# The Truth About Television

## By Edgar H. Felix

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**IN this article, Mr. Edgar H. Felix, one of the leading authorities on radio and radio developments, gives a complete analysis of the present position of television. This article is extracted from the columns of "Radio Retailing," a leading radio publication in the U.S.A. Although long, it is worthy of reproduction, because of the complete treatment it gives the subject in which there is growing interest because of repeated claims of success as made by cablegram.**

THE eagerness with which anything pertaining to the visual transmission and reception of images was examined by the radio trade during the R.M.A. show in Chicago is but a reflection of public interest in this new field. The public has already purchased tens of thousands of dollars' worth of scanning discs and neon tubes without any assurance of practical results. The American urge to experiment and pioneer is readily capitalised, but there is enough shrewdness in the buyer to make him study the product before risking his dollar. The dealer must know what he is selling and what it will accomplish before he can face the customer successfully.

That there are pitfalls as well as profits in the new field is clearly apparent from a review of the progress of television in England. Selfridge's, a leading London department store, fired the opening gun by announcing a sale of "television" receivers at 32 dollars 50 cents. Buyers flocked, sought information, and awaited demonstrations. Information came to them in the form of a magazine, the first issue of which was eagerly purchased. Dealers, following the example of the London store, stocked scanning discs, selenium cells and neon lamps. Television made news and the Press supported it liberally at the start.

Within two months, however, a leading British trade paper reported "the television flurry is over." The public had examined and passed its judgment. Some dealers had lost friends by selling goods which did not give satisfaction. A trade publication, as a warning to dealers, had offered a 5,000-dollar prize for a satisfactory demonstration of the television devices, and the challenge had been unheeded. The progress of television has been set back seriously in England by the premature appearance of equipment unsupported by broadcasting and unable to sell itself by demonstration. Dealers had stocked on faith instead of upon actual results.

In Boston, they are having a television flurry and another may be expected any time now in Chicago. A careful survey in Boston reveals that no dealer has been able to show bona fide television images to prospective customers. Unless dealers can do so soon, the television flurry will be over in Boston too. The experimenter market knows its radio and it doesn't rent telescopes to look at the moon on cloudy nights.

ALL kinds of radio image equipment are now being offered to the radio trade. A host of manufacturers is jumping into the field, getting all set to be in on the mushroom market when anything pertaining to television sells. Many of them are making meritorious products which do what is claimed for them. While there is a seller's market and the public is clamouring for goods, no live dealer wants to overlook opportunities because that is when big profits are made. As long as one simple rule is followed—know your goods and represent them accurately—the television market is an opportunity. By observing that simple maxim, you may avoid the poisonous mushrooms, and profit from the sale of wholesome ones.

The principal radio vision products now being offered are scanning discs, neon lamps and still picture recorders. To sell a neon disc in any given territory, there must be available a television signal and a means of synchronising with it which can make a recognisable image with the particular disc being offered. It must be possible to

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set up a demonstration in your store or laboratory so that you can show the experimenter just what kind of an image he may expect to reecive. A 24-hole scanning disc is useless in a territory where only a signal intended for a 36-hole scanning disc is available.

IT must be remembered, also, that absolute synchronisation must be maintained between the transmitter and the receiver. This is accomplished by means, usually, of synchronous motors at each end, but unless both the transmitter motor and the receiver motor are on the same power line, absolute synchronisation is almost impossible to attain, due to the differences between frequencies of the various power companies. In the majority of cases, of course, the television receiver will be on power lines far removed from the broadcasting station. In these instances, synchronisation is maintained by hand manipulation of a variable rheostat connected with the receiving motor, keeping it in time with the impulses received.

Advances in the art will undoubtedly correct some of these details. At present, however, they must be taken into consideration.

The fundamental principles of all image transmission are simple, and, while the dealer is facing the technical buyer, he must be qualified by definite knowledge to answer the experimenter's questions.

The broadcasting of visual images is similar to tonal broadcasting in the means used for radiation and reception, but fundamentally different in the method by which the signals are collected at the transmitter and restored to their original form at the receiver. A device, consisting usually of a photoelectric system, responds to variations in intensity of light, converting them into electric currents. These variations are combined and radiated, received, and amplified, and then converted back into light impressions so that they may be seen by the eye.

THE transmission of visual images is somewhat more complex than sending tonal impressions. The eye responds to an infinitely greater number of impressions in a given time than does the ear. We cannot easily gather the impressions perceived by the eye into a single electrical current because of their vast number. Air wave impulses, sufficient to give us a complete musical reproduction, are a composite of many different frequencies, all of them compressible within a band of 0 to 5000 cycles. This relatively narrow band covers from the lowest to the highest of the fundamentals, and all the necessary overtones to enable a listener to distinguish any musical instrument. The total number of sound impulse impressions responded to by the ear in a second numbers only in the thousands.

The eye responds to millions of impressions every instant, and makes an impression of them upon the brain through the telegraphic nerve system. Examining a 4 x 5 photograph, you look over its entire surface in an instant. If it is of 133 screen, such as is used in high grade magazines, a 4 x 5 picture consists of 353,780 separate dots. A cheaper magazine uses a hundred screen, requiring 200,000 dots for a 4 x 5 picture, while even the poorest of newspaper reproductions have a screen of at least 45 and therefore consist of 40,500 dots in a 4 x 5 size.

For the transmission of such images by wire or radio, a separate electrical impression of the intensity of light and shade on each spot must be transmitted and reproduced at the receiving end. The eye comprehends these numerous impressions at one glance, but the eye of radio, the photoelectric cell, makes an impression of but one spot or area at a time. The transmission of the poorest kind of newspaper picture, 4 x 5 size, consists of sending 40,500 separate messages, each an electrical impression of the intensity of a single spot.

To secure the impression of motion, or television, the complete picture must be repeated at least sixteen times per second, so that the lagging effect of the eye gives the subject continuity. Therefore, to reproduce the crudest 4 x 5 picture, an electrical impression of 648,000 dots must be sent each second. as compared with the requirement of sending 5000 impressions, the maximum necessary for tonal transmission. Consequently, assuming a 4 x 5 picture of the crudest newspaper screen as the minimum standard of an image having entertainment value, 125 times as much ether space is required for its transmission as is used for sending a complete musical programme. This required ether space amounts to double the entire present broadcasting band! —Obviously, an impossible procedure at this time.

Any sacrifice from this standard, admittedly a low one, is attained by subtracting from the clarity or stability of the image. For practical purposes, it is difficult to conceive of any widespread system of radio visual transmission which can be accommodated on a conventional broadcast channel. Short waves are satisfactory for experimental purposes, but the public at large cannot be served on short waves because, first, they are not available, being required for much more important national and international communication; second, they require a new and separate receiving set for reception; and third, fading and skip distance effects make their reliable reception over large service areas impossible.

Assuming a maximum modulation of 5000 cycles and considering that sixteen complete pictures must be sent each second for television, 312 is the maximum number of image areas of which a television picture sent on a broadcast channel may consist. If we reduce the size of such a picture to one square inch, that is to 1 x 1 inches in size, it would be equivalent to 17 screen, or about one-third the clarity of the poorest kind of newspaper picture. Furthermore, this assumes that no means of radio synchronisation is employed which would require additional ether space. Obviously, such an image leaves much to be desired from the standpoint of entertainment value.

In spite of these difficulties, practical television is as certain as safe commercial aviation. But television must await the discovery of a simple, inexpensive means of sending more than one visual image impression at a time. So long as we must send impressions of the subject point by point in a series progression, television will remain only