Vol. 3 SEPTEMBER 1930 No. 31 SIXPENCE MONTHLY

TELEVISION

THE BIG EVENTS

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THE WORLD'S FIRST TELEVISION JOURNAL.

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By SYDNEY A. MOSELEY
and H. J. BARTON CHAPPLE, B.Sc.(Hons.), A.M.I.E.E.

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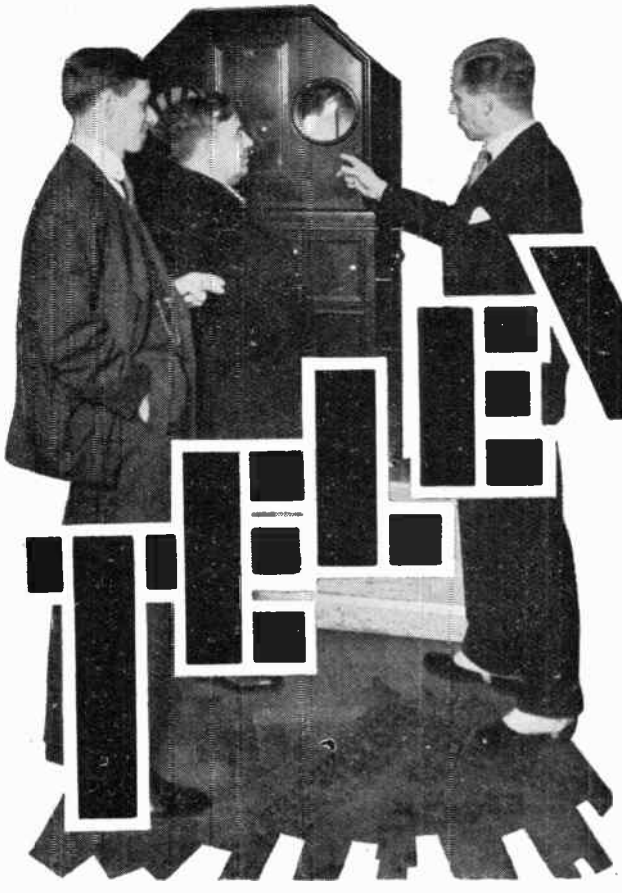

TELEVISION

THE OFFICIAL ORGAN OF THE TELEVISION SOCIETY

SYDNEY A. MOSELEY, *Managing Editor.*

Consultants { C. TIERNEY, D.Sc., F.R.M.S.
W. J. JARRARD, B.Sc., A.R.C.S., A.I.C

VOL. III] SEPTEMBER 1930 [NO. 31

A BRITISH TRIUMPH

NOT even the most optimistic individual who boasts of his "television mindedness" would have felt absolutely safe in predicting such a wonderful success for the demonstration of Baird television on the screen at the London Coliseum. It was a triumph, both individually and collectively, for the Baird people, and we join with the innumerable eulogistic reports which have appeared in the Press, both at home and abroad, in extending our heartiest congratulations upon the achievement.

Britain leads again, and our faith in the Mother Country has been justified. We said last month that television is not standing still. The events which have transpired give point to our remarks. In this issue our readers will find full details of what took place at the Coliseum, the culmination of the fortnight being the *pièce de résistance*—tele-talkies. As in the past, we shall keep our readers fully cognisant of the progress being made in screen television, for undoubtedly it represents an achievement which for its future almost savours of the prognostications of Jules Verne.

Now for the competition. We feel more than pleased with the interest which our novel competition aroused, and in offering our congratulations to the winner, we should like to point out that all who took part did a pioneer service, and it is hoped to extend these competitions during the coming season. Always read the rules carefully, however, for some of the competitors automatically nullified their efforts by not doing exactly as they were told, and this, to say the least, is unfortunate.

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Our Novel Competition

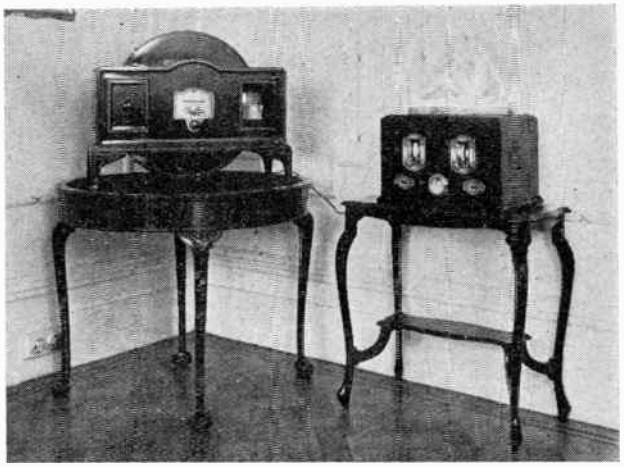
ANNOUNCING THE RESULT OF OUR READERS' EFFORTS TO WIN A "TELEVISOR"

