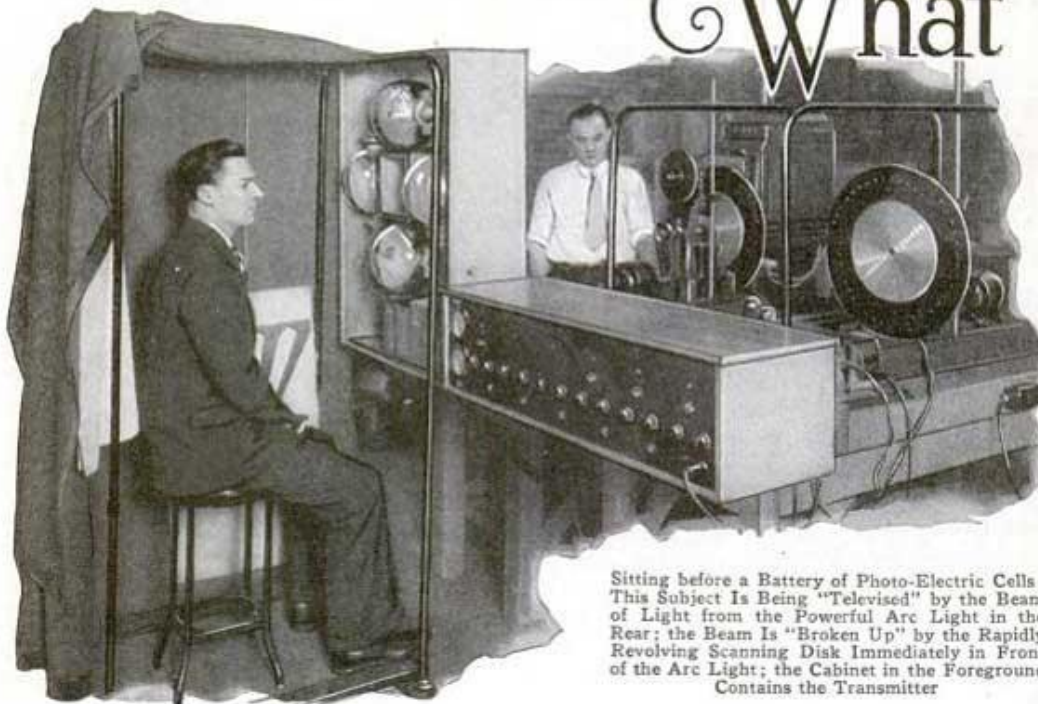


What



Sitting before a Battery of Photo-Electric Cells; This Subject Is Being "Televised" by the Beam of Light from the Powerful Arc Light in the Rear; the Beam Is "Broken Up" by the Rapidly Revolving Scanning Disk Immediately in Front of the Arc Light; the Cabinet in the Foreground Contains the Transmitter

WHEN will radio television and radio movies be available to the average radio fan for home reception?

That question, asked by untold millions, has provoked more and a wider variety of answers than has been evoked by any single phase of the radio industry's development.

Dr. Lee De Forest, inventor of the radio tube, says, "this development may be a matter of ten years or more."

Dr. C. Francis Jenkins, famous movie and television inventor, says "radiovisor receivers will be available for Christmas presents this year," and, "we expect to be broadcasting baseball and like entertainment by this time next summer."

David Sarnoff, vice-president and general manager of the Radio Corporation of America, estimates four or five years are yet needed for perfection.

H. P. Davis, vice-president of the Westinghouse Electric and Manufacturing company, declares, "anything so far demonstrated in television in my opinion would be premature if offered to the public as a service."

And the manufacturers of television kits say television has already arrived.

There are five different views, ranging from right now up to ten years—and probably every one of them is absolutely correct—a paradox that arises not through disagreement, but through different interpretations.

Messrs. Sarnoff, De Forest and Davis see television as something that should not be offered to the public until it is as complete, as simple, as perfect and as fool-proof as radio broadcasting is today—after years of experimental development.

