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Edited by HUGO GERNSBACK

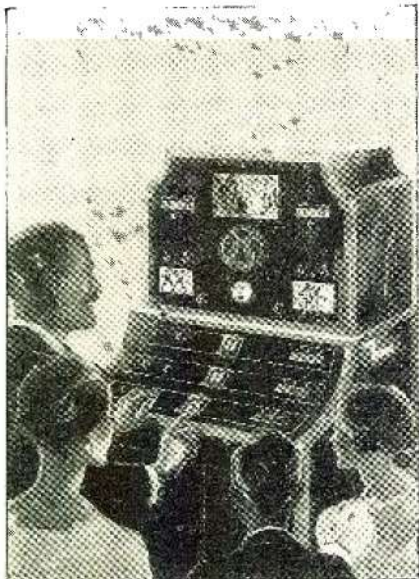
a
MULTIPLE TELEVISION

(See Page 528)



“Multiple Television” — A Forecast

Why the Possibility of Receiving More Than One Television Image at Once Is of Practical Importance



The first-class television receiver of the future will afford more than one program. We may readily predict a family debate as to which scene of action will receive the place of honor in the varied entertainment.

THE scene which adorns the cover of this issue of RADIO NEWS is not, like its predecessor of last month, taken from the life, nor does it incorporate a photograph of television apparatus which is now in existence. But it does represent a scene which will be many times repeated, a few years in the future, when the owner of a television receiver will not only have a choice of several interesting programs, but be able to sample them all at once, as it were, and choose according to the tastes of the family.

There are several reasons why this should be desirable, and possible as well. It is not particularly profitable to tune in more than one broadcast station at a time, so far as the audible or “aural” programs go. In fact, the best efforts of radio engineers and designers—as well as those of the Federal Radio Commission and other branches of government—have been devoted to the endeavor to make this impossible, so far as an involuntary reception of multiple programs is concerned. The reason for this is based on the one-dimensional nature of our organs of hearing; our ears cannot, except by great effort, analyze a medley of unrelated sounds. We cannot listen to two people at once attentively; let alone a jazz band and a quartet of chamber music at the same time. Nobody, therefore, wishes two loud speakers to pour forth different programs. We tune out or switch from one station before we try another.

WHY SHOULD WE WANT SEVERAL IMAGES?

With our natural television receivers (the eyes) the case is otherwise. They receive the ultra-short waves, which we call light, over a large angle simultaneously, and over what seems to us a large area; and, though it is true that our whole field of vision is not equally sensitive, the mobility of these highly-complex organs and their power of accommodation or “focusing” is almost as quick as thought itself. We are therefore able to give at least cursory attention to several moving scenes at once, without their creating interference with each other, as in the case of sounds.

When we have acquired the faculty of

being present at several places of entertainment simultaneously (for purposes of sight and hearing at least) as will be the case when television has developed to the point of reproducing large scenes as faithfully as the microphone now picks up their accompanying sounds, we may well seek to transfer to our receiving instruments the faculty of glancing from side to side which we now possess. In other words, when more than one event is being televised, we shall desire the power to keep in touch with all of them; giving our closest attention to the parts of each visible program which are most of interest. This will be especially true when the action being broadcast is of a nature that cannot be rehearsed, and whose progress is not governed by the broadcaster's allotment of the minutes—which will be true of an increasing number of public activities, as time goes on.

The matter was brought to the mind of the Editor of RADIO NEWS while he listened in to the opening ceremony of the recent Radio World's Fair. The presence of Mr. Edison, who performed the formal act of inaugurating the show, had been announced in advance; but not that of Mr. Ford and other notables, who were not on the program; and many listeners may therefore have missed an opportunity they would gladly have taken advantage of, the more

so if television reception had also been available to them. The fact suggested the theme of this article: why can we not receive at once several television images on the same receiver, if we have the necessary number of tuning units with which to pick up several broadcast stations simultaneously?

