RADIO — ELECTRONICS

formerly RADIO CRAFT

Exclusive TELEVISION NEWS Section

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LADY TELEVISION ENGINEER

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LATEST IN RADIO — ELECTRONICS — TELEVISION

Lady Television Engineer

by TEX BARBARITE

The author repairs a camera

MAINTAINING an electronic exhibit like the Radio Corporation of America's Exhibition Hall in the heart of Radio City, New York, means a great deal more than replacing knobs and pilot lights removed by souvenir hunters. It includes turning a bushing on a lathe as well as answering the queries of John Q. Public on AM, FM, and television.

My engineering bent was formed in my early childhood. My hobby throughout my younger days, until I was enrolled in a girl's private school, followed radio lines. My three brothers and I constructed our own crystal sets. When crystal sets were outgrown, we graduated to vacuum-tube circuits. When I entered the girls school, I found myself very unhappy because the administration felt that science and mathematics were unnecessary subjects for a girl. Finishing secondary school, I decided to go to the Texas College of Mines in El Paso to study for a degree in mathematics. There I received a scholarship to study electrical engineering at Purdue University. At Purdue my interest was spurred by the the fact that the field of engineering, hitherto dominated by men, was being opened to women by the wartime shortage of men.

From school I went to RCA in Camden, N. J., and worked in the Television Terminal Equipment Design Laboratories. This division handled design for the microwave transmitter, distribution amplifiers, video amplifiers, synchronizing generators, image orthicon and iconoscope cameras, and all associated equipment.

Having little knowledge of television, I took advantage of courses the company offered in night school. In the laboratory we operated our own experimental transmitter, W3XEP, for which I got my commercial phone license. This provided all-around experience—students served as announcers, projectionists, cameramen, station engineers, and in other essential positions. At that time I was also teaching basic theory and code to Civil Air Patrol cadets. This background was the basis for my transfer to the RCA Exhibition Hall when it opened in New York in April, 1947.

The most important exhibit here is the television field camera mounted in a "See Yourself" display. This camera (see cover), used in conjunction with the field power supply, sync generator, and camera control, utilizes an image orthicon tube. Highly sensitive, it is most useful where low light levels are available. When the camera is in use, the cover can be removed and the viewfinder attached on top of the camera. A plug receptacle provides all the connections between the two units. The viewfinder is a monitor using a 5FP4A kinescope. The sides of the camera are hinged to give access to the unit for maintenance and servicing. Selection of any one of four lenses is made possible by a rotating turret controlled by a handle at the rear of the camera.

Orthicon Ingenious

I consider the image orthicon one of the most interesting and ingenious pieces of equipment I have ever worked with. By means of the lens system, the optical image is focused on the semi-transparent photocathode, which is at a high negative potential with respect to ground.

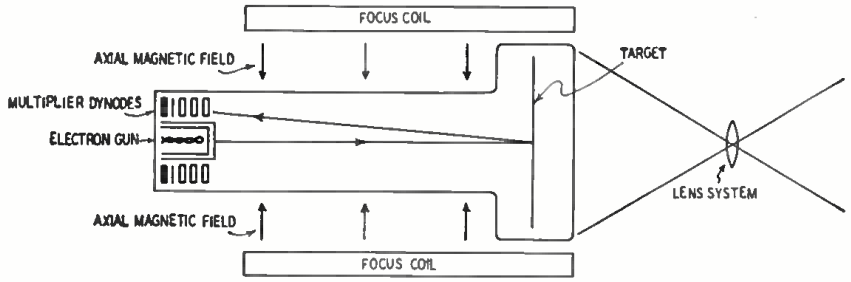
The radial electric field produced by the accelerator grid between photocathode and target, and the axial magnetic field produced by the focus coil around the tube, assures proper focusing of the photoelectrons on the target. If nonuniformity exists in either electric or magnetic field, the result is what is commonly known as S distortion.

As a well-focused beam of low-velocity electrons strikes the target (see drawing), enough electrons are deposited on the target to make it negative to the remaining electrons in the beam and repel them. The potential that any point on the target will reach is termed the "equilibrium potential." The beam is kept constant, and the electrons turned back are attracted to the rear end of the tube which is at the highest positive potential. The final function of the tube is to amplify the "picture information" in the returning electron beam. Several multiplier dynodes are used, each at a higher potential than the previous one. From the last dynode (there are five) the electrons are attracted toward the collector mesh (signal plate), connected to an external load resistor.

New Exhibit Projects

Projects in the making here in the Showroom include a monoscope camera and a master monitor, both to be installed in the control-room racks. The monoscope camera is a camera with the test pattern on the mosaic of the iconoscope. The pattern is composed of carbon deposited on an aluminum plate. The carbon and aluminum have different emission characteristics. Electrons

emitted by the scanning of the pattern are collected on the wall of the monoscope tube. This coating is at a positive potential with respect to the pattern, but is a.c.-coupled to ground. Therefore, the picture signal appears between plate and ground. The master monitor uses a 10-inch kinescope and a 5-inch oscilloscope and is adaptable to the supervision of composite picture signals at any stage of our transmission. A switching arrangement on the monitor allows it to be used as a control unit for the film camera chain. Both master monitor and monoscope must be wired for power and for our type of switching system, and adjusted for optimum operation.