Dr. Jenkins and the various manufacturers of television kits and parts believe there is a host of radio fans who got a lot of joy out of tinkering with crystal sets, coherers, fancy home-wound coils, and all the other accessories on which radio was raised from a pup, and who will get equal, if not greater, pleasure through a vicarious association with the development of television.

Anybody with an average acquaintance with the insides of a radio set, with fair mechanical ability, and \$45 to invest, can buy one manufacturer's kit, including an electric motor, scanning disk, neon lamp and other parts, fit a television receiver together, hook on some batteries

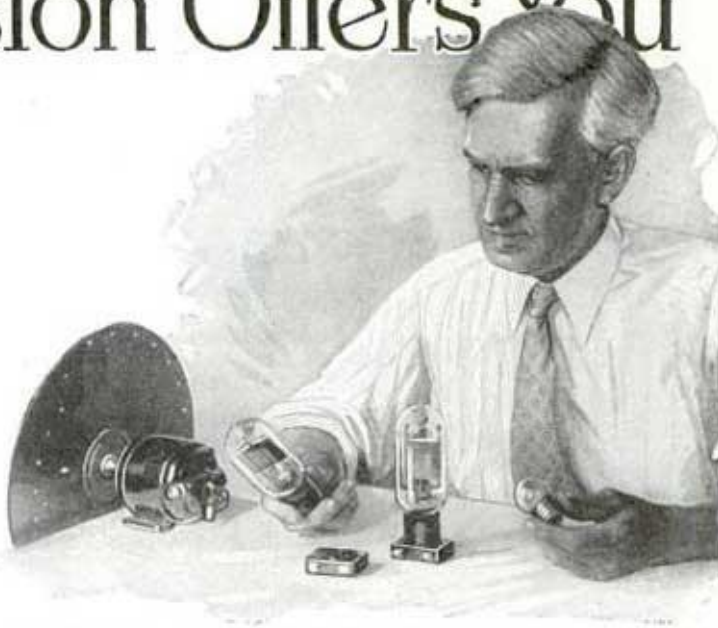
Television Offers You

and his existing radio receiver, insert a few tubes and start receiving pictures.

They may be, in the words of Dr. De Forest, "small, poorly illuminated, coarse-grained, unclear silhouette and half-tone effects." But they will be pictures, either mirrored images direct from life, if you tune in on some stations, or radio movies, if you are in range of others. They will be pictures, and they will come through the air to you, and if you got a thrill a few years ago out of a jumble of DX-squeals, there is a bigger thrill in seeing an image in the frame of a homemade television receiver.

It is true that the image may be a tiny, black silhouette, about as clear and exciting as watching the fat gentleman across the street doing his setting-up exercises in a lighted room behind a drawn blind—in other words, it's a shadow picture, but it does move and live. Or it may be a rather sketchy half-tone effect requiring considerable exercise of the imagination to smooth out the blobs of dark and light into a mental picture of the face. But the first photographs transmitted by wire and radio were not perfect, either.

The companies that see millions in television as a regularly established commercial product are not interested, naturally, in the fan who wants to tinker with a homemade piece of apparatus. When they do go on the market, it will be with complete outfits in fine cabinets—press a button, turn a dial and the set does the rest. Popular Mechanics asked seven men who have been intimately associated with television and broadcasting for their opinions. Those seven included four who have been active in developing television and radio movies, one famous radio engi-