The television image, as all our readers now understand, is in the nature of an optical illusion, created by the motion of a predetermined rate of a scanning disc or similar optical device across a lamp whose illumination is varying at a rate depending on the nature of the image being televised. Each flicker takes place at a time when a different portion of the neon lamp's area is exposed and, therefore, creates the impression of light or darkness over a different portion of the visible area of the disc. The effect is that a complete image is built up before the eye, which cannot see each point of light separately. Take away the disc, and the fluctuations of the light are too rapid to register on the eye; take away the flicker, and a blank, uniformly-lighted area appears before the spectator. The action is of a nature which is called “stroboscopic” (see RADIO NEWS for August, 1927, for a detailed explanation of the term).

Only a very small portion of the disc, however, is used at any one time for the reproduction of an image; the unit space between two successive holes, in the spirally-drilled discs now used, which have been described at considerable length in the last few issues of this magazine. If, therefore, we place additional lamps, flickering at other television-image frequencies, in several positions behind the circumference of the scanning disc, we may produce as many different pictures as we have receivers. (We can, of course, reproduce also the same image in multiple at different points of observation, by placing a number of lamps in parallel across the output of a single amplifier; but these images would be “out of frame,” by reason of the different positions they would occupy along the spiral.)

HOW IT MAY BE DONE

For the purposes of color television, as described in the October issue of this magazine, however, discs have been drilled with more than one spiral of holes. With a disc of this kind (as shown in Fig. 1) we could commence the production of pictures along the outer edge of the area—not merely at point A, as shown, at the top of the disc, but also point B and point C, which are spaced 120 degrees apart, in the case of a disc with three complete spirals. It is true that the lower pictures would be inclined at an angle of 120 degrees to those at the top; but the television receiver of the future will be equipped, undoubtedly, with magnifying devices to bring

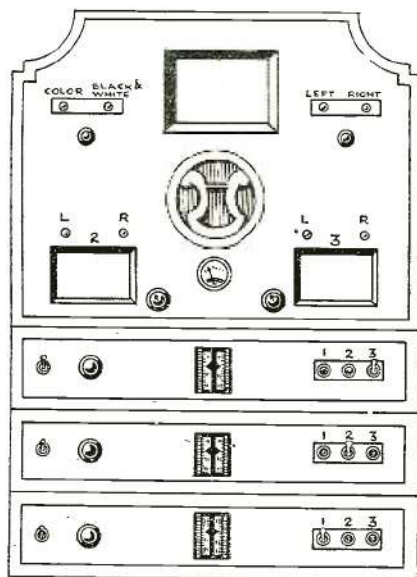


FIG. 2

Here we have the panel layout of a proposed receiver based on the disc system. Each of the three receivers tunes in a program of both sight and sound impulses, though the latter are conveyed to the speaker only in connection with the image in the larger screen. The option of color or of black-and-white with greater speed is obtained in this.

up the image to such a size that it can be seen further away from the disc than at present—to accommodate additional spectators. It would, therefore, be possible to introduce either lenses or prisms to bring the last virtual image "right side up."

Let us then suppose that, instead of reproducing the same image at three positions on our disc, we have three tuning units (See Fig. 2) each with a suitable amplifier for the band of television impulses, and a suitable filter which separates from these the audio frequencies impressed at the same time on the carrier wave. The limitations of our hearing, as already pointed out,

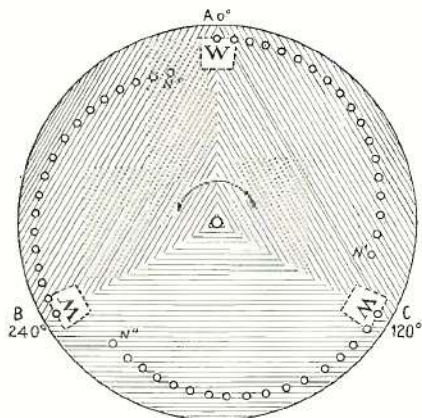


FIG. 1
If we have a three-spiral disc, such as that used for color transmissions, with three neon lamps a separate image may be built up simultaneously in each of the three positions here.

