Where TELEVISION

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What progress is being made in television? How far has it advanced today? What new developments lie in the immediate future? These pressing questions, about which the vast public waiting for television is wondering, are answered in this unusual article by Mr. Sarnoff, whose eminence in the field enables him to speak with unquestioned authority.

IMPORTANT strides are being made with television. In our development work now proceeding at Camden, N. J., we are seeking to perfect television to a point where it is capable of rendering real service before offering it to the public.

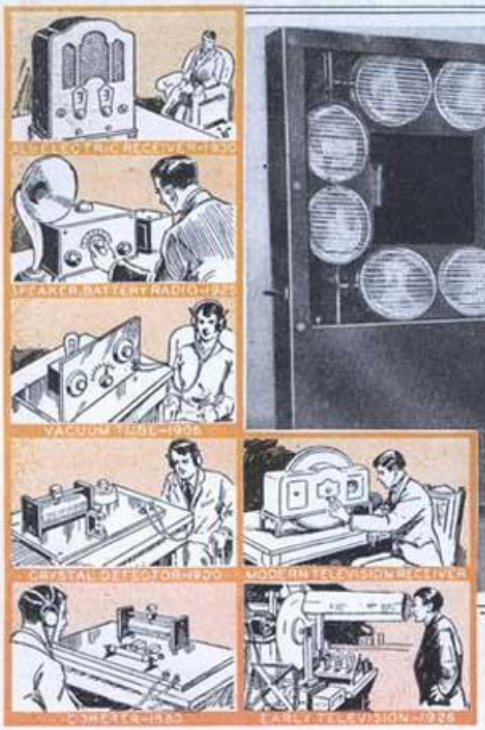
While the public was willing, and even eager, to experiment with radio in the early stages of broadcast development, it seems to us that it will desire a comparatively more advanced television receiver than the early crystal radios.

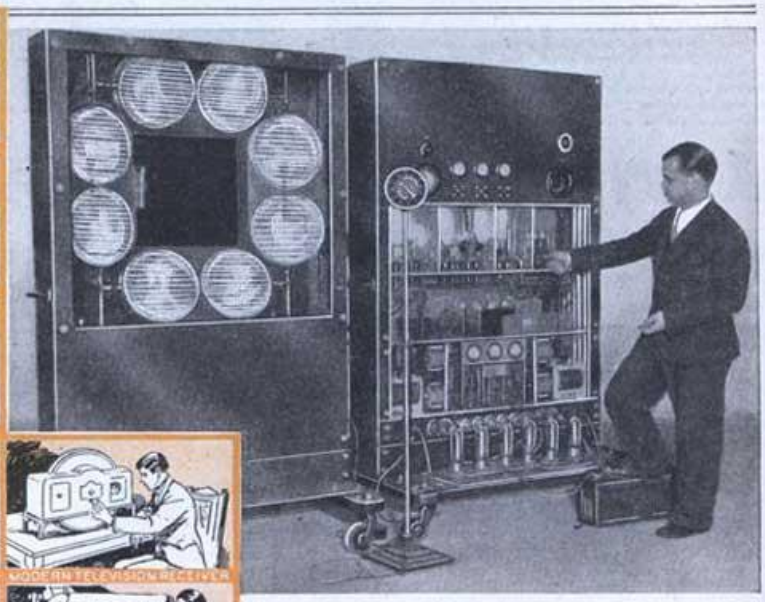
There was no precedent for the taking of sound and music out of space, but the public has been educated by the motion picture industry to expect picture transmission of a high quality, and it is doubtful whether interest can be sustained by inferior television images.

The progress we have made so far has given us the belief that ultimately a great service of television can and will be made available. I do not believe that television will supersede sound broadcasting by radio. It will be a correlated industry.

The present status of television might be likened to the condition of radio in the immediate pre-broadcasting era, when amateurs were beginning to hear faint sounds through the air.

