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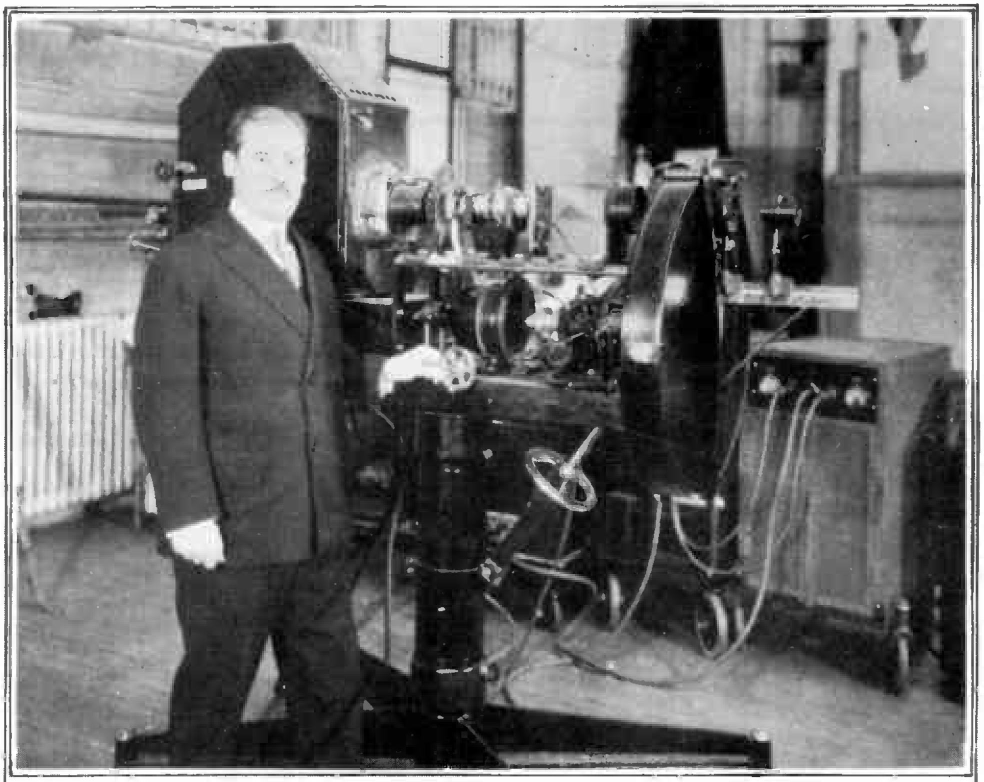

DR. E. F. W. ALEXANDERSON, OF THE GENERAL ELECTRIC COMPANY, AND HIS PROJECTOR AS USED IN THE THEATRE-SIZE TELEVISION DEMONSTRATION IN MAY, 1930, AT RKO PROCTOR'S THEATRE SCHENECTADY, N. Y.

Seeing and Hearing at a Distance with Sound Pictures and Television

VOL. 59, No. 2

Dewey Classification R 500.09

VISUALIZING AT A DISTANCE

MEDIUM	BY WORD-PICTURES: VOICE	BY WORD-PICTURES: CODE	BY SIGHT-PICTURES: DRAWINGS PHOTOS, PRINTS	BY SIGHT-PICTURES: VISION CONTINUOUS ACTION
Air	Observer Talking	Drums, Horns	———	———
Light Waves	Optical Telephone	Smoke, Fire, Heliograph	———	Telescope Beam Television
Messenger	Disc Phonograph Film Phonograph	Stringed Beads	Carrying the original	Motion Pictures
Wire	Telephone	Telegraph	Wire Facsimile	Wire Television
Radio	Radiotelephone Radio Broadcasting	Radiotelegraph	Radio Facsimile	Radio Television

Notes: Sound Motion Pictures are a synchronized combination of Motion Pictures with either a Disc Phonograph or a Film Phonograph.
Sound Television is a simultaneous transmission of Television (wire or radio) and Radiotelephone or Wire Telephone.

VISUALIZING AT A DISTANCE BY SIGHT-PICTURES.

In this lesson we will discuss various direct methods of creating the impression of sight or vision at a distance. Before going into a review of the improvements that modern science has given us, let us study somewhat of the nature of light.

The Sun is the Primary Source of Light.

The primary source of light is the sun. This body is at so high a temperature that it has the quality of incandescence, or radiating some of its energy as waves in the ether which is supposed to fill celestial space. The human eye is an organ which is sensitive to these waves, both as to color and intensity. We have man-made sources of light-waves in the primitive torch, a camp-fire, and the incandescent electric lamp. None of these would be of much use to us except for a certain optical principle called reflection. We speak of "seeing" a cold object which gives no light of its own, whereas we actually see whatever light-waves are reflected from its surface, whether the original source is the sun or some man-made device. The light-waves falling on an object are reflected in many directions, and at different intensities. Whatever waves, and of whatever intensities, enter the window of the eye by a direct line (including mirrors and prisms) from the object, cause the mental response that we call vision.