READERS will recall the details of the novel competition which we organised last month and which was broadcast during one of the Baird Company's experimental transmissions on the morning of August 12th. Undoubtedly it proved a popular and interesting test for all those who were able to look-in upon that day. From correspondence we have received, it would appear also that there were a number who listened but could not look-in, and the results which these competitors submitted gave point to our continued argument that hearing without sight is only half a blessing. A large number of entries was received, but unfortunately several of the competitors failed to comply with the simple rules which we laid down and in consequence were automatically disqualified.

The Winner's Solution

A simple story was read slowly by the announcer, and during the eighteen pauses which ensued an object, action, or person representing the missing word was televised. On this occasion no one sent in a correct solution. We have much pleasure, therefore, in congratulating Mr. H. R. Jeakings, of Mill Street, Bedford, whose solution contained only one error. Mr. Jeakings submitted the following :—

	Additional Description.
(1) Ring the bell ..	Large round bell, push-button type.
(2) Maidservant ..	Had on the usual white cap.
(3) Visiting-card ..	This was received on small tray.
(4) Handshake ..	Two people shook hands.
(5) Hat	Man wearing Trilby hat.
(6) The Prince of Wales	A very good picture of the Prince.
(7) Glass of beer ..	Glass of beer or stout, froth on top.
(8) Milk	Milk in usual glass bottle.
(9) A banana	Quite distinct.



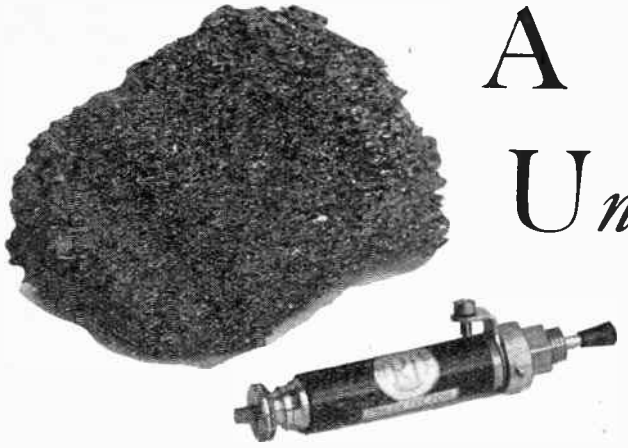
The Baird "Televisor" (left), which we know will find "a place of honour" in Mr. Jeakings' home.

	Additional Description.
(10) Apples	One apple only (very clear).
(11) The banana ..	This was peeled before the "Televisor."
(12) Cards	One card 3 of diamonds overlapping 6 of clubs, only three pips of the 6 of clubs showing.
(13) At 9.15	Large clock face quite distinct.
(14) Telephone	Old pattern instrument.
(15) The cat	The cat had long rough hair.
(16) Policeman	Badge on helmet quite distinct.
(17) Hair and tie ..	Combing hair and adjusting tie, etc.
(18) Scarf	White scarf.

There is only one error here, this being clue No. 10, when the objects televised during the pause were an apple and a banana, the correct solution being fruit. It will be noted also that the winner, in addition to submitting his list, went to the trouble of describing every object and action in fair detail, even noting the old pattern telephone instrument used in clue No. 14.

In announcing Mr. Jeakings as the successful competitor we extend our hearty congratulations to him on his excellent reception, and trust that the "Televisor" which now becomes his property will always serve to recall his interest in the art of television.

It is hoped that at some future date competitions of a somewhat similar character will be devised, and due notice of this will, of course, be given to our readers in the columns of the Magazine. Every reader who participated took part in a pioneer service and their co-operation was greatly appreciated.



A Crystal Detector Unit for Television

By *William J. Richardson*

SINCE a fair measure of interest has been aroused by my article dealing with the use of a crystal detector for television images (in one instance it is being translated into French for use in some of their journals) I feel that the requests for more details will best be met by describing the actual construction of the unit, which can be so easily joined up to your low frequency amplifier.

I will not go over the ground I dealt with last month, but one factor must not be lost sight of. Provided you are content to lose the amplification normally provided by the detector valve then, apart from the wonderful images given by the crystal detector, you experience the saving in cost.

A Saving in Money

With so many calls on one's pocket in an effort to satiate "a heavy television appetite" no one can afford to neglect the saving of a few shillings and in this unit it will be noticed that the outlay is really quite small, and out of all proportion to the results it is capable of giving. Components have been kept down to the barest minimum, but, even so, the results appear in no way to have been affected.