Voices and music were passing through space in those early days of radio; comparably, there are actually some images passing through the air today. They are

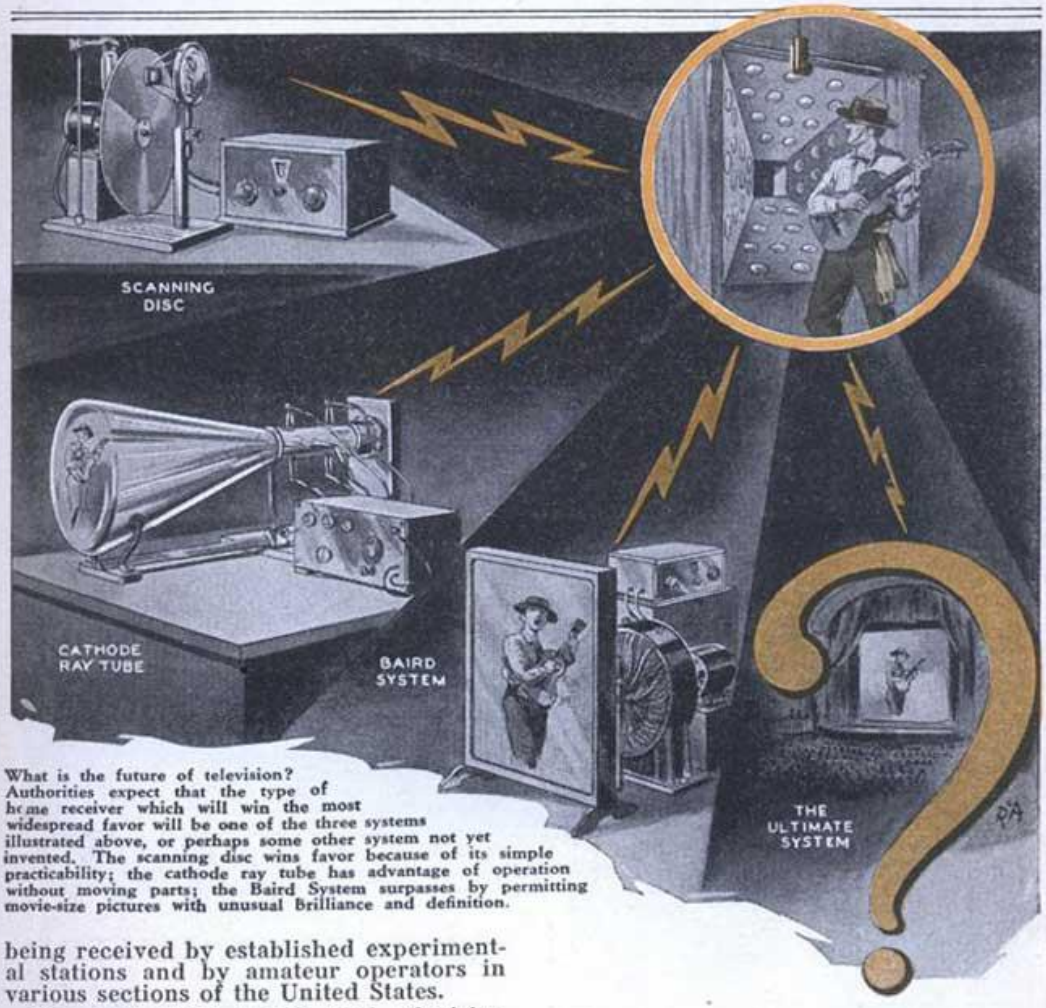




Above is shown Ulysses A. Sanabria, 24-year-old Chicago television wizard, with apparatus which he used recently in producing clear 10-foot pictures on New York theatre screen. At left is the bank of photo cells for pick-up; at right is amplifier. Comparison of progress of television with sound broadcast is seen in drawings at left. Note the present stage.