A partial cross section of the image orthicon, showing path of the electrons.

Working as a maintenance engineer for the Promotion Department is not all repair work—not for a girl anyway. Once I was called on to don my best dress and attend a champagne cocktail party fashion show at the Ritz. I had to forego the champagne, however, as my job was to set up and operate a PA system for playing records. Another time I purchased and installed an inverter for Mrs. John McCormack, widow of the famous Irish tenor. I even entertained the mayor and his wife from my home town in Texas. It's all in a day's work.

Reaction of the public to a female technician is varied and amusing. I seldom talk to visitors; but, in the two years and more that I have been at the Exhibition Hall, just about every conceivable reaction has come to me. I'm not siding with my sex, but women, by far, are easier to talk to than men. The women know nothing about radio and don't pretend to, whereas too many men are out to "stump the experts." Men also seem reluctant to talk to women about a medium that used to be exclusively theirs.

Public pours out troubles

Many people come here to complain about the operation of their radios. The majority of these cases do not require a technician, but some instruction and a little public relations. A full recitation of the circumstances usually paints an entirely new picture. But service technicians do know of instances where Junior has dropped the new radio in the brook while the 90-day guarantee was still effective. Other set owners complain because the A-batteries of their portable receivers have gone dead before the end of the guarantee of the radio, or that the portables won't play in a steel-constructed building. Then there are our friends of the would-be-technician type who are at leisure and want to use all of ours picking up what they didn't learn in school.

Recently, I spent two weeks in Camden, N. J., at RCA's home office, learning the latest television circuits and techniques. Most important to me was the antenna information. Service and installation men will be glad to hear of the Woodward antenna which receives signals from only one direction at a time. Not an answer to any and all reception difficulties, it is most effective in cutting down co-channel interference when the receiver is located in a fringe area between two transmitters. Consisting of an array of four 8-foot dipoles in the form of a square, with the opposite members 8 feet apart, the antenna can be made to receive from one direction or the other by flipping a switch at the receiver. Interconnection of the dipoles through a diplexing network makes this one-way reception possible. Efficient reception on high bands is achieved by "shortening" the dipole with V's fastened to each leg.

Of special interest to the radio amateur is the TV interference suppressor recently developed by Captain John L. Reinartz of RCA's tube department in Harrison, N. J. This device, connected into the ham transmitter, traps harmonics before they can reach the antenna.

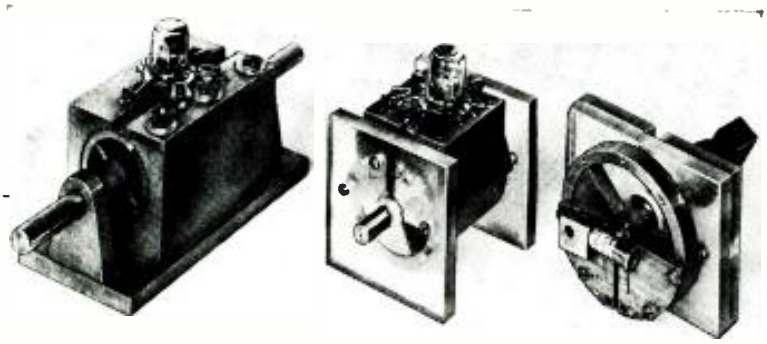
Hams are forever being blamed for many of the ills in television reception. I have seen at least one case where this was not true. In a small town just west of Philadelphia, there are only two amateurs in the entire area. Even though their logbooks showed they were off the air, they were blamed for a peculiar type of disturbance. The noise appeared in the form of a flash of maggots (similar to ignition noise). Just for a second it would disrupt the scene; occasionally it would travel downward in a bar effect. Service engineers from Philco, RCA, and Stromberg-Carlson traced the trouble to power lines and the power company remedied the difficulties.

My ambition—one that comes naturally to most radiomen and women—is to have my own well equipped shop. However, I am now involved in a project that has top priority; I am in the throes of building a shop in the basement of my home, not for radio, but for woodworking. It is my idea to gain some experience in the art of cabinet construction and finishing. I would like eventually to be able to design, construct, and finish custom cabinets for radios, television receivers, phonographs, and combinations. In the final analysis, I suppose that I have a different outlook on my ambition than a man would have. I prefer to make it a hobby rather than a money-making vocation.

CONVERTERS FOR THE ULTRA-HIGHS

Stanford Research Institute in Stanford, Calif., recently reassured the nation's present and future TV-viewers about the coming advent of u.h.f. picture transmission. The Institute's Department of Electrical Engineering has developed three new u.h.f.-to-v.h.f. converters which are both simple and inexpensive. With such a converter, a standard receiver will need no internal modifications to receive u.h.f. programs.

One of the laboratory models is fixed-tuned at 530 mc to pick up transmissions from an experimental station operated by John H. Poole, sponsor of the project. Another is variable from 475-675 mc, and a third tunes from 475-890 mc.



The tuners used are shown in the photo. At left is a cylinder oscillator. A modified "semibutterfly" oscillator is in the center, and a 475–890-mc crystal mixer at right. With the usual TV receiver, noise figure of the converters is about 11 db, sensitivity 200 μv. Oscillator radiation at the converter's antenna terminals is 56 mv. Image suppression is 42 db.