In Fig. 1 I have shown the theoretical circuit, which my own experiments proved to be the best arrangement. There is the plain tuned grid circuit with the aerial fed to the centre tap through a .00005 mfd. fixed condenser. Negative bias is applied at the grid of the high frequency screened grid valve *via* the 1½-volt cell shunted by a 1 mfd. fixed condenser.

Choke Feeding

Since the apparatus, as originally constructed, was experimental in character, a fuse lamp was included in the screened grid lead to nullify any serious accidents which might have occurred from short circuits, etc. In the plate circuit of the high-frequency valve we have joined a screened grid H.F. choke so that the amplified signal pulses are forced to take the path to earth provided by the .001 mfd. mica coupling condenser, and the coil L_2 tuned by the .0005 mfd. variable condenser.

Finally, we have the crystal detector and .001 mfd. mica condenser as a shunt across the tuned circuit, the coupling to the grid of the first valve of the low frequency amplifier being taken from the junction point between the crystal and the condenser. No volume control is provided for, it being felt that this could be carried out in the low frequency amplifier itself.

Components

For those readers who desire to duplicate the unit I am giving, at the end of the article, a list of the components required, together with the manufacturers' names. Naturally, substitutes can be used provided they are of good quality, but since there is only a limited space it is necessary to ensure that

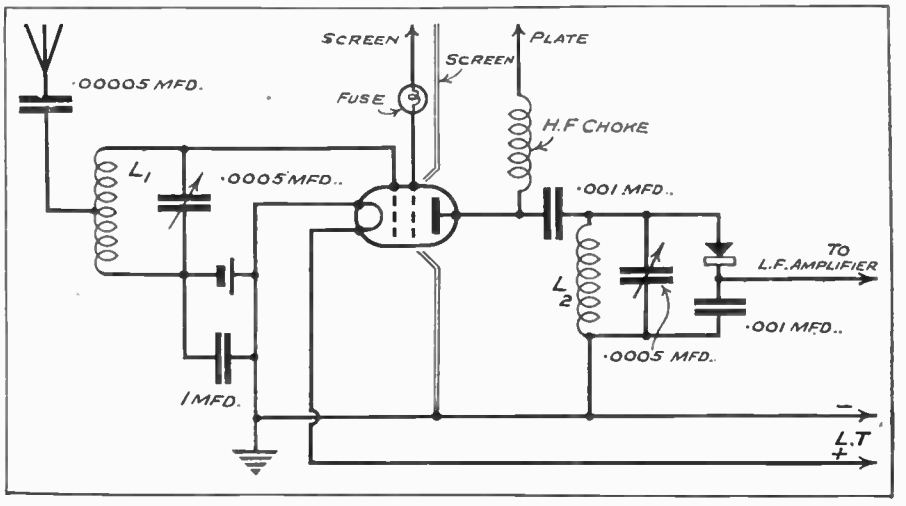


Fig. 1.—Complete details of the theoretical arrangement finally adopted for the Richardson detector unit.

these alternatives, if chosen, have sufficient room on the baseboard or panel.

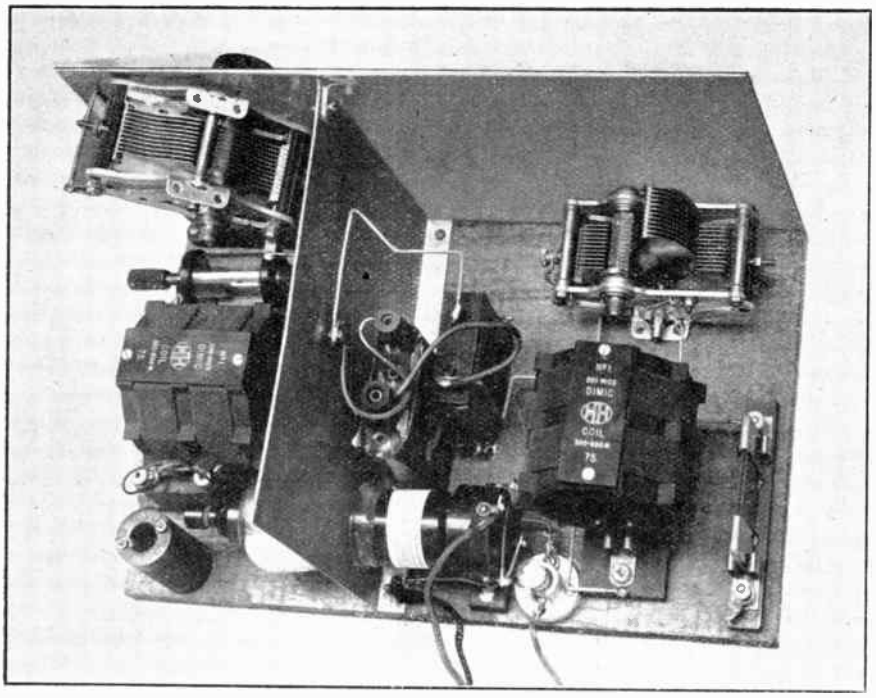
Now let us proceed to the constructional details, which will be found quite simple. To assist constructors a photograph of the original unit as constructed is shown with this article. In the wiring diagram, however, it will be seen that the condensers have been arranged better on the panel, while a different type is used, namely, the Formo, as specified in the component list. The screened grid valve-holder has also been changed from that shown in the photographic illustration, but the other components remain, and it was felt that this block of the original unit would be of assistance to readers.