The clearness of this vision depends on the intensity of the light reflected into the eye, the opening of which is only about one-eighth of an inch. As the observer moves farther from the object, less and less of the light reflected from the object reaches the eye, and the vision becomes less clear.

The Telescope.

Man went on through the early ages craving to be able to see beyond the scope of his eyes alone. The invention of the magnifying glass brought on the study of the science of optics. By means of lenses and prisms, man learned to turn the light waves from their normal straight line. It is common knowledge how a magnifying glass may receive light waves over one entire surface from the sun, and turn these until they meet in a much smaller area. The optical principle of this "burning glass" enabled man to combine several glasses into a device called a telescope, which is an instrument for scoping or viewing at a distance. The telescope in its earlier form is monocular, i. e. for use with one eye. A later form, the binocular, is for use with both eyes. The latter retains somewhat the perception of depth and relative distance which is lacking in a "one-eye" observation.

Even this invention did not satisfy his need. Among other limitations, the eye could still see only those objects from which the diffused light could travel in a straight line. We will continue then with other systems not so limited as to path or distance.

Picture-Messenger Systems.

Drawings. So far we have noted that in voice and code systems a great deal is left to the powers of visualization of the recipient. It is time that we give him a better service by leaving less to his imagination. This actually started when early man developed the art of engraving or painting crude pictures of the objects before him. These drawings, on wood or stone or plant-leaf, conveyed enough to permit the recipient to visualize the action. This was aided materially when the artist had learned to draw the moving parts of the observed action in such postures and positions as would normally occur only in the midst of some motion.

Photographs. Photography is a combination chiefly of two sciences, optics and chemistry. A good deal was known of optical principles before the world of chemistry made available a working knowledge of the effect of light-waves on some chemical compounds. This resulted in the present art, which has become a popular recreation and at the same time an effective aid to business. It broadened man's vision considerably by enabling him to study objects and scenes that were not common to his locality. As time went on a more realistic picture was wanted. One attempt was to give the photograph depth. This was done by taking two simultaneous photographs by a pair of adjacent cameras. These photographs were later viewed through the two eye-pieces of a stereoscope so that they were superimposed in the brain in the same manner that the vision of some nearby object by both eyes results in a concept of depth or distance.

Just as in the case of primitive drawings, motion and action in a scene can only be suggested, in a single photograph, by the posture or position of the moving object when the exposure is made.

Motion Pictures. It can readily be seen that we can get a more definite idea of the action of the scene if we have a series of photographs during the action, and subsequently view them in the same order in which they were taken. The time element here introduced allows us to create a system which will give, at the remote point of viewing the pictures, a sensation of continuous sight of the action. This is the basis of the motion pictures. Suppose a man is walking down the street, followed by a cameraman who takes a series of photographs in rapid succession. Each successive picture will show the man in a more advanced position. These pictures are then printed at even spacing on a positive print film. The film is put through a projection machine consisting of a source of light, an optical system, and a mechanical system. The latter is designed to hold each picture in succession in a steady position while light is permitted to shine through it onto a screen; and when each picture is replacing the one before it in this beam of light, the mechanism cuts off the light to prevent the film movement from being seen on the viewing screen.

If more than twelve pictures are projected per second, the eye responds as if it were a truly continuous action. If fewer pictures are projected in a second of time, the eye responds to each separate picture. This effect is known as "flicker", and causes eye-strain.

We note that the OBSERVER function is performed by the optical system of the movie camera. The TRANSLATOR function starts with the light-sensitive chemical compound which coats the negative film; after passing through many processes and many hands, it winds up with the final positive film print. The latter is usually the portable record. The MEDIUM of conveyance has likewise become more complicated, including the related activities of distributors, express companies, railroads, and so on. The INTERPRETER function consists of the projection machine and screen.

Just as in the case of still photographs, an effort was made to eliminate the flatness of the usual motion picture. An illusion of depth and distance is achieved by the stereoscopic camera and projector.

We know the movies chiefly as a source of entertainment of a fiction nature. However, through the newsreels we receive distant vision of action-scenes in the real life of a world community. Home movie cameras also provide a portable record of more personal scenes of action. This is still far from man's goal of instantaneous vision at a distance, or television. The motion pictures have one particular advantage over television in that the recipient may view the action at a later time and place convenient to him.

Sound Motion Pictures. The sound picture problem (Fig. 1) is largely a technical one concerned with the proper synchronization of the sight and sound records when projected. Each of these records consists of physical materials in motion. Reality can be simulated only when the projection of picture action and accompanying sound are timed accurately and automatically. A mass of other problems were presented in securing a good fidelity of reproduction in both picture and sound.

The personnel involved has become tremendously increased. Optical experts, chemists, mechanical engineers, and sound engineers are only a few of the types of experts required to bring into being even the first models of such equipment. Its manufacture, installation, and maintenance require many other men of varied training.

PICTURE and FACSIMILE TRANSMISSION SYSTEMS.

In General. In the commerce and the news of the world a photograph or drawing is very useful in improving the amount of detail which it is possible to convey quickly by word-pictures, whether telephoned or telegraphed. The art of transmitting still pictures or drawings from one place to another is sometimes called telephotography.