make it undesirable to reproduce more than one audible program; and a single loud speaker with a selective switch enables us to choose any one of the three programs for our ears. Each set of television frequencies, however, is led to a suitably connected glow-lamp—one of these is placed at each of the equally-spaced intervals along the rim of the disc. Here it is scanned by one of the three similar spirals, point for point, just as the other two are dealt with elsewhere. Three images, then, appear at different points on the disc and are brought up to the proper sizes and positions by their respective optical systems. We can then, with an occasional side glance, keep in touch with the three sets of actions being televised at three different radio stations; though devoting the greater portion of our attention to the one of most interest at the moment.

A RECEIVER OF THE FUTURE

It is obvious, of course, that all three of the television programs being thus received must be alike in their characteristics, as regards frequency of scanning and analysis of the images; though there is no necessity that the scenes televised be of equal size or fineness of detail. We can have a television "close-up" or "fade-out," just as we have in the movies; and will undoubtedly have such effects, as technique in television progresses.

It is certain, however, that the synchronizing systems in use must be exactly alike, if multiple images are to be reproduced; and, even in that case, such factors as varying distances of the receiver from two or more transmitters must slightly affect the phase relationship of the received signals. We shall, therefore, concentrate our main attention on one image, which will be brought up in size and sharpness more than

the others, and keep it "in frame." While under our hand are compensating devices to do the same for the other images, we can follow their actions in general without this precaution—the more so, as we shall not be endowed with additional hands by the progressive development of television. If, therefore, one of the smaller scenes below interests us more at the moment, the snap of a switch on its tuning unit causes it to exchange places with the image above.

In the sketch (Fig. 2) of the controls of such a receiver, each tuning unit has three switches, designated as 1, 2 and 3. The snap of the No. 1 switch, we may suppose, connects the amplifier to a lamp which produces the large image above and, at the same time, connects the associated audio amplifier to the loud-speaker unit whose sound-opening is in front of the center of the disc. If we suppose the levers interlocking, the same motion throws down the image which previously occupied No. 1 position to the No. 2 or 3 screen below, and cuts off its audio-amplifier output from the speaker. Thus the shifting of scenes is but the work of an instant.

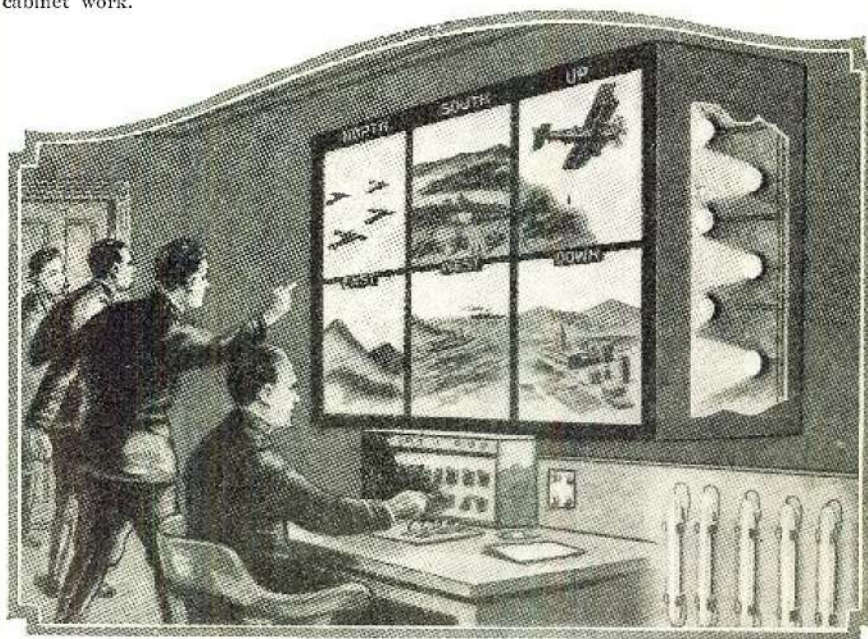
The touch of a button at the right of the large screen adjusts the image and brings it into frame. Similar buttons are provided for the lower images, which will undoubtedly need more effort to keep them in their frames. Nevertheless, as we have said, as they will be used merely to obtain a general idea of the stage of the proceedings which they represent, they will probably be permitted to wander slightly, unless other members of the family desire to watch them more attentively. We may, of course, imagine a slight division in the family council represented on our cover as to which of the available television broadcasts should have the place of honor; presumably the question will be decided by the same gentle influence which has converted the radio receiver from a jumble of crude apparatus on a breadboard to a splendid example of interior decoration in period cabinet work.

