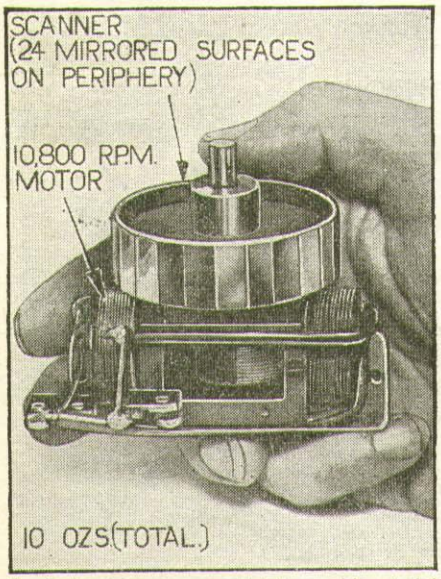
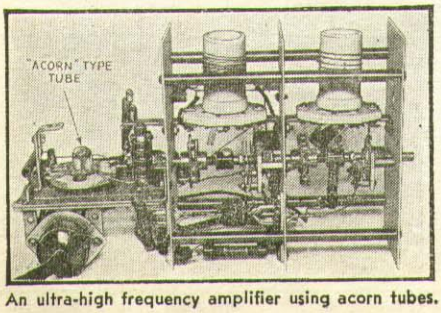


The Peck mirror scanner which is capable of high definition reproduction.



An ultra-high frequency amplifier using acorn tubes.

THE OPTO-MECHANICAL SYSTEM OF TELEVISION

The author's opinion of the future development is based on the advantages to be gained by mechanical scanning.

WILLIAM HOYT PECK

I BELIEVE that the opto-mechanical system will always continue to occupy a major place in the visual entertainment field.

It is, in fact, my belief that mechanical scanning is far more practical than the other system at this stage of the science and that, because of features inherent in each it will always be the most satisfactory method for use in the home. One should not, of course, compare the present highly efficient mechanical scanners of today with the comparatively crude ones of a year or two ago— The reflecting lens system which I have developed and patented differs from the old pinhole disk or simple lens systems as a modern superheterodyne from the crystal sets of 1920.

Prime requisites for a home-television receiver are low first cost, simplicity of mechanism, circuits and operation, ease and cheapness of replacement of the parts which naturally deteriorate with use and, highly important, safety to the user.

Proponents of the cathode-ray receivers generally consider only the light source and scanner; they do not consider the 6 or more additional tubes which are required to maintain the "sweep circuit" which controls the motion of the electronic beam. Nor do they mention that each of these extra tubes must have its own oscillator coils, condensers and so forth; in addition to a separate power pack, including rectifier, chokes, condensers and resistors, to supply the fearsomely high voltage which the cathode-ray-tube requires.

On the other hand, the mechanical system requires no more tubes than are found in the average radio receiver—it uses no extra circuits. It consists merely of a light source (an ordinary automobile headlight bulb), a light modulator tube and a tiny disk driven by a motor as small and dependable as that used in an electric clock. This motor is driven by the signal received over the air, and thus automatically synchronizes the disc

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THE OPTO-MECHANICAL SYSTEM OF TELEVISION

(Continued from page 88)

for any transmission, regardless of number of lines per image or images per second.

As to the question of cost, I cannot, of course, tell what price cathode-ray receivers will retail for, though rumors set their prices between $350 and $750. But I can state definitely that our television receiver, in a console cabinet with screen, and capable of tuning-in all-wave radio broadcasts as well as television images will be sold for about $225 or less.

But first cost is not the entire cost of any radio set. Tubes need replacing from time to time, and in my set there are 6 to 12 fewer ordinary tubes, to say nothing of the extremely costly cathode-ray tube—which I do not use. Cathode-ray tubes will vary in price according to the size of the image which they will produce. Those capable of showing pictures approximately 6 ins. square may sell, it is said, for as little as $5.00 and may last for 4,000 or 5,000 hours, while those producing larger pictures—say a foot square—will probably cost from $25.00 to $75.00, though their life may be considerably shorter.

The only elements needing replacement in my system are the auto headlight bulb, which costs 10 cents, and the light-modulator tube, which will sell for a dollar or less. Both these elements will last for 5,000 hours or more. The scanning disc and motor need never be replaced. My system uses only normal radio receiver voltages—less than a tenth the voltage required by the cathode-ray type. Its fewer tubes and lower "wattage" will also result in saving current and consequently lower electric bills, for the 1-100th horse-power motor uses far less current than one ordinary electric light bulb!

