Radio Amateurs in the Television Picture

Announcing a Planned Program of Technical Coöperation

By James J. Lamb*

RADIO history repeats itself. The experimental activities of licensed amateurs in radiotelephony supplied the initial impetus and acceleration for sound broadcasting in the early 1920's. Now, over 15 years later, we radio amateurs have immediately before us the same opportunity to aid the progress of modern television development and perform an important public service in traditional amateur fashion. That this should come about was inevitable. Amateur radio provides the logical experimental proving ground for new developments between their laboratory stage and their attainment of widespread practical utility. In performing this service we have not only benefited ourselves as amateurs, but we have also earned recognition for experimental contributions no less important than the appreciation amateur radio has merited for emergency and other communication activities. For a time, it appeared that those concerned with the technical and economic problems of television development would do without experimental amateur aid. According to plan, television would come out of the laboratory, pass through a period of field trials conducted by a few restricted groups, and then be presented as a fully standardized and "perfected" public service—all under strictly commercial auspices. Participation of independent amateur experimenters in the intermediate stage of this program was not contemplated. Of course not everyone engaged in the commercial development of television thought that this would actually work out. And neither did we. Behind this lies a story.

*Technical Editor.

THE AMATEUR BACKGROUND

One responsibility of A.R.R.L. headquarters is to be on the alert for technical trends which may affect amateur radio: to judge, to the best of our ability, the possibilities of new developments as aids or hindrances to the progress of amateur radio; and on the basis of this judgment to do our best, by practical action, not only to adapt developments to our own needs but also to coöperate in their evolution so that progress may be maintained.

We have actively followed this policy with regard to television since the time of those early experiments with mechanical systems some ten years ago. For television is pretty much an old story in amateur radio. This magazine devoted considerable space to experimental television systems during 1928. In fact, there were more articles on television listed in the index for that year than articles on radiotelephony, the score being 6 for television to 4 for 'phone. General Electric, in Schenectady, and the late Dr. C. Francis Jenkins, in Washington, D. C., were the principal sponsors of transmissions on the medium high-frequency bands with pictures of 24 and 48 lines —exceedingly crude by present-day standards and even too crude to do more than demonstrate

principles at that time. The television content of *QST* tapered off to three articles in 1929 (and telephony scored four). Two of these three articles were distinctly of a debunking nature—in the January issue, "Rotten Television," by The Old Man, whom we now know to have been our late president, Hiram Percy Maxim; and, in the March issue, "What Price Television," by M. B. Sleeper. These two stories pretty definitely wrote *"finis"* to the amateur's further expenditure of money and effort on experimental reception with mechanical systems.

But this did not mean that the prospect of experimental television was hopelessly ended for us. In one of the 1928 articles, "Radiovision," in the September issue, Thornton P. Dewhirst had pointed the way and outlined the basis of what has become the modern technique in television reception. He said:

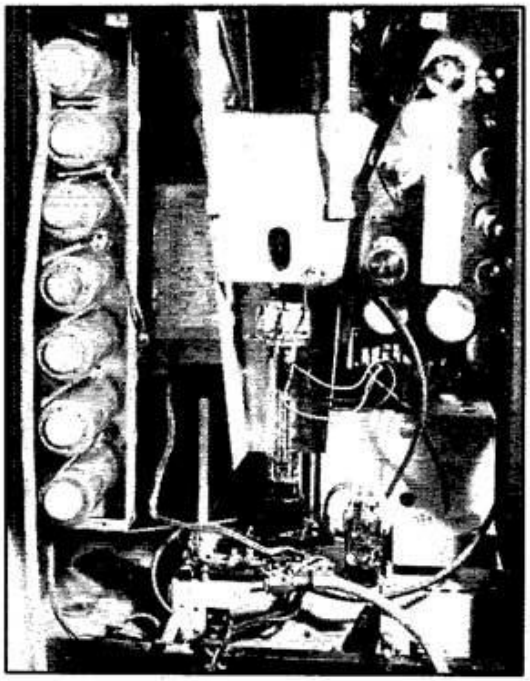
"The use of the cathode-ray tube for the receiver is worthy of consideration since it opens up the possibility of real radiovision. In this tube, a stream of electrons may be moved in two directions at right angles to each other by means of either an electric field or a magnetic field. The window of the tube is covered with a fluorescent material and the electrons upon striking it cause it to glow. By means of proper values of current or voltage and frequency, the small spot of light can be made to cover completely the window. For radiovision work, the use of a material for coating the window that was not only fluorescent (emits light when exposed to certain rays) but also continued to glow for a short period after the ray has been removed would be of material assistance. This will help in causing the vision to persist and thus give the effect of greater illumination as far as this characteristic is concerned."