Stands Today

An authority surveys the present and looks into the future



What is the future of television? Authorities expect that the type of home receiver which will win the most widespread favor will be one of the three systems illustrated above, or perhaps some other system not yet invented. The scanning disc wins favor because of its simple practicability; the cathode ray tube has advantage of operation without moving parts; the Baird System surpasses by permitting movie-size pictures with unusual Brilliance and definition.

being received by established experimental stations and by amateur operators in various sections of the United States.

The next stage should find television comparable to the ear-phone stage of radio. Then, television should attain the same degree of development as did radio sound broadcasting in the early period of the crystal set.

This does not mean that the actual physical structure of the first television receiver will be similar in any way to the crystal receiver.

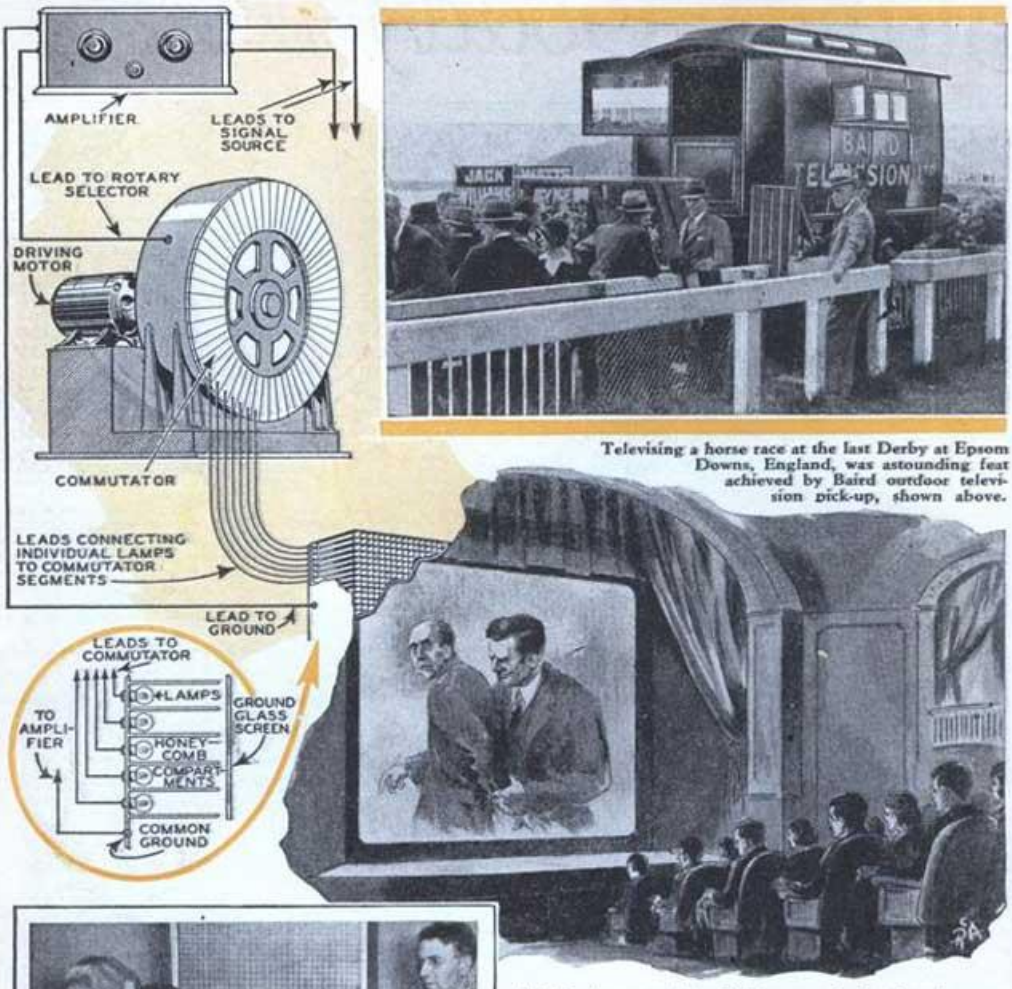
Before television reaches the practical stage of service it is necessary that several experimental stations for the transmission of sight by radio be established. Through the operation of these experimental stations, we expect to obtain exact information and practical field experience which are required before definite plans can be developed for a television service of nationwide scope.