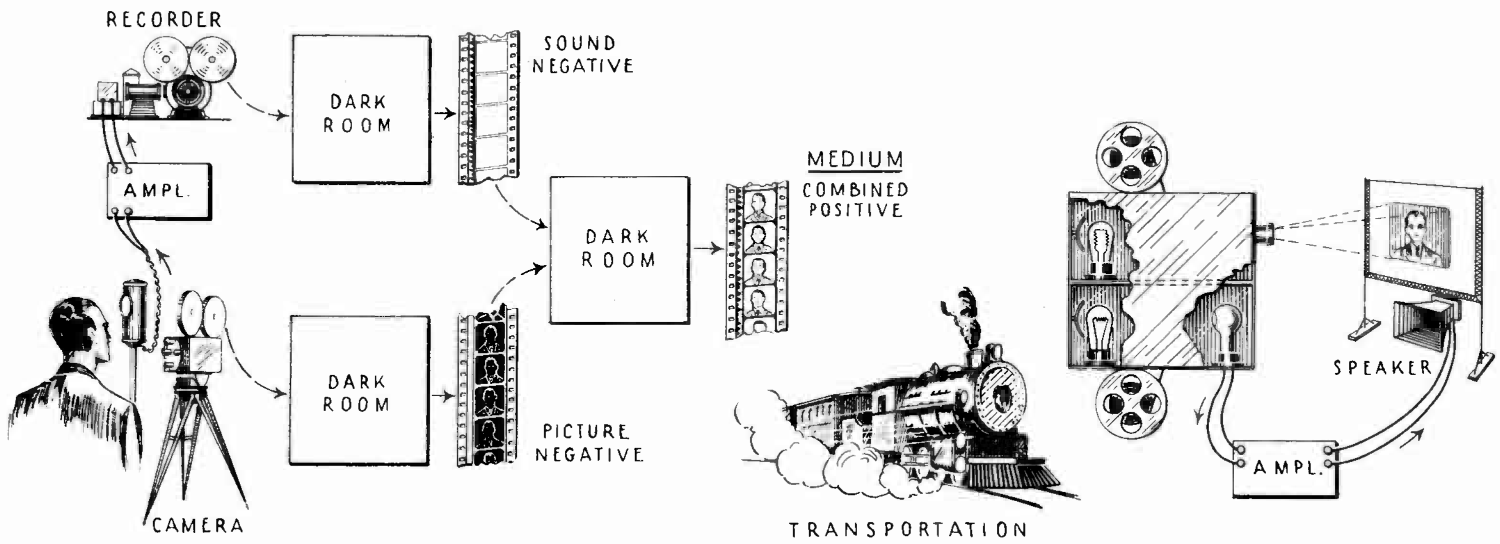

Fig. 1 — SOUND MOTION PICTURES PROVIDE A DELAYED DELIVERY OF EXCELLENT ENTERTAINMENT COMBINING REPRODUCTION OF SOUND AND ACTION.

Whether the medium connecting the two points is a wire circuit or a radio channel does not appreciably affect our present explanation.

In order to tackle the understanding of this problem, let us consider a fanciful situation where the graphic record we desire to transmit is a mosaic pattern of a tile floor. It is desired to construct a facsimile of this design or picture at a remote point. At the original mosaic an observer is stationed, having a telephone connecting him with the remote point. Here the receiver is held by a tiler who is prepared with a stock of tiles of the same shade as those composing the original. We will limit these for simplicity to white, gray, and black.

It is evident that the simplest and quickest way would be for the two men to have a definite understanding as to what order will be used in viewing and calling the tiles. For instance, the OBSERVER starts at the top of the pattern and scans the first row of tiles from left to right, TRANSLATING the different shades of tile into different telephone currents, by calling out "white, white, gray, black, etc." as the case may be. When he comes to the end of the first row, he starts at the left end of the second row, calling the tiles as he scans to the right. All this time the distant tiler has been INTERPRETING the telephoned instructions and laying down tiles of the designated shades and in the same order. Continuing this process until the whole mosaic has been scanned, there will result at the remote point a pattern identical in picture-effect with the original. Another point is of interest. So long as the individual tiles at the receiving end are of the same shape as the original tiles, they may be of any different size and still give an identical picture-effect. The sizes of the patterns will be proportional to the sizes of the tiles.

Continuing this fanciful description, it is probable that much time and labor could be saved by replacing the observer and the tiler by two machines connected by the same two wires that previously connected the telephones of the two men. Let the transmitting machine be equipped with an electric eye (a colloquial name for a photo-electric device translating changes of light intensity into changes in electric current). The receiving machine which lays the tile must be designed to automatically lay the proper shade of tile as dictated by the current changes in the connecting circuit. As the transmitter rolls across the original mosaic, tile by tile, and row by row, the receiving machine would (by separate synchronized control of motion) roll across the remote floor, laying tiles in succession in the same order as those scanned by the transmitter. The final complete picture would be a facsimile of the original.