COLOR OR SPEED—CHOOSE!

We now come to a second interesting feature of our multiple receiver. As we have already said, our multiple disc is designed for color work; this, however, requires multiple lighting and more complicated connections. We may assume that these are provided at the top of the cabinet alone. The action in the lower screens is seen only in monochrome; pink-and-black if the neon lamp as now used is deemed sufficient for the purpose. At the top, however, three sets of lamps, each giving one of the primary colors, alternately illuminate the successive spirals, producing the effect of natural color. (How this is done was described in a very interesting article in the October issue of *Radio News*—consult page 320.) To obtain this effect, however, we must sacrifice some light, as the image is illuminated only one-third of the time in each color. We would find also that, in a scene of very rapid action (such as a boxing match, or a race) our colors will be slightly "out of register;" like the effect you may have seen in color printing when the red, the yellow and the blue were slightly out of the respective places they should have occupied. In addition to this, many broadcasts would undoubtedly be made without color. In this case, we have only to press the button at the left of our large screen, and disconnect the color-separating mechanism. All the primary rays are thrown at once upon the disc, increasing the amount of practically-white light, and each spiral draws a picture in black-and-white. The result is a much more sharply-defined and more highly-lighted image, enabling us to follow the action more closely.

It is not essential to our purpose, of course, that a disc with a triple spiral be used. To obtain the large number of holes required to scan a larger scene in detail, it may be necessary to use a single spiral, and to change the color transmitted only

(Continued on page 589)



This partial reproduction of a full-page illustration in *THE EXPERIMENTER* for November, 1924, indicates a military use for multiple television. It is necessary for a modern general to be near his center of communications, well in the rear of the lines. With radio-guided airplanes, equipped with six television cameras—looking up, down, forward, back and sideways—he can see the progress of action as if present, and give his orders accordingly. As one observation plane is shot down, the turn of a switch puts a second into operation instantly. The method of reception here shown may more closely resemble that adopted than does the present disc system with its limitations.

Multiple Television

(Continued from page 529)

once during each revolution, instead of three times, as previously described. This does not, however, alter the principle of the system's operation, and involves only a gearing down to a one-third ratio of the mechanism which alternates the operation of our colored lamps or ray-filters; to compensate for the fact that each turn of the disc produces only one change of color.

TELEVISUAL AVIATION CONTROL

The application, however, of the multiple television is not limited to household entertainment, appealing though its cultural value may be for those who desire the most elaborate conveniences. The system will lend itself admirably to the purpose of replacing a visual observer at a place where it is inconvenient to maintain the latter; just as the various "mechanical men," "televoces," etc., permit remote control of power stations and other important machinery.


First and foremost among these applications we may list the operation of an airship by remote control—and it is interesting to note that this very possibility was predicted on the first laboratory demonstration of television—actual, though crude—by the Editor of this magazine. "The Radio-Controlled Television Plane" by Hugo Gernsback, appeared in *THE EXPERIMENTER* for November, 1924, with the illustration reproduced partially, and in reduced form, at the bottom of page 529. It depicts "The Plane Which Sees."