Constructional Work

Drilling dimensions for the aluminium panel are given in Fig. 3. Remember that the left-hand condenser (facing panel front) is bushed with suitable insulating washers, and in consequence allowance must be made when drilling. Notice the positioning of the cross screen and drill the fixing holes for this accordingly. Now screw the panel to the baseboard, and fix the condensersand cross screen in place.

The positioning of the other components on the baseboard is readily undertaken if reference is made to Fig. 2, which gives baseboard and behind panel wiring. Screw all these components down carefully, and proceed to carry out the small amount of wiring. The wiring runs are indicated clearly in Fig. 2; and be sure to make neat right-angled bends in the wire whenever possible.

I have preference for soldered joints throughout, but since most of the components are provided with terminals, this type of joint can be dispensed with and the ends of the wires looped round the terminal shanks. Notice that the moving plates of the left-hand condenser of Fig. 2 are earthed to the metal panel, or, in other words, direct contact can be made by the one-hole fixing nut.



This illustration shows the original experimental unit which was altered slightly before being described in the accompanying article.

Correct Positioning

A further point to note is the positioning of the screened grid valve-holder. A hole 1½ ins. in diameter is drilled in the cross screen near the bottom edge remote from the panel. The centre of this hole should be 1⅜ ins. up from the baseboard, and 1¼ ins. in. Before finally fixing the valve-holder pass the screened grid valve through this hole, and push the four legs home into the sockets. The valve-holder should now be sufficiently away from the screen so that the hole coincides with the screening grid of the valve.

Although there is only a small amount of wiring, be sure and check up the leads with those shown in Fig. 2, as it is always annoying to find that a "sin of omission" has been made when all is joined up for an aerial test. That is why I advocate caution all the way through when constructing any piece of wireless apparatus.

An Aerial Test

When sure that all is in order, preparations for an aerial test can be undertaken.

Place the two No. 1 Dimic coils in the L_1 and L_2 bases, the .00005 mfd. fixed condenser in the appropriate holder, and screw a low-consumption fuse lamp bulb into place.

For the screened grid valve the choice is open to any of 6-volt variety marketed by Mullard's, Cossor's, G.E.C., etc. Push the valve well home into the valveholder, remove the terminal nut at the top of the glass bulb, and replace with the safety connector. 1½ volts negative bias generally will be found satisfactory for the screened grid valve, and the plugs in the small battery sockets should be arranged accordingly.

Use Headphones First

The best purpose will be served by testing this unit out on ordinary broadcast reception in order to see that it functions according to specification. A pair of headphones should therefore be joined between the lead marked "to L.F. amplifier" and L.T.–. Join a 6-volt low tension supply to the positive and negative