Actual facsimile or picture methods vary from the case described. The original may be a photographic print or film, a half-tone print or film, a line drawing, or engraved or printed page. It is usually placed on a drum, which is caused to rotate in front of a scanning device. (See Figure 2). The scanning system consists of one or more lamps, a photo-electric cell, and lenses, prisms, and reflectors as required to make an efficient optical path between the light source, the picture, and the cell, usually a phototube. This whole system moves as a unit in a direction along the drum axis. A common system uses a restricted flood lighting from the lamps around the scanning point, which is actually only the focus of a lens system (like a reversed telescope). This spreads into the phototube the light reflected from the picture at the focal point. The opposite type of optical system is where the direct light from the lamps is concentrated through a lens system into a focal point at the surface of the picture, like the "burning glass"; the variable light reflected diffusely from the picture is then gathered by a close-fitting reflector and directed into the phototube. It is with the photographic prints and other opaque originals that the reflected light is used; with a photographic film or a drawing on tracing-cloth, etc. the scanning light passes through the original, and the drum must be transparent. Compare this method with the photo-electric pick-up from the sound track on film, in sound motion pictures.

The combination of the rotation of the picture drum and the lateral movement of the scanner unit is exactly like the movement of a phonograph cylinder and reproducing needle in a dictating machine. The point scanned therefore follows a similar continuous spiral line about the cylindered picture. The variations in the light reflected from the picture along this line cause corresponding variations in the otherwise steady current through the phototube. This is applied as a modulation to an audio-frequency current which is the tone signal transmitted by either a wire or a radio channel. The effect on the transmission of the use of this tone is the same as though the picture itself were being broken up into small regular areas corresponding to the tiles of the mosaic pattern. The tone may be introduced in another way. An opaque disc having holes pierced in it at regular intervals around a circle may be placed in either section of the light path of the scanner. This light chopper, as it is called, puts a regular succession of impulses in the illumination of the phototube, and passes a musical tone through the amplifier. The picture causes a variation in intensity of the successive light impulses, and therefore a variation in amplitude of the successive cycles of the audio-frequency current which constitutes the tone signal.

When a photographic picture is transmitted, the gradations of shade between white and black will be infinite; the receiving system must be capable of reproducing all these shades at their true relative values. Usually a drum recorder is used, on which is mounted a sheet of ordinary bromide paper as used for photographic prints. The drum is caused to rotate at the same speed as the transmitter drum. The recorder conveniently consists of a lamp whose light is concentrated, through a lens system, into a fine area at the surface of the paper. This lamp is a special kind of glow lamp, and its brilliancy responds very rapidly to changes in the amplitude of the electric impulse coming to it from the transmitter through various amplifiers, etc. This method naturally requires time for the developing of the print.

The transmission of line drawings or printed matter is simpler, since only the white and black values of shade are represented in the original. The recording process can be less intricate. On an early type a jet of hot air is moved across a chemically treated sheet which is normally white. It turns quite dark wherever the hot air jet has been released by the impulses in the signal current. A second type of simple recorder makes use of a roll of white paper which slowly unwinds under a sheet of carbon paper. When the transmitter scanning point crosses a black element of the original picture, a signal current is caused which operates the recorder in such fashion that a lever presses the carbon paper against the white paper. This makes a black picture-element at that point of the received picture corresponding to the point then being scanned at the transmitter. The complete record is "turned out" as soon as the scanning of the original is complete.

Mention has been made of a synchronized control of motion as applied to scanning and recording. We have also previously mentioned, under "Sound Motion Pictures" the synchronism of the sound record and picture in order to make the projected program a unified effect. In facsimile, synchronism means controlling the motion of the original and the facsimile record so that each picture-element of the two will be identically located in their respective areas. One method of doing this is to control the speed of the transmitting drum and the recording drum by a tuning fork at each end which have accuracies in vibration frequency of closer than one part in several hundred thousand. A second method is for the transmitting station to generate a separate alternating current which operates the drum by a synchronous motor. At the same time this alternating current is impressed, as a constant unmodulated tone signal, on the wire or radio channel used also for the picture signal. At the receiving end the synchronizing tone signal is filtered out from the picture signal and applied to the driving motor of the recording drum, which effectively locks in step the motions of the two drums.

Uses. This service has been expanded to include the transmission of whole newspaper pages across the continent by means of radio, the general scheme being to transmit several columns at a time and patch these columns together by hand at the receiving point. Successful sending of weather maps to ships at sea, and even to airships, has been achieved. Letters reproduced in the original handwriting have added a new integrity to long-distance communication. By far its greatest usefulness to date has been in the transmission of news pictures, whether by wire or radio. The distribution to the masses of people is therefore by printing these pictures in newspapers. It is seen that the cheapness of newspapers and the speed of the modern news presses has practically made it not at all worth while for individuals, in their homes, to possess receiving equipment capable of reproducing these still pictures. It is probable that there will be no general home service of this kind, except where the still picture is held up before the pick-up of a television transmitter. This will cause a considerable loss in the value of the picture, for the reason that a still picture could be transmitted slowly as a facsimile and a great degree of detail maintained. The same amount of detail transmitted by a television transmitter would require an almost prohibitive breadth of communication channels, and would be quite wasteful. It would appear that an unwarranted amount of space has been given thus far to still pictures when we are particularly interested in other subjects. This is done because in dealing with still pictures we contact with very tangible things, such as photographic prints, etc., and these have a touch and feel to them which the student can realize. On the other hand, although technically there is a great deal of similarity between the images seen on printed pictures and the transmission of televised images, yet images of the latter kind seem to be such very unreal things to anyone studying this subject for the first time. So having devoted a reasonable amount of time to a study of still pictures before going into a full account of television will no doubt make this work easier for you to understand.