Since that time, an airplane has been flown successfully by the Signal Corps of the United States Army, for a considerable period, without a human being aboard; its controls being directed solely through relays operated by radio signals sent out from the ground. However, this demonstration, though an interesting one, tied the plane very closely to the operators on the ground; as they would have had no way of estimating its motions had it flown out of the range of their direct observation.

Let us suppose, however, the plane of the future without any crew aboard except its radio-operated relays and its sextuple transmitting television, which is continually taking synchronized observations ahead, beneath, behind, to right, to left, and above. Around the multiple receiving television at headquarters will gather three or more men.

The "pilot" sits at one side, his eyes hidden by the hood that covers the reproduction of the image which shows the view ahead, and slightly downwards, in the direction of the plane's flight. He holds the controls which steer the plane up, down, right or left, as well as those which govern the speed of the motors. In the edge of the television image are framed visible characters impressed on the image by the automatic recording instruments of the plane; so that the pilot may note their condition, just as if they were on the instrument panel before him.

Beside the pilot sits the "observer," equally intent upon the moving scene below the plane, and informed also as to the longitudinal and transverse inclinations of the plane, and its speed. He controls the radio-operated camera, which takes pictures of the ground or sea beneath, and the relays which drop the cargo, perhaps. If the



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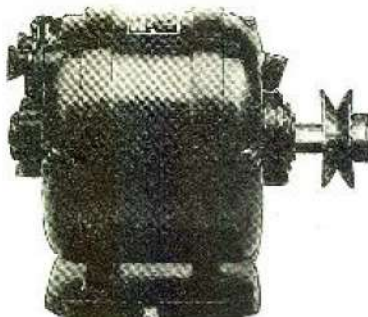
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plane is a military one on a war errand, he is the "bomber."

The views to the rear, either side and above are of less pressing importance, perhaps. Their observers are placed on the other side of the machine, looking through the disc in the opposite direction—this makes no difference in the operation, as the transmitters are designed accordingly. There is no problem of the different pictures being variously out of frame; as they are scanned by machinery operating from the same motor and driving gear. One of the operators at the rear keeps them "isochronized" with the receiver and in frame, so that the pilot and the observer are relieved of the task. These operators glance occasionally over the telepanorama, but are not likely to be called into action unless the swooping attack of a hostile plane is noted. In this case, they wait for it to "cross the wires" (which indicate on the screen the line of fire of the fixed machine guns that the plane carries) and let off a reel of cartridges at the foe.

Somchow, we begin to have recollections of that *quattrocento* battle in Italy, in the days when mail was of proof, and two armies fought all day with but one fatality, due to one soldier's breaking his neck by a fall from his horse. When the machinery is to do all the fighting and dying, it will be more comfortable—if equally laborious—for the military forces converted into a mechanical service of supply.

250-Type Tubes Designed for Large Amplifiers

IT often seems that in their eagerness to be among the first to make use of a new tube, some radio engineers, fans and writers do not give due consideration to the proper use of such tubes. In some instances, this has been the case with the 250-type tube.

This tube was primarily brought forth to satisfy the demand for power amplifiers for use in auditoriums and other large gathering places. When used in such connections, the use of an amplifier before the last stage capable of providing a voltage amplification sufficient to bring out the best in the power stage is required.

The use of a push-pull power stage using two 250 tubes is not generally recommended, except for instances where extraordinarily large power output is required. Certainly such an amplifier has no place in the average home.

For ordinary home use, the greatest advantage of the 250 tube lies in the fact that it will give, with lower plate voltages, an output equivalent to that obtained with a 210-type tube at much higher voltages. For home use, therefore, the plate voltage used should not be higher than 300 volts.

Radio Reviews of Literature

(Continued from page 565)

TELEVISION FOR THE HOME, by Ronald F. Tiltman. Published by Hutchinson & Co., Ltd., London, England. 7½ x 5 inches; 106 pages, illustrated with photos; cloth. Price 2s 6d (61 cents in England).

The above title, as shown by the author, offers in itself some room for discussion after one has completed the perusal of this book. It is then that a

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