The effect of television upon the present established radio industry will be beneficial. There will be no interference between the broadcasting of sound and of sight. These services will supplement each other and complete the impression upon the human mind by reaching it through both the eye and the ear.

Television broadcasting stations will operate on wave lengths different from those now used for the broadcasting of sound. An entirely different receiver will be necessary. In the practical sense of the term, television must develop to the stage where broadcasting stations will be able to broadcast regularly visual objects in the studio, or scenes occurring in other places through remote control.

Reception devices must be developed

Baird System May Bring Theatre Television With Clear, Bright Images



Televising a horse race at the last Derby at Epsom Downs, England, was astounding feat achieved by Baird outdoor television pick-up, shown above.

Chief advantage of the Baird system is that it makes possible television in the theatre, with images having unusual brilliancy with fair definition. The image is built up with small lamps in the compartments, current to the lamps being delivered from segments contacted by rotary selector connected to receiving amplifier, as illustrated in drawings.

Here Mr. Baird is demonstrating how image appears on the ground glass screen, built up in "square-effect" by lamps set in honeycomb-like compartments in the rear.

that will make these objects and scenes discernible in millions of homes.

Devices must be built upon a principle that will eliminate rotary scanning discs, delicate hand controls and movable parts. Research must make possible the utilization of wave lengths for sight transmission that will not interfere with the use of the already over-crowded channels in space.

The potential audience of television in its ultimate development may reasonably be expected to be limited only by the population of the earth itself.

This vast increase in the entertainment audience has been made possible by the introduction of modern science into the older arts. And now television will come to open new channels, to provide new opportunities for art and the artist and to create new services for the audiences of all the world. Potentially speaking, tele-

Television Programs Sent on 4 Meter Waves to Prevent "Ghost" Images

To eliminate "ghost" images and permit greater number of picture elements, resulting in clearer images, engineers are building television transmitter atop Empire State Building, in New York, which operates on 4 meter wavelength. Waves are radiated directly to receivers, with no intervening obstacles, and serving audience of more than ten millions.

Television images broadcast on usual wavelengths (150 meters) sometimes result in "ghost" images at distant receivers. Sky waves reflected by heaviside layer lag behind ground waves and consequently arrive out of phase at receiver, causing double picture as illustrated in insert above.

vision can be utilized by 26,000,000 homes in this country alone.

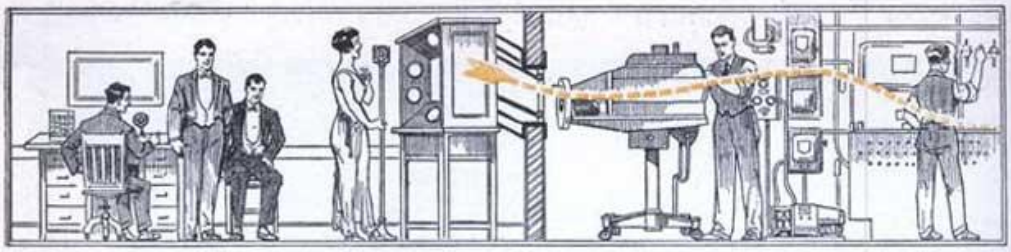
The instantaneous projection through space of light images produced directly from objects in the studio or the scene brought to the studio by remote control involves many problems.

Special types of distribution networks, new forms of stagecraft, and a development of studio equipment and technique will be required. With these must come a new and greater service of broadcasting, both of sight and sound. A new world of cultural and educational opportunities will be opened to the home.

But even more appealing to the individual is the hope that television may, at least in a measure, enable man to keep pace with his thoughts. The human being has been created with a mind that can encompass the whole world within the fraction of a second. Yet his physical senses lag woefully behind. With his feet he can walk only a limited distance. With his hands he can touch only what is within reach. His eyes can see at a limited range and his ears are useful at a short distance only.