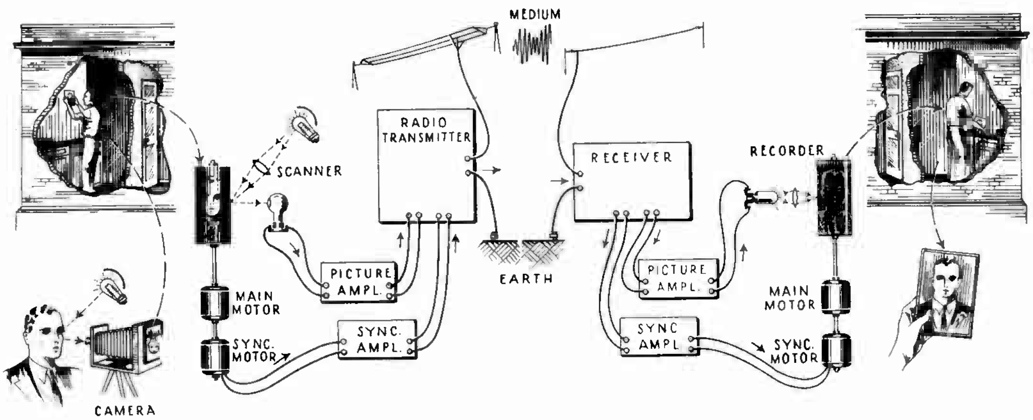

Fig. 2 — STILL PICTURES BY FACSIMILE TRANSMISSION ARE ESPECIALLY USEFUL IN ILLUSTRATING NEWSPAPERS; WORDS ARE ADDED IN TYPE.

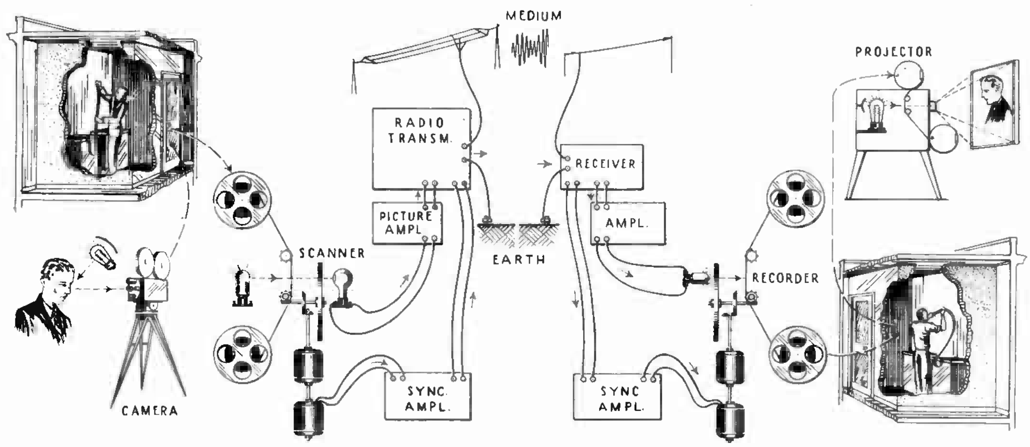

Fig. 3 — MOTION PICTURES BY FACSIMILE TRANSMISSION SAVE PART OF THE TRANSPORTATION TIME, BUT AT A SACRIFICE OF PICTURE QUALITY.

RELATION BETWEEN FACSIMILE, MOTION PICTURES, and TELEVISION.

It can readily be seen that no difficulty would be encountered in handling a motion picture film over a facsimile system as in Figure 3. At the transmitter, the positive film strip would be fed into a mechanism bearing a facsimile scanner. The signal channel would be the same as before. At the receiver an unexposed film strip would be passed continuously through a photographic recorder. After developing, the resultant would be the same orderly arrangement of separate photographs as seen on the distant original. If the facsimile strip were of the identical size and had sprocket holes properly placed, it could be put into a motion picture projector and shown on a screen. The time of transmission and subsequent developing would be so great that only in rare cases would any benefit be derived over the ordinary messenger or common carrier system of delivery.

But let us see what an opportunity we have here. The motion picture film represents an original camera action somewhere at a film speed of 90 feet per minute, or 24 frames (pictures) per second. In the facsimile transmitter this film would be made to pass the scanner at the rate of perhaps 4 inches per minute, resulting in a delivery to the facsimile recorder at the rate of 1 picture in about 10 seconds. After the tedious recording at this rate, the finished film would be projected at its intended rate of 24 frames per second on to a viewing screen. If the facsimile picture rate can be increased from 1 frame in 10 seconds to 24 frames in 1 second, we will have accomplished delivery at the rate intended for projection of the picture on the screen. Then all we have to do is eliminate the usual recording and developing process, and make the facsimile signal control some method of directly illuminating the viewing screen. This immediate "delivery" of the pictured action was secured by mechanically or electrically breaking up the continuous facsimile picture signal in such fashion that each picture-effect or frame was laid down in succession in the same place as the one before it, on a viewing screen. (See Figure 4). Here again that quality of the eye called "persistence of vision" enters in to cause the effect of continual vision.