There is only one more control on this set than on ordinary broadcast receivers, for a component of the signal is used to maintain synchronism. The addition control is to be used for framing the picture when first tuned in. This control makes our receiver far more flexible than the cathode-ray type, for it is doubtful whether they will be able to receive programs sent out by transmitters using any type of scanning other than that to which they have been set at the factory, while our sets will receive any number of lines, from 180 to 405, whether straight or interlaced scanning is used. It does not seem practical to me that a set should be as limited as the cathode-ray type, any more than that a radio receiver should be limited to one of the two major networks, and be incapable of receiving the other chain, or the independent stations.

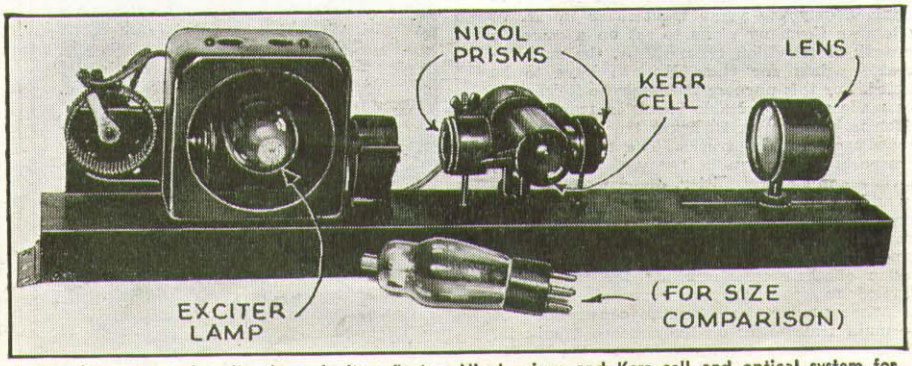
With the cathode-ray tubes thus far demonstrated, the picture has been limited to a square inscribed upon the circular end of the tube, and the length of each cathode-ray tube must be approximately 3 times its diameter, which creates the problem of building a cabinet big enough to house the tube if a large picture is desired. Newer cathode-ray tubes may be sufficiently brilliant to project a picture upon a screen, but these would probably use even higher voltages and have shorter life, due to the greater activity of their radio-active end screens. Using my mechanical system, we are now projecting a 14 x 16 in. picture on a screen built into a small console cabinet.

Most mechanical scanners have hitherto produced pictures of only 60 lines, while the cathode-ray tubes are stressing images of more than 300 lines. The new model, which I am bringing out shortly, will project 180-line images, or 9 times the detail formerly secured with a disc, and more than half the lines used in cathode-ray work. In other words, it is theoretically possible to view a cathode-ray image at 5 ft., while the same effective detail would be had at 10 ft. with any system. However, it is necessary that a cathode-ray scanner use twice as many lines as a mechanical scanner in order to get equally good images, for the flying spot remains uniform in size in my system, while it decreases in size when modulated downward on a cathode-ray tube, resulting in black spots which must be filled in by closer scanning.

Furthermore the usual cathode-ray image is "peasoup"-green and black, while the images our system provides are black and white. Although experiments are being conducted to secure black and white images with the cathode-ray tubes, to the best of available information very uneven results have been thus far secured. Let me again stress the brilliance of an automobile headlight bulb, 90 per cent of the light of which actually reaches the screen used in our system, as compared with the flourescence of the end-screen of the cathode-ray tube. This is like a comparison between a powerful electric light and a kerosene lamp.

Both systems will, in my opinion, probably use 24 effective frames per second, being thus enabled to transmit programs composed of standard motion-picture film in addition to direct pick-up of studio and outdoor programs.

Apparatus now under construction in our laboratory includes a receiver capable of reproducing straight or interlaced scanning images from 180 to 1,000 lines per frame, and automatically synchronized with any transmitter. The scanning disc has been reduced from its former size of 5 ins. to 2 ins., making for silent operation and greater economy, both in production and use. The flexibility of this new apparatus will fit it into the rapidly changing television broadcast situation whatever the ultimate number of lines and frames may be.



A complete set-up of exciter lamp in its reflector, Nicol prisms and Kerr cell and optical system for image projection.

Radio-Craft, August 1936