When television has fulfilled its ultimate destiny, a man's sense of physical limitation will be swept away, and his boundaries of sight and hearing will be the limits of the earth itself.

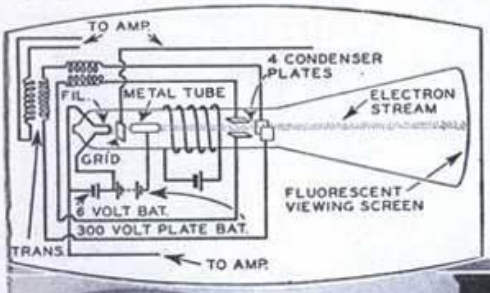
Drawings above illustrate most outstanding difficulties still encountered in present day television reception. When receiving scanning disc motor is out of synchronism with transmitting motor, images shift from side to side, or get out of frame vertically or horizontally. Pictures with poor detail usually result from insufficient number of lines in the transmitter scanning disc. Static causes light streaks.



Television programs travel the route from photo-electric cells to home television receiver as indicated by the dotted arrow. Voice is picked up by the "mike" while the performer, illuminated by the flying spot from the projector, is televised with the bank of photo cells. Operator of the projector has task of adjusting the "flying spot."

EDITOR'S NOTE: In connection with the predictions made above by Mr. Sarnoff, engineers expect the development of television will follow along the lines of one of three outstanding systems now being employed. A tense but silent battle is now being waged between these systems—the Baird system, developed by John Logie Baird, of England; the well-known scanning disc system; and the cathode ray tube system, which has a great advantage in that it employs no moving parts.

The Baird system promises to open a new field of television movies, both in the theatre and in the home. With the perfection of this system, which is illustrated in an accompanying drawing, we may be able to sit comfortably in our home or in the theatre and watch the performance of plays being transmitted from a master theatre, much in the manner of present chain broadcasting.



This future development of television was foreshadowed in a demonstration conducted recently in London. For a period of some thirty minutes the audience was treated to visual and aural entertainment by several well-known British artists performing in a distant studio. The images were declared by spectators to have a brightness and definition comparable to the usual motion picture performance.

The images were produced on the screen, measuring 2 by 5 feet, by a bank of 2,100 small tungsten filament lamps, each of which was set in a small compartment. The 2,100 compartments formed a huge honeycomb, thus building up the image in small squares. To diffuse the image and thus eliminate to a great extent the "square effect," an opaque screen of ground glass was placed before the "honeycomb."

The battery of lamps is switched on

Elimination of the cumbersome scanning disc and other moving parts is made possible by use of the cathode ray tube, shown at left. Image is built up on the fluorescent screen by "pencil" of electrons, which are caused to swing rapidly over screen by electrostatic action of the condenser plates. At right is shown cathode ray receiver used to pick up programs from W6XAO, Los Angeles, California, now broadcasting regularly on 6¼ meters, or 44,500 kilocycles.

Continuing the path of the television program. The outgoing signal is adjusted in the control and made ready to put on the air over antenna at wave lengths usually around 150 meters. Signal is then picked up at home antenna and led into home television receiver for entertainment of the family. Voice and picture are reproduced in synchronism.

and off to form the image by a special commutator machine having 2,100 segments, each of which is connected to a lamp in the "honeycomb." A rotary contact arm, or selector revolving at a speed of 750 R.P.M., sweeps over the aforementioned segments, delivering current to the lamps at a rate of over 25,000 contacts every second!

The majority of engineers at present are striving to develop a home television receiver which eliminates the cumbersome scanning disc. What is sought is a receiver which is quiet in operation, practically fool-proof, and which has a minimum of moving parts to get out of kilter.

The cathode ray tube possesses many of the qualities necessary to fill the bill. Forming an almost self-contained unit, save for the amplifier, the cathode ray tube is primarily a projector, with a glass screen covered with a fluorescent material. The filament of the tube emits a stream of moving electric particles which are transformed into a pencil point of light when they impinge on the fluorescent screen.