The chief interest of course lies in the immediate television of the remote action-scene. Dispensing with the motion picture camera which first OBSERVED the action and TRANSLATED it into a film which could be scanned at will, we advance in technique to where the scene is observed (scanned) directly by a photo-electric system which instantly translates into electric signal impulses the progressive examination of the scene, as shown in Figure 5. This is true <u>television.</u> The receiving equipment is identical in principle with that for the transmitted motion pictures.

In either of the above types of transmission of continual action we have a synchronizing problem such as we had in facsimile. It is clear that some system must be used at the receiver to assure each frame (scanning repetition) being laid down exactly over its predecessor, point for point. The crude early method was to have a hand-operated speed control for the motor which turned the distributing disc. Later this motor had part of its work done by another and smaller motor driven synchronously by some alternating current component of the scanning signal.

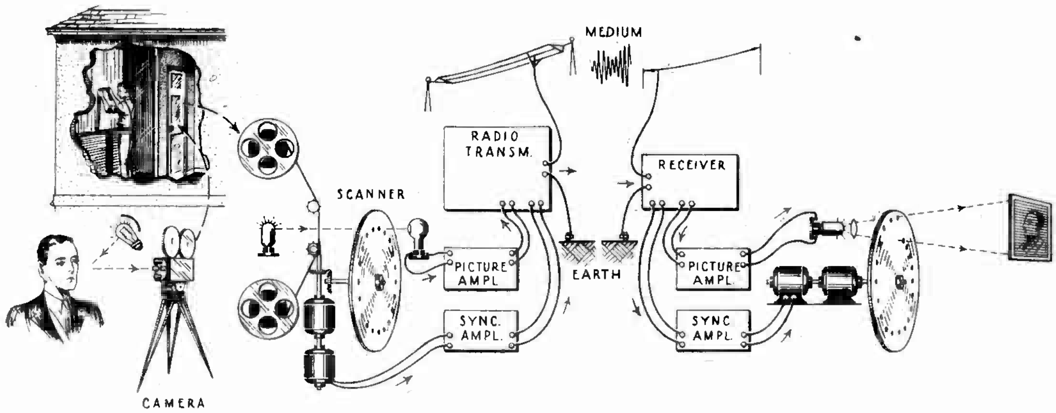

Fig. 4 — TELEVISION TRANSMISSION OF MOTION PICTURES GIVES SIMULTANEOUS PROJECTION AT THE RECEIVER, BUT THE PHOTOGRAPHIC PROCESSING DELAYS THE TRANSMISSION CONSIDERABLY AFTER THE ACTION.

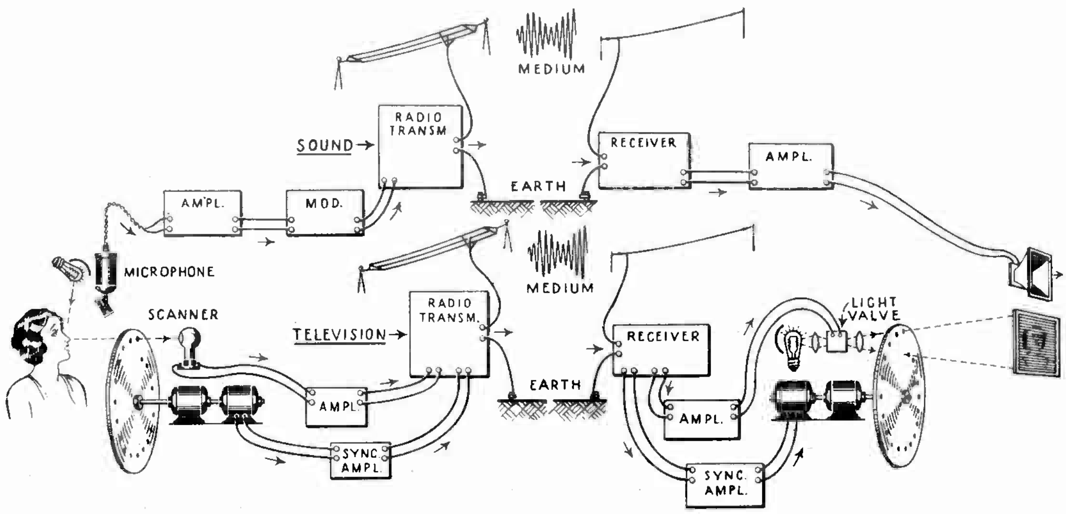

Fig. 5 — TRUE TELEVISION (WITH SOUND) PROVIDES INSTANTANEOUS REPRODUCTION OF BOTH ACTION AND SOUND AT A REMOTE POINT.

