractions at the Radio World's Fair held in New York during September was the exhibition of television transmission and reception staged by Ulisses C. Sanabria, the young television expert of Chicago, whose pioneer television work on the broadcast band was described at length in an article appearing on page 210 of the September number of Radio News. Every afternoon and evening during the week, people waited in long lines to get a glimpse of the television images as they appeared in four receivers set up in the exhibit hall of Madison Square Garden. The apparatus was kept running almost continuously from noon till eleven o'clock in the evening, being shut off occasionally only to give the arc light and the driving motors a chance to cool off.

Mr. Sanabria displayed for the first time his new three-spiral-disc system, to which reference was made in the article cited; he thus produces 18 pictures a second, yet keeps the frequency of the image impulses within the 5,000-cycle limit prescribed by law. As a matter of fact, the television signals are actually "sharper" than voice and music signals; that is, they do not spread over the tuning dials of a receiver as much as the latter. This rather surprising effect has been the subject of comment by numerous listeners in and around Chicago, in which city a Sanabria transmitter is in nightly use at WIBO. This station broadcasts television images every evening and Sunday and Monday at 11:00 a.m., Central Standard Time.

**TELEVISION AT STATION WMAQ**

By the time this number of Radio News appears, the television transmitter displayed by Sanabria at the New York radio show will have been installed at WMAQ, the powerful broadcast station operated by the Chicago Daily News. If you are within range of this station, you can readily learn the identity of television broadcastings by consulting the daily radio programs printed in your local newspaper.

This machine and that in use at WIBO were built under Sanabria's direction by the Radiotronics, Inc. of Chicago. Mr. A. J. Carter, its president, stated at the New York show that several other transmitters were then under construction, and would be installed shortly in different parts of the country. It is likely that one of the new transmitters will be taken over by a third Chicago station, although at the time this number of Radio News went to press the financial negotiations had not yet been completed. Another transmitter is tentatively scheduled to go to Philadelphia.

Except for the important detail of the disc itself, the Sanabria television is much like the numerous other disc machines. A ten-kilowatt arc serves as the initial source of illumination, its light being broken up by a disc into slender rays which flash across the face of the subject being televised. These rays are reflected into a bank of four ten-inch photocells, which respond to the gradation of tone (reflected from the lighter and darker areas of the face) by producing a flickering current. This current, which is very weak, is amplified by a suitable bank of amplifiers and made to modulate the radio transmitter. This action has been described in detail in numerous articles in Radio News.

In practically all other disc systems designed for ordinary black-and-white transmission, the disc is drilled with a single spiral of tiny holes, which cause a series of beams of light to sweep across, or "scan," the face of the person being televised. With a single spiral (of either 24 or 48 holes, usually), 24 or 48 beams have swept across the subject. Then the outermost hole of the disc comes into position again and the subject is again scanned from top to bottom in one revolution of the disc. The holes are of such diameter that the beam of light thrown out by each just skims over or slightly overlaps the edge of the hole covered by the one from the preceding hole. As the holes are in a spiral, the whole surface of the subject's face is smoothly scanned, usually from top to bottom.

**THE SANABRIA 3-SPIRAL DISC**

The Sanabria disc, however, is drilled with three spirals, as shown in Fig. 1. Each spiral comprises fifteen uniformly spaced holes, with the spirals themselves set differently in relation to the center of the disc. To understand exactly how the holes are arranged, study Figs. 1 and 2 very closely. Fig. 2 shows how hole 1 of spiral 1, hole 1 of spiral 2, hole 1 of spiral 3 and hole 2 of spiral 1 would look if all four of them could be made to appear together along the vertical diameter of the disc.

Let us start with hole 1 of spiral 1 in the position it occupies in Fig. 2, and start the disc rotating in the counter-clockwise direction. This hole sweeps past the arc light, and is followed by hole 2 of the same spiral, and by the remaining thirteen holes. Notice carefully that holes 1 and 2 of spiral 1 do not overlap or even run closely, edge to edge; in fact they are quite widely separated. Now when the 15th hole of spiral 1 has flashed by the arc, hole 1 of spiral 2 comes into position. This hole just skims beneath the path cut by hole 1 of spiral 1; similarly, hole 2 of spiral 2 runs nearly beneath the path covered a few moments previously by hole 2 of spiral 1. When all 15 holes of spiral 2 have run by the arc, covering half of the dark path left by the passage of spiral 1, hole 1 of spiral 3 comes into position. This sweeps under the path cut by hole 1 of spiral 2, and above the path cut by hole 2 of spiral 1. The other 14 holes of spiral 3 cover the remaining dark or unscanned strips of the subject's face. The disc revolves at 900 r.p.m., giving 15 pictures per second.

At this point, assuming that you have been reading this text and then finishing, the eye retains the images produced by the first scan for some time after spiral 1 has

![Diagram of Spiral Disc](image_url)
SIGHT AND SOUND TOGETHER

One of the interesting experiments Mr. Sanabria performed in Chicago, just before leaving for the New York exhibition, was that of transmitting both voice and images on the same 5,000-cycle broadcast channel, at the same time. At the transmitting end he simply connected the microphone in one of the intermediate stages of the audio amplifier working with the photoelectric cells. At the receiving end he inserted a low-frequency filter in the plate circuit of the last audio amplifier tube, with the loud speaker in the proper position in the circuit.

It is possible for this simple system to work only because the voice frequencies are comparatively low, and the image frequencies relatively high. The voice impulses do tend to break up the images at times, but the experiment was performed with marked success. In fact they were actually tried "on the air" and several experimenters in Chicago reported that they were able to reproduce the voice and images simultaneously.

It is obvious from the foregoing description of the Sanabria television system that a special receiving disc is necessary. The 48-hole disc which has become virtually the standard for television work, for no reason at all, will produce no results. By the time this magazine appears, inexpensive three-spiral discs undoubtedly will be available.

Several Wavelengths Used for High-Frequency Radio Movies and Television

STATION WIXAY, located at Lexington, Mass. (near Boston), is now broadcasting both television and "radio movies" on a wavelength of 0.05 meters, a 48-hole disc, revolving at 500 revolutions per minute, being used. This station has been authorized by the Federal Radio Commission to use a wide modulation band for experimental purposes. No definite schedule of transmission has been given; but owners of short-wave receivers can easily pick up the signals and learn the schedules from the broadcast announcements.

The transmitter of WIXAY (which is a companion station of WLX) is rated at 900 watts, and was designed especially for radiovision work. It should be heard without trouble in most parts of the United States and Canada. Alfred J. Poli, formerly in charge of the experimental laboratory of the Raytheon Manufacturing Company of Boston, is chief engineer of the station and the designer of the television apparatus.

As the studios of WIXAY-WLX are located in the same building housing the short-wave transmitter, it will be possible to broadcast the images of performers, either before or after they appear before the microphone. The television transmitter has been built in semi-portable form; so that it may be wheeled from one room to another. It is Mr. Poli's plan to cut a hole in the wall of the main studio and to stand the television inside this, so that the apparatus will not crowd the studio itself.

For the "radio-motion" transmissions, especially prepared motion-picture film will be used. Radio News will publish further details of the apparatus, and will give the full transmitting schedules, as soon as the information is released.

Above, left. A. J. Carter of the Carter Radio Co. being televised by the transmitter which U. A. Sanabria is operating. This apparatus was exhibited at the radio show held recently in New York and Chicago. The "checklist" receiver appears at the right.