Controlling this electron stream are two sets of deflecting plates swinging the stream of particles back and forth to correspond with the motion of the scanning instrument at the transmitter. The result is a complete scanning of the fluorescent screen on the end of the tube, building up the image as it sweeps back and forth.

The system which has found most widespread use at present, particularly in the United States, makes use of the well-known scanning disc. Credit for the most outstanding development with this system to date goes to Ulysses Sanabria, young Chicago inventor, who has perfected equipment which can project an image of remarkable brilliance and definition on a 10-foot screen.

At a demonstration conducted recently in a New York theatre, 2,000 people witnessed

Television transmission is now brought down within the reach of the radio amateur, thanks to the new transmitter shown at left which was recently put on market for $250. Drawing at upper right illustrates how television may aid police by broadcasting photos of criminals. Below is police authority demonstrating how criminals can be televised.

a television program which drew such comments as from "pretty good" to "extremely creditable."

What distinguishes the Sanabria system is the new high power lamp which projects the flying spot on the screen, and the specially designed transmitting and receiving scanning discs. The receiving disc has 45 holes in all, arranged in three sets of spirals, each covering 120 degrees of the disc. With such an arrangement one-third of the entire surface of the subject is scanned in one-third of a revolution of the disc, which rotates at 900 R.P.M.

It is the unusual design of the projector which makes possible the almost movie-size images. The disc, 3½ ft. in diameter, instead of having mere holes is fitted with 45 lenses, each two inches in diameter.

Directly behind this disc is a Taylor projector lamp, designed by Mr. Sanabria, who is keeping its construction a secret. The screen on which the image is formed is set 18 feet in front of the projector. The translucent material of the screen permits the image to be thrown against it from the rear, while the audience views the performance from the front.

Most of the current television programs are being broadcast on wavelengths around 150 meters. Signals transmitted over a distance of more than 150 miles, however, tend to show "ghost" images on the viewing screen, as illustrated in an accompanying drawing.

To eliminate this defect, engineers are designing transmitters to operate on wavelengths around 5 meters. The waves are transmitted directly to the receiving antennae, so that reflection of secondary waves from the heaviside layer to the receiver is avoided.

Regular television service from station W6XAO, in Los Angeles, was opened recently, broadcasting on a wavelength of 6¾ meters, or 44,500 kilocycles. At the present time signals are being sent out between six and seven P. M. (P. S. T.). Eighty lines are used and the image is repeated fifteen times per second.

There are practically no mechanical features to the system in use at W6XAO, as the system employs cathode ray beam at both transmitter and receiver, instead of motors and scanning discs. The receiving area extends approximately forty miles from the point of projection. Reception is also weakened by intervening hills.

The early part of the year of 1932 will see the inauguration in New York City of a new low-wave television broadcasting system operating down on 4 meters. The antenna is now in process of construction on the tip of the mooring mast of the world's tallest structure, the Empire State Building.

The station is expected to serve only an area within 15 to 25 miles of the tower, as the waves are limited to visible distances. In this area, however, an audience of ten million can be served.

Despite the present status to which tele-

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Where Television Stands Today

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vision has advanced, it still labors under many serious difficulties. Chief among these are a lack of definition (poor detail) and brilliancy.

With the few lines now utilized the images do not receive a thorough scanning, particularly where scenes covering a wide area are involved. Increasing the number of lines will bring clearer pictures, making it possible to televise such spectacular events as football games and boxing matches.

For images lacking brilliancy, insufficient signal strength, and particularly, the present inadequacies of the neon lamps now available are largely responsible. Television will not arrive at perfection until a lamp is developed which can respond brilliantly to weak signal currents.

When engineers have vanquished the difficulty of perfect synchronization they will have made a noteworthy advance. When the scanning disc of the receiver gets out of step with the transmitter, strange things happen to the televised picture. As illustrated in an accompanying drawing, the image rises and falls on the screen, sways from one side to the other, or shifts dizzily back and forth till it becomes unrecognizable.