In this same article, the author also outlined general requirements for satisfactory picture reproduction which still apply—and which are not yet completely solved. Quoting his words:

". . . When the elementary area used to build up our picture bears the same proportion to the whole picture that the individual particle of the (film) emulsion of the moving picture bears to the total number of particles in the exposure, and (when) some method of transmitting each of the individual parts with ease and the problem of synchronism have been completely and simply solved, radiovision will be ready for the public."

Now we must remember that in 1928 the cathode-ray tube was not the familiarly-known tool for routine amateur use that it is today. It was then a relatively rare, expensive and somewhat temperamental device restricted to the realm of the laboratory of the advanced physicist. But it soon became our conviction that television reception ultimately would employ the cathode-ray tube, and that until the c.r. tube technique was sufficiently developed, further amateur activity in experimental television would be practically futile.

We continued to keep an eye on the ball, but could not discern anything sufficiently significant to warrant further *QST* space until 1931. But in the middle months of that year the television pot began to boil sufficiently to give off some steam and evidence of the beginning of the cathode-ray era became visible. In the early fall of 1931 Associate Editor Ross Hull and this writer made an inspection trip to several of the representative television camps to learn first-hand just how much fire there might be under the pot. The results of this survey were reported by Hull in the article, "Television—What About It?" in the Nov., 1931, issue of *QST*. The sum and substance was that the cathode-ray technique promised results, that higher definition was in sight with "perhaps 240 lines to the picture," that transmission on ultra-high frequencies above 40,000 kc. was proposed—but that television still was in the laboratory stage.



INSIDE A MODERN TELEVISION RECEIVER

THE PRESENT SITUATION

It was not until about a year ago, in the Fall of 1936, that television had reached a stage where we became convinced that our active experimental participation would not be much longer delayed. Technique in the art had reached the state where refinement rather than new basic developments had become the ruling order. Experimental field tests with fairly high-power trans-

mitters were started. Under the auspices of the Radio Manufacturers Association, a set of proposed standards was promulgated. So we started to look for a way into the modern television picture.

But several questions of utmost importance had to be answered first. Was there reasonable assurance that transmission would, in general, conform to the proposed standards and that such changes as might be made would be in detail rather than drastically sweeping? Even though there were no transmitters using these standards operating on anything like fixed daily schedules, would there be at least sufficiently frequent transmissions suitable for experimental purposes in several centers with large amateur populations? (It was our aim then, as it is our firm purpose now, not to encourage the building of receivers by people solely interested in being entertained by television shows, but rather to present practical technical information to encourage experimenting amateurs to attack the problems of television in a constructive way.) Could we secure adequate practical technical information, with design data and constructional information on television receivers of proved performance which would be suitable for amateur experimental work? Would the operators of the experimental television transmitting stations coöperate in keeping us posted on their current activities and, possibly, their future plans? Would the necessary special cathode-ray tubes and other essential components be made available? And, finally, did a sufficient number of amateurs want *QST* articles on television?

Throughout the past year we have worked to get the answers to these questions. And we report here and now that the answer to every one of them is a resounding, "Yes!"

Taking the last question first, a decidedly positive answer was given by A.R.R.L. members returning the questionnaire sent out with membership certificates and cards. *An average of the replies for six months shows that over one-third (37%, to be exact) of the membership want articles on the theory and practice of television.*

The answer to the question of design data and constructional dope on practical television receivers was given by Marshall P. Wilder, W2KJL, who is not only a real amateur but also one of the most experienced and competent workers in the cathode-ray television field that we know of. We were fortunate to have secured the promise of his coöperation nearly a year ago, when, while he was doing independent research on television tubes, we worked out a plan for just such a series of articles as he begins in this issue. He also has been instrumental in coöperating with us to have made available to amateurs essential components, especially tubes, for construction of experimental receivers.

Promises from several manufacturers assure diversified sources of essential television components, including several types of cathode-ray tubes and their associated components. An encouraging feature with respect to the c.r. tube situation is that the prices are to be considerably less than ordinary oscilloscope types of the same screen sizes—even though the construction of the television tubes is more expensive.