Sound Pictures. It is perhaps obvious that there is little entertainment value in the transmission of silent motion pictures. In transmitting sound motion pictures, the sound record, whether on a disc or on the film, is picked off in the same fashion as for theatre projection. The amplifier output, instead of going to nearby loudspeakers, is transferred to a wire or radio channel as a medium of delivering the sound program to the same point as the picture program. Here an ordinary telephone amplifier, or the equivalent complete radio receiver, feeds a loudspeaker adjacent to the screen.

TELEVISION.

Television, in brief, consists of a transfer from light to electricity at the transmitter, an electrical path, and a transfer from electricity to light at the receiving point.

We have seen how radio began with the theoretical calculations of scientists published years before a demonstration was made of intelligible transmission. In like manner, the fundamentals of the science of television were known and published decades ago. The electrical equipment available then was simply not sufficiently developed to permit the clear use of the knowledge.

The real advance of television began with the development of electronic tubes, and particularly the phototube, in which the electron emission is produced by the illumination of an electrode. The rapid response of this tube to changes in intensity of light overcame the difficulty encountered with the early photo-conductive cells using selenium, in which the electrical response lagged appreciably in time behind the light stimulus. The present quality of performance of the phototube is due largely to the momentum given its development by the exacting demands of its use in sound motion pictures.

In television reception methods, advance came first through the development of better glow lamps, which give a response in light intensity that depends on the value of electrical stimulus The new problems in signal amplification had a firm basis of solution in the experience gained in designing voice-frequency and radio-frequency amplifiers for radio broadcasting and sound motion pictures.

A television scanning system consists of a source of illumination, a phototube, and a means for shifting the optical path connecting these so that the point of reflection progresses over the scene in regular fashion, repeating this entire scanning operation periodically at not less than twelve times per second, to prevent flicker in the image. The process may be by progressive illumination or by progressive observation. The first uses a concentrated light beam which shows as a small spot of light on the object or scene. The phototubes are spread out to receive the reflected light from that spot as it travels rapidly over the scene. The second method uses flood lighting of the scene, and the observation of the reflected light by the phototube is confined by lenses to a small area or spot of the scene at a time. The observing path progresses rapidly over the scene until the entire area has been covered. The second method is useful outdoors or in a lighted studio. The first method has some advantages for indoor studio work.

We find a good deal of similarity between the scanning system at the transmitter and the early forms of projecting system at the receiver (Figure 5). In scanning, there is a regular shifting of the optical path between a source of constant illumination and the phototube that receives the reflected light of varying intensity. In the receiving projector, there is a regular shifting of the optical path between the eye and the light source whose intensity varies with the electric signal which had its beginning in the phototube at the transmitter. In the early systems, use was made of a disc invented by Nipkow in 1884 and having a single turn of holes placed in a spiral form. Scanning discs of identical layout but perhaps different size, were used to shift the optical paths at both transmitter and receiver.

Then the receiving system was improved to eliminate the disc or other mechanical distributors for the light. These were replaced by a weightless cathode ray which was electrically shifted. Illumination of varying intensity occurred at a fluorescent screen which was bombarded by the cathode ray at varying electron density, controlled by the television signal. A modified form of cathode ray tube has also been used as an electrically shifted means for scanning the object at the transmitter.

Sound Television. The accompanying sound program for a transmitted motion picture merely required a simultaneous pick-up from the sound track of the film. When an action-scene is scanned directly for television, a microphone adjacent to the action is used for the sound pick-up. In either case the sound program is put on a separate wire or radio channel. Reception likewise is independent of the television reception. To produce an illusion that the television and sound are one and the same program, the loudspeaker is placed as near the televisor as possible. It will be remembered that in sound motion pictures, the sound projectors are placed right behind the projection screen to similarly perfect the illusion.

It is interesting to note that sound television is not troubled with synchronization of sight and sound, as was found in sound pictures, where they are recorded in physical form. In the former. we find that the velocity of light and radio waves, and of the electron flow in wires, is so great that the time of travel for different paths is negligible. Simultaneous projection is therefore assured.

LIGHT-BEAM TRANSMISSION OF TELEVISION. Laboratory experiments have demonstrated that a beam of light can be used as the transmitting medium in place of the usual radio transmitter. With this system a scene could be televised and the television signals put onto a wire circuit running to a transmitter consisting of a powerful lamp and a means of modulating the intensity of its light with the television signals. The rays of the lamp would be directed toward a point perhaps several miles away, where a straight-line view could be had of it by an "electric eye". This photoelectric cell would transform the light-beam impulses into varying currents and with suitable associated equipment it would provide ordinary television projection.

Conclusion. In the foregoing review covering the development of sound and picture transmission we have not attempted to give a thorough discussion of the historical or technical features relating to radio, television and sound pictures. The lessons which you will study go into the details. This review with its pictorial illustrations serves to give you a good idea of the general scheme of things in these fast growing industries.

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EXAMINATION QUESTIONS

1. What is the purpose of the telescope?

2. Consider your five senses: smelling, seeing, tasting, hearing and feeling. List them in the order of their importance in your life.

3. Through which of these senses could you get the most information about things around you, in the shortest time?

4. What is the technical basis of motion pictures?

5. What processes in motion pictures are concerned with each of its following functions: A. Observation, B. Translation, C. Transportation, and D. Interpretation.