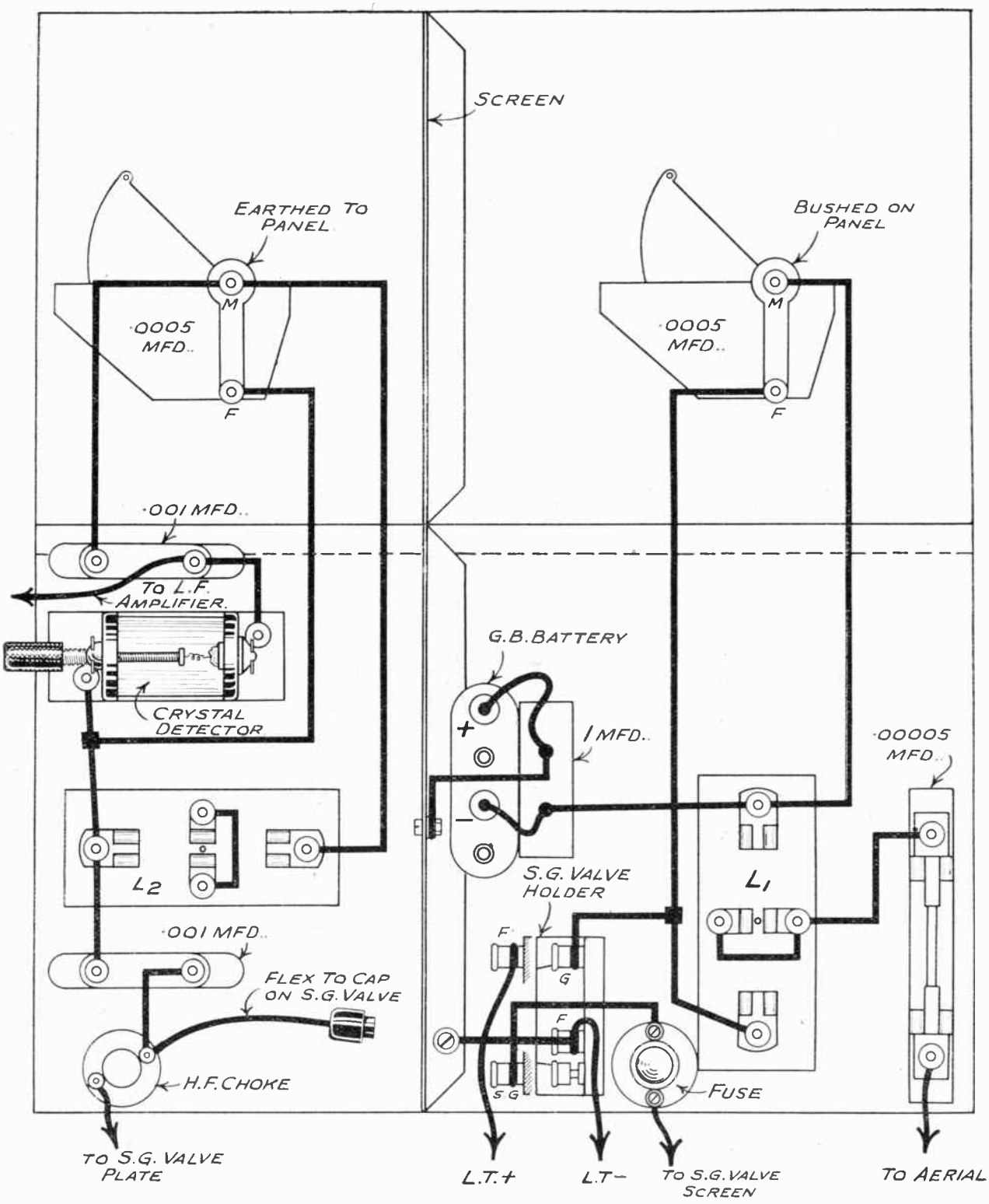


Fig. 2.—The complete back of panel and baseboard wiring diagram which shows you exactly where all your leads should be placed.

leads and the negative lead of the 120 volts H.T. supply also to L.T.–. Apply 80 volts to the screen lead and 120 volts to the plate lead of the high-frequency valve.

Finally, join the aerial lead to the .00005 mfd. fixed condenser and the earth to the junction of L.T.– and H.T.–, which, of course, automatically earths the metal screen and panel. Carefully adjust the cat's-whisker on the crystal (if you are using one of the permanent type this action will not be necessary),

and move the two tuning dials until the local station is heard. The volume will, no doubt, be considerable, and if so slight detuning will rectify matters. Everything will depend on the distance from and the power of your local station, but, in any case, the station which this unit must receive is the London Regional on 356 metres, since it is this station which broadcasts daily the Baird television signals.

For Image Reception

If all is well when receiving this station—and, after all, there is little to go wrong—the unit can be connected to the low-frequency amplifier for working the vision apparatus. Connections must, therefore, be made to a common 6-volt low-tension source for both this unit and the amplifier and either the same or separate H.T. supplies used, whichever is most convenient. Since the high-tension current for the unit is very small, it may be met best by using an ordinary dry battery.

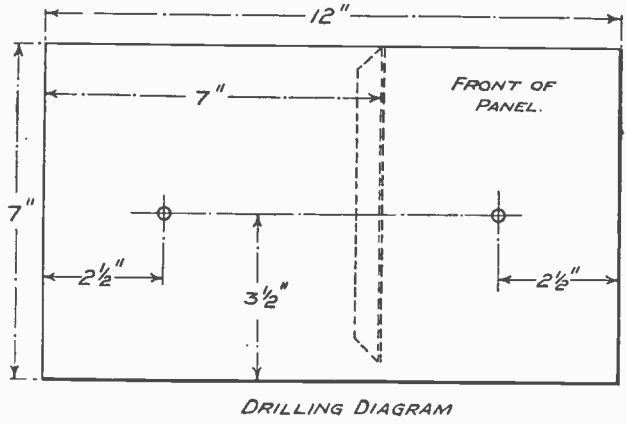


Fig. 3.—The panel drilling operations will present little difficulty.

Join the unit to the low-frequency amplifier via the lead so marked, the common L.T.- connection providing the second input point to the amplifier. All is now plain sailing for a test on the television transmission. Try several detecting points on the crystal to find that which gives the best image, and if you are rewarded with the same results which attended my own tests, then I know you will have nothing but praise for crystal detection.

List of Components Required

One Aluminium Panel, 12 in. by 7 in. by $\frac{1}{16}$ in. (British Aluminium Co., Ltd.).
One Aluminium Cross Screen, 8 in. by $6\frac{1}{2}$ in. by $3\frac{1}{2}$ in. with $\frac{1}{2}$ in. "lips" (British Aluminium Co., Ltd.).
Two .0005 mfd. 1930 de Luxe Condensers (Formo).
Two Vernier Dials (Formo).
One Universal Valve-holder (Whiteley Boneham).
Two No. 1 Dimic Coils, with bases (McMichael).
One .00005 mfd. Clip-in Condenser and base (McMichael).
One Fuse Lamp and Holder (Bulgin).
One Screened Grid H.F. Choke (Peto Scott).
Two .001 mfd. Mica Condensers (T.C.C.).
One 1 mfd. Mansbridge Condenser (T.C.C.).
One S.G. Valve Safety Connector (Belling Lee).
One Crystal Detector (Burndept).
One $4\frac{1}{2}$-volt G.B. Battery (Siemens).
One Wooden Baseboard, 14 in. by 8 in. by $\frac{1}{2}$ in.
Quantity Glazite Connecting Wire (Lewcos).

Radio Association Reorganised

SCHEME FOR MAINTENANCE OF RADIO SETS.

THE Radio Association, which was founded in 1922, has been entirely reorganised, and it is now offering membership benefits which may prove of interest to our readers.

The membership subscription from September 1st is six shillings, and there is no entrance fee. For this every member is given free maintenance of his, or her, radio set by an approved local representative who will call just when required, and make any necessary adjustments that may be necessary to put a faulty receiver in order. Free insurance of the radio set against damage by lightning is given up to a limit of £25 for any one claim. All technical queries submitted by members are dealt with by an experienced staff under the personal direction of Professor E. E. Fournier D'Albe, D.Sc., while the Association's solicitor gives attention to any legal queries from members on matters connected with radio reception in the home. In addition, every member receives a free copy of "Home Radio Journal," an annual publication.

For the purpose of giving satisfactory maintenance service the country has been divided into areas, and in each an approved radio dealer has been appointed local representative. All members joining from his area will be registered on the particular dealer's "panel" and supplied with special printed post-cards available for one year. At any time that the member's set fails to work satisfactorily, one of the post-cards is sent to the local representative who calls and puts the matter right without charge. Incidentally, it is hoped that in the future it may be possible to extend the scheme to cover television receivers also!

This national maintenance scheme is a serious attempt to meet a need of the vast body of listeners, and it has received the approval of the President of the Association, His Grace the Duke of Sutherland, and the Chairman, Lieut.-Colonel C. L'Estrange Malone, M.P.

Readers who would like to obtain full details of this scheme should send a self-addressed envelope, bearing $\frac{1}{2}$d. stamp, to Radio Association, 22-23, Laurence Pountney Lane, London, E.C.4.

The Natural Vibrations of Photo-electric Cells and their Extinction by Light

PROFESSOR B. S. ROSING, of the Leningrad Technological Institute, has discovered that photo-electric cells under certain conditions give rise to independent electric oscillations, which can be made audible in a telephone, and that these oscillations are extinguished by light. The following brief account of the discovery is based upon a report contributed by Prof. Rosing to the *Zeitschrift für Technische Physik*, No. 6, 1930.

The general arrangement of the experiment is shown in the diagram of Fig. 1, where P is the photo-electric cell, C a small condenser, R a high resistance, T a telephone, and B a high-tension battery.

The frequency of the spontaneous oscillations may be varied within wide limits by changing the resistance

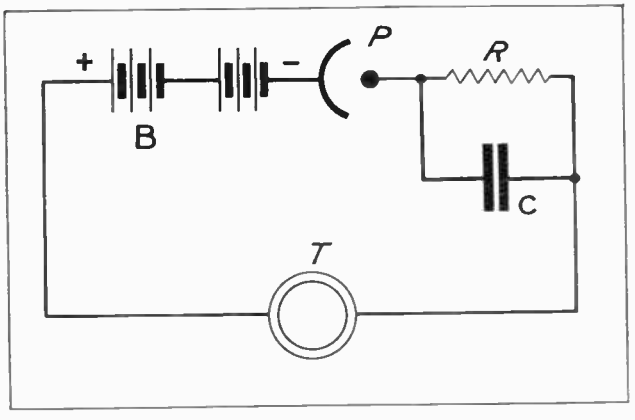


Fig. 1.—Here we have the photo-electric circuit arranged for spontaneous oscillations.

or the inductance. It may be one per minute or several thousand per second, and the vibrations are quite strong. The surging of the E.M.F. round the terminals of the photo-electric cell may be as high as 35 volts, and the current through the telephone may be 50 microamps.

On recording the oscillations by means of a string electrometer and a photographic recorder, the influence of light upon the phenomenon is clearly brought out. Fig. 2 shows the effect of strong illumination in extinguishing the oscillations, and Fig. 3 shows the effect of intercepting the light repeatedly with the hand.

Theory of the Effect

In order to account for the effect, it is necessary to study the characteristic of the photo-electric cell. Fig. 5 shows the characteristics of a photo-electric cell when illuminated and when in the dark. Those portions of the curves which correspond to a " negative

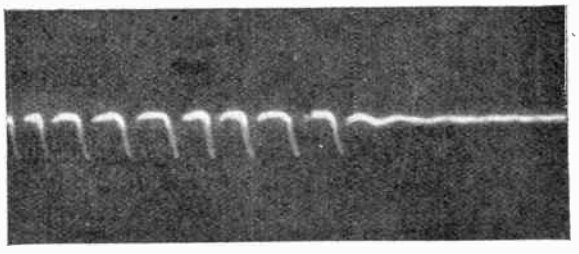


Fig. 2.—Cathode ray oscillogram of the oscillations of the photo-electric cell in the dark (left) and in a strong light (right).

resistance," *i.e.*, where $\frac{di}{de}$ becomes negative, are the portions where the spontaneous vibrations are generated.

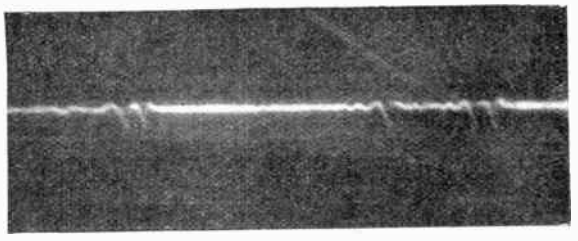


Fig. 3.—The Cathode ray oscillogram of the photo-electric cell for intervals of light and darkness.

The author goes on to prove in detail that the essential condition for the occurrence of the vibrations is that $R > \sqrt{L/C}$. In other words, the resistance and capacity have to be high, and the inductance low.

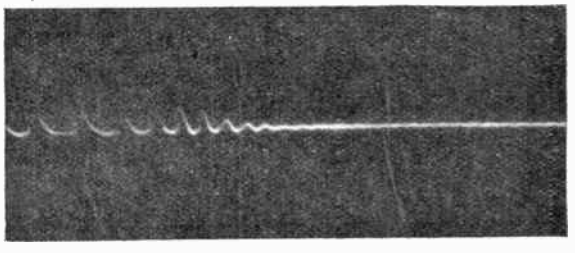


Fig. 4.—Extinguishing the vibrations by altering the inductance

The general rule is that spontaneous oscillations take place when *the conductivity of the photo-electric*

circuit for electric waves is greater than its conductivity for steady currents.

The effect of illumination is to stretch the characteristic in a vertical direction, so that with the same external resistance and the same voltage a point may cease to fall into the area of "negative resistances," and the vibrations be wholly or partly extinguished.

The effect of light may be imitated by progressively diminishing the capacity in the circuit beyond a certain point. Thus in Fig. 4 the capacity was diminished in the dark until the spontaneous oscillation was extinguished.

Practical Applications

The discovery amounts to a new method of making the photo-electric cell effective for converting light into some other form of energy. The minimum fluctuation is between the limits of 0·1 and 0·3 metre-candles, the former illumination allowing perceptible oscillations, while the latter produces silence. With such feeble illuminations it is safe to say that no impression has been made on a telephone with a photo-cell before, and even the response of selenium has been inaudible.

With this feeble working illumination it should be

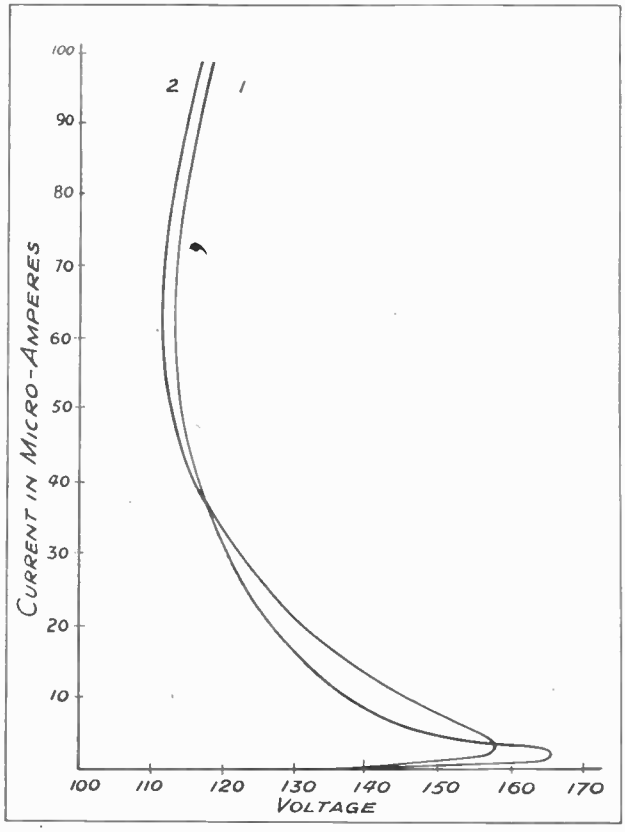


Fig. 5.—Characteristics of the photo-electric cell in a feeble light (1) and a strong light (2).

easy to work signal lamps for audible Morse code. The problem which the author has attempted is the problem of reading and orientation of the blind. He has constructed a new reading machine for the blind by which the printed letters are converted into sets of dots and dashes on the plan of the Morse

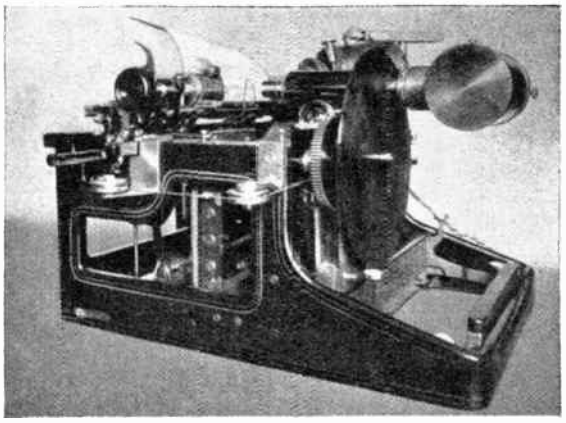


Fig. 6.—A reading instrument for the blind.

alphabet. This is said to be done by a "simple exploring device," but no details are given. As in its rival selenium instrument, the optophone, provision is made for reading various sizes of type and various line intervals. The new instrument is shown in Fig. 6.

Professor Rosing is a well-known worker on the television problem, and was the first to suggest the employment of a cathode ray for tracing the image on a fluorescent screen, thus avoiding moving parts at the receiving end.

E. E. FOURNIER D'ALBE.

Television Demonstrations at Forthcoming Exhibition

Make a Note of these Dates in your Diary

An exhibition of visual and auditory aids to learning will be held at the London School of Economics, Houghton Street, Aldwych, W.C.2, on September 4th, 5th and 6th. The exhibition is held under the auspices of the British Institute of Adult Education, and will be opened by the Right Honourable Lord Gorell, C.B.E., M.C., at 3 p.m. on September 4th.

The exhibition will consist of demonstrations of television, broadcasting, films, talkies, lanterns, epidiascopes, gramophones, etc., and will be open to the public on 5th and 6th September from 11 a.m. to 8 p.m. A catalogue (price 6d.) of the exhibition will be obtainable at the entrance, and this entitles the holder to admission.

Demonstrations of television will be given on Friday 5th from 6 p.m. to 7 p.m., and on Saturday 6th from 5 p.m. to 6 p.m.

Sydney A. Moseley
on
The Big Events

IT has always been my ambition in addressing these notes to the reader to anticipate events in the world of television. I hope readers will realise that so far I have not let them down. The big events of the past month which surprised the world were anticipated by readers of TELEVISION.

In the last issue I gave readers exclusive information regarding the first demonstration of Baird television on a screen at the Coliseum.

This marked one more epoch in the history of television.

For the first time on record a public theatre included television in its ordinary programmes, for which people in thousands paid to see. Three times a day for a fortnight! And at the end public interest was at its highest.

I emphasise this because there are not wanting men over here—the "Little Englanders"—who prefer to boost anything else but the Old Country's wares.

Generally speaking the Press rose