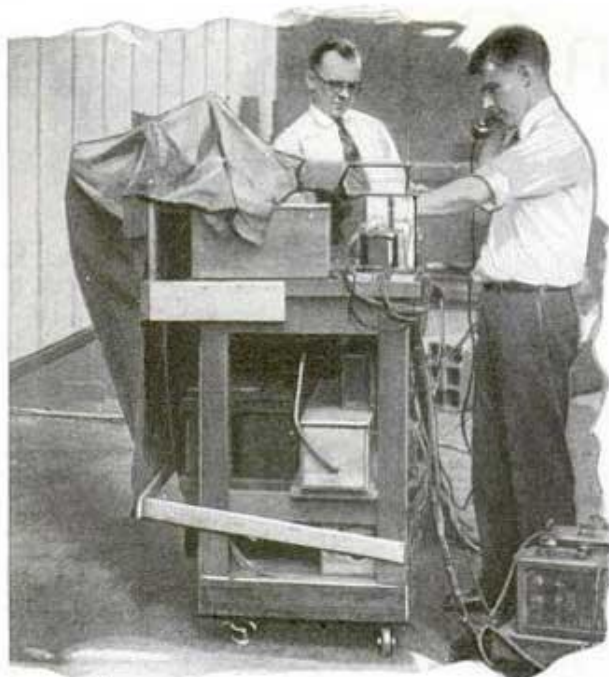


Some of the Apparatus Now Available to the Amateur; Scanning Disks, Special Motors, Photo-Electric Cells and Neon Lamps Are All on the Market

neer, and two who are leaders in radio manufacture and broadcasting. The four inventors of television and radio movies are Dr. Herbert E. Ives, who perfected the apparatus demonstrated by the Bell Telephone laboratories; Dr. E. F. Alexanderson, inventor of the General Electric company's television set; H. P. Davis, vice-president of the Westinghouse company and interested in the radio-movie outfit created in their laboratories; and Dr. C. Francis Jenkins, of Washington. The other three were David Sarnoff, of the Radio Corporation of America; Merlin Hall Aylesworth, president of the National Broadcasting company, and Dr. De Forest, the inventor of the radio tube.

From their replies listen to the following extracts. H. P. Davis of Westinghouse is speaking:

"Both television and radio movies are accomplished facts in electrical engineering laboratories, and, so far as laboratory research is concerned, there are no fundamental principles involved which today have not been solved. However, before these developments leave our laboratories and are offered the public in the manner in which radio broadcasting now offers public service or as adjuncts to broadcast



This Apparatus Transmits, by Means of Recently Developed Photo-Electric Cells, Pictures "Taken" in Daylight

programs, a considerable period will ensue, during which various elements entering into television and radio movies must be perfected and co-ordinated.

"Leading scientists and engineers all over the world are now working on the problem. There is an overwhelming public interest in its solution. Thus we have a supply of engineering talent and a public demand which should hasten practical development. I do not hesitate to state that the day is coming when television and radio movies will be at the service of the radio public.

"Since radio broadcasting is on such a high plane, serving a public which expects only the best from those organizations involved, I cannot believe that, in good faith, we should offer anything which, as yet, is in an experimental condition. It is my belief that the development period in television should be passed in the laboratories and that, when it is offered to the public, it should be a finished product. Anything so far demonstrated in television in my opinion would be premature if offered to the public as a service."

Now for the views of Francis Jenkins, an inventor himself and one who believes in letting all the amateur inventors in:

"Radio movies on forty-six meters are broadcast Monday, Wednesday and Friday evenings from our station and regularly received in many homes already. Our transmitters will soon be attached to stations now broadcasting music and radiovisor receivers will be available for Christmas presents this year. From this beginning the art will grow rapidly. We expect to be broadcasting baseball and like entertainment by this time next summer."

Lee De Forest has frequently voiced warnings against being overoptimistic about television, repeatedly pointing out that, when it comes, it will always be better over telephone wires, because free from static interferences. He repeats them now:

"Satisfactory television in the home is a very long way off. For the next few years radio fans will, however, derive much interest and

amusement from receiving small, poorly illuminated, coarse-grained, unclear silhouette and half-tone effects. All this talk about motion pictures by radio in the home and color by television, etc., as being just around the corner is the veriest bunk, and, in the interest of fact, common sense and on behalf of theater owners and sincere purveyors of motion-picture entertainment, some of whom are actually panicky concerning the future, such pipe dreams should be conscientiously discouraged.

"Real television will some time arrive, but will always be much more satisfactory over the wire than by radio. I consider this development may be a matter of ten years or even more."