Conferences with executives of leading experimental television transmitting stations have brought promises of full coöperation in keeping us advised on times and types of transmission so that we can pass this information along to interested experimenters. We also have been informed that more frequent transmissions are contemplated after the first of the year. No changes in standards are contemplated, other than the variations in polarity of modulation and method of transmitting the brightness component described in W2KJL's article elsewhere in this issue—which the receiver, to be presented subsequently in *QST*, is designed to accommodate.

THE PROSPECT

One tangible result of all the cumulative effort that has gone into this planning is the inauguration of the series of articles on practical television reception by Marshall P. Wilder, W2KJL, in this issue. These articles will progress in logical order through the design, construction and adjustment of a cathode-ray type receiver incorporating the latest circuit developments. It will be capable of delivering a good picture. But its construction just should not be attempted by anyone less capable than the amateur who is well grounded in the fundamentals of circuit operation, who has had experience with the building and successful adjustment of fairly complicated equipment such as a multi-stage transmitter or superheterodyne receiver. He also should be familiar with the operating principles of cathode-ray tubes. In fact, he must have a cathode-ray oscilloscope available for the adjustment of the television receiver circuits before any attempt to operate the complete set is made. Experience with ultra-high-frequency apparatus and familiarity with the peculiarities of u.h.f. communication, while not so necessary, will stand him in good stead. The television receiver is not a simple thing to get going. But there are hundreds of amateurs who have the required ability and who will find it just the kind of venture to satisfy their desire for a good technical job to take on.

It must be distinctly understood that the construction of a television receiver is not to be undertaken by the non-technical "home set builder" who doesn't know a saw-tooth wave from a megacycle, no matter how alluring a kit advertisement may seem and no matter how simple a "picture diagram" may make the job look. Most of the real work (and it's head work) is in

(*Continued on page 66*)

Radio Amateurs in the Television Picture

(*Continued from page 10*)

the circuit adjustment, not in the assembling and wiring.

How much will the parts for the vision receiver cost? In the neighborhood of one hundred dollars, everything included. If parts already on hand are worked in, or if an alternative input tuning system is used, the cost may be lower. Then again, if a larger-type tube than a 5-inch or 7-inch size is demanded by the more ambitious, it may cost more. In other words, the price will be on the order of what many amateurs pay for their communication-type receivers.

Who will be able to make first practical use of the receiver design, construction and adjustment information? The answer to that is, of course, those within range of a television transmitter. In the beginning, this will mean, generally, amateurs in the metropolitan areas of cities that have experimental television transmitters in operation at the time the receiver articles are completed, which will be late this winter. (A list of cities which now have experimental transmitters and in which transmitters are contemplated for the early future is given in W2KJL's article elsewhere in this issue.) As it happens, the regions in which television signals will be first available are practically the same as those where ultra-high frequency amateur activity has been, and is, greatest. The u.h.f. gang is in a good position to take advantage of that logical coincidence.

How will all amateurs benefit? From the articles themselves, every amateur who is sincerely interested in developing his technical knowledge will profit by reading them and learning thoroughly the lessons they teach. Even though the individual may not be in position to build and make immediate use of a receiver, it will serve him well to make himself as familiar as possible with the practical technique of television. Commercial television executives have stated to us that commercial television broadcasting will demand hundreds of engineers and thousands of servicemen who are familiar with television technique, and that in television, as in broadcasting, amateur radio must be the reservoir of technical personnel.

How can amateur radio contribute to the technical progress of television? Those within range of the experimental transmitting stations will make valuable contributions to the development of television by reporting on the transmissions received, particularly with regard to the signal strength, synchronization under different transmitting conditions, variations in signal-noise ratio. A large number of receivers distributed over a wide area promises to answer one of the most perplexing problems worrying the television people to-day; namely, what is the effective range? They are looking to us to give an answer. We are confident that we can do it.

By such coöperation, we shall continue the traditional proving-ground service to radio development which has played its part in earning

for amateur radio the position it holds to-day. Our coöperation will not revolutionize the advancement of television, of course, any more than our participation in television development will revolutionize amateur radio. But by our constructive coöperation we shall contribute to its progress—while continuing our other activities in full stride.

QST, December 1937