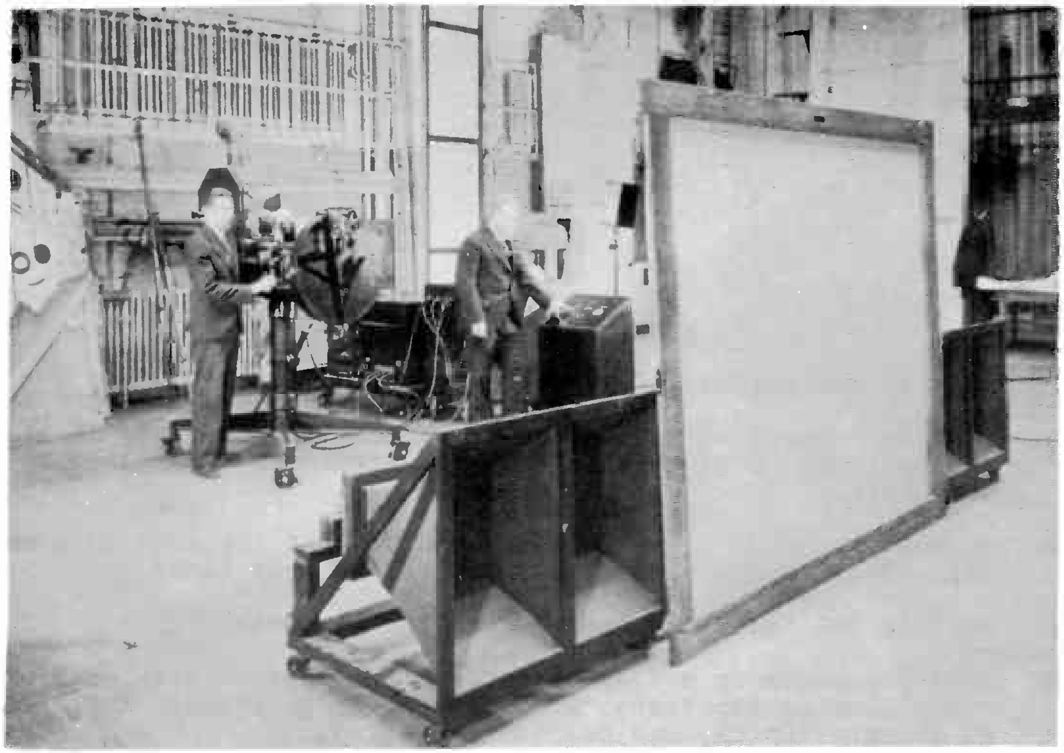
6. A Sound Motion Picture system is really a combination of what two forms of communication?

7. In a few words what is the difference in purpose of a microphone and a photoelectric cell?

8. Why is the facsimile transmission of line drawings and typed print matter simpler than the transmission of photographs?

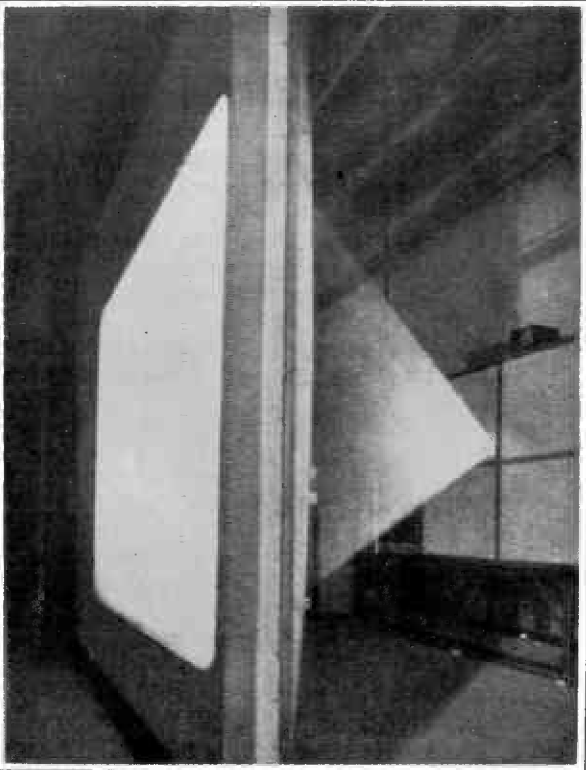
9. In what way does the television method of delivering motion pictures at a remote point differ from the facsimile method of delivering the same?

10. A Sound Television system is really a combination of what two distinct forms of communication?



ABOVE:

A BACK-STAGE VIEW OF THE TELEVISION PROJECTOR AND SCREEN AS USED IN THEATRE TELEVISION DEMONSTRATION ILLUSTRATED ON THE FRONT COVER.



RIGHT:

A BACK-STAGE VIEW OF MOTION PICTURE PROJECTION BOOTH AND SCREEN, AS USED AT THE ASSEMBLY THEATRE, NEW YORK CITY. (PHOTO COURTESY TRANS-LUX DAYLIGHT PICTURE SCREEN CORP.)

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