Dr. De Forest's opinion on the effect of radio movies on the present motion-picture industry raises an interesting point. Harry M. Warner, president of Warner Brothers Pictures, Inc., first to produce satisfactory talking movies when he brought out the Vitaphone process, and Carl Laemmle, of Universal Pictures, who is going in for talkies on a large scale, were asked their opinions. Says Mr. Warner:

"Dr. De Forest is absolutely correct in

his statement that theater owners have nothing to fear from television. Television will no doubt be an advancement in transmitting photography, but to affect an industry which supplies entertainment is out of the question. On the contrary, should this invention be successful, it will be the greatest help to places of entertainment by stimulating interest direct in the home."

Mr. Laemmle is equally emphatic in his views, for, he says, "in the twenty-two years I have devoted to motion pictures I have never seen the time when science and invention damaged the industry. On the other hand, I have seen the business elevated to an art largely through the help of inventive genius. Therefore, whether television and radio movies are years away or just around the corner, I predict that, when they do come, they will prove a blessing and not a curse, and I sincerely urge those who may be panicky to remember that progress cannot possibly harm them. The very thought that these new wonders may at some time be perfected gives me a thrill of pride and greater confidence in the moving-picture industry."

So much for the great argument about the location of the corner which television must turn to enter the public's street. But what is the situation today?

Francis Jenkins, as he has stated, is broadcasting radio movies three times a week from his station in Washington on a wavelength of forty-six meters. He uses a system of forty-eight lines to a picture—

more will be said about that a little later.

The General Electric station at Schenectady, N. Y.—WGY—is broadcasting television images of twenty-four lines to the picture on several days each week.

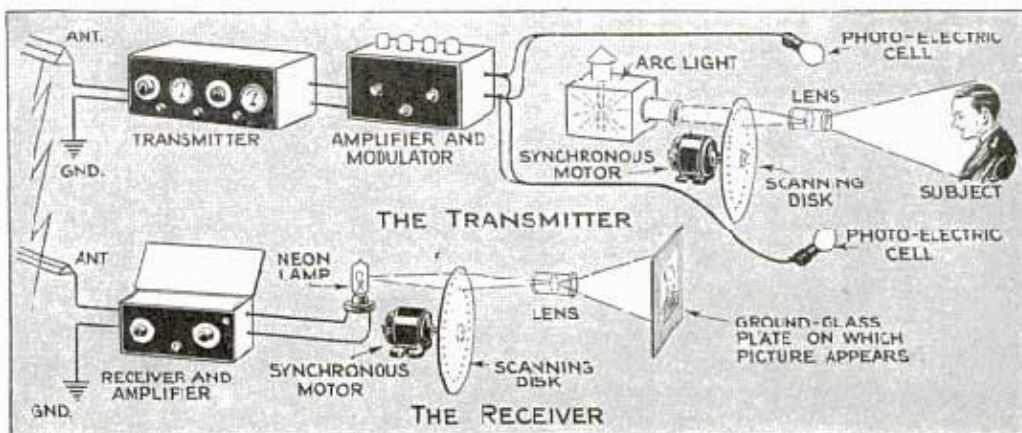
In New York city WRNY is broadcasting television on a system employing thirty-six lines to the picture.

Before this article can appear in type, it is probable that several other broadcasters will be on the air.

Each broadcaster so far, regardless of the number of lines to the picture, is producing pictures one and one-half inches square. If you look directly into the picture frame in front of the revolving scanner disk, that is the size image you see. Obviously the amount of action and detail that can be crowded into a picture only an inch and a half square is limited. One human figure, or at most two, may be produced with fair results, but to attempt to crowd a baseball diamond, a prize-fight ring, or a political convention into that space would mean complete loss of detail.

Jenkins has improved on other systems by installing a large magnifying glass in front of the picture frame, giving the illusion of a picture some four inches square. Enlargement beyond that size, at least by any means known today, is impossible.

The reason lies in the scanner disk and the number of "lines" employed by it in transmitting the scene. The great difference between ordinary radio broadcast of music or voice and the broadcast of television is that the first is a one-dimensional, straight-line affair, and the second



This Diagram Shows, in the Simplest Form, How the Light Waves from the Subject Are Transmitted by Radio and Converted Back into a Picture at the Receiver

is two-dimensional, having both width and length. The music is a series of successive signals, transmitted one after the other. The picture must be a complete square.

No one has ever found a means of transmitting an entire picture as an entity. Instead an optical illusion is utilized, the same optical illusion which makes the movies possible. It is called the retentivity of vision. When the eye sees a thing and telegraphs the intelligence to the brain, the image lingers for a fraction of a second. Because of this lingering, if approximately sixteen pictures are shown the eye each second, and each picture is slightly different from its predecessor, the eye is fooled with an illusion of movement.

In television the radio engineer goes farther than that. He cuts each picture up into a number of sections, transmits each section through the air as a straight-line radio signal, and then pieces the sections together before the eye so rapidly that the images of all linger as one picture.

The cutting process is done with a scanner, a large metal disk, revolving at high speed and containing a series of holes, arranged in a spiral. In all disks so far used, the distance between the outer hole of the spiral and the inner hole is one and a half inches, and the result is a picture one and a half inches square.

The number of holes that can be used and the number of pictures which can be transmitted each second—in other words, the speed at which the disk can be revolved, for each revolution transmits one complete picture—depend entirely on the sensitivity of the photo-electric cell, which receives the light passing through the holes in the disk and transforms its varying strength into electric impulses of corresponding intensity.

Photo-electric cells are improving rap-

idly. Hardly a year ago the best cells would not respond rapidly enough for a disk of more than twenty-four lines. A better cell made the thirty-six-hole disk possible; still better brought the forty-eight-hole disk, and lately the Westinghouse company has demonstrated radio-movies using sixty lines to the picture.

What does such a picture look like? The average newspaper half-tone illustration has sixty-five lines to the inch; in other words, sixty-five dots each way in

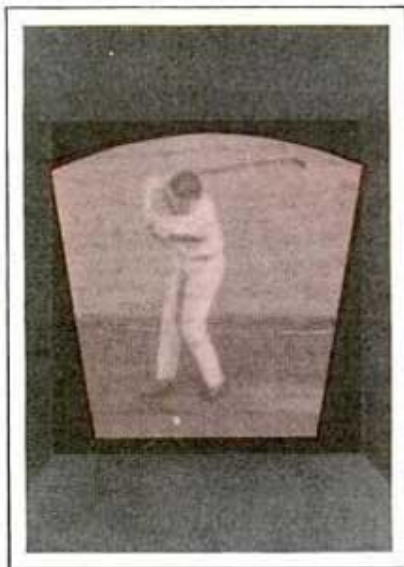
its screen. That rating is to the inch, and all television images to date have been an inch and a half square, so the best transmission yet, with sixty lines, has been spread over an area fifty per cent greater each way than the newspaper illustration.

The illustrations in Popular Mechanics have 110 lines to the inch, against forty to the inch for the best television experiment, with the new Westinghouse apparatus. Engravings for reproduction on fine calendered paper may be made with 120 lines, 133 or even 150 lines to the inch. From these

figures it is easy to estimate the relative clearness of a television image.

Remember that each television picture consists of a series of lines—twenty-four, thirty-six, forty-eight or sixty, as the case may be. Put an enlarging glass in front of the image and you get the same result as when you hold a magnifying glass in front of a newspaper illustration. Enlarge it a little bit, and you see the dots quite plainly. Keep on enlarging it, and the dots spread so far apart they cease to form a picture. That's the reason why television, as yet, can't be thrown life-size on a screen, like movies.

Scientists expect to solve this problem, and all the other problems of television. The experimenter who wants to get in on the fun can buy a kit and build a set, but finished television has not yet arrived.



The Above Illustration Shows the Exact Size of the Received Image with Approximately the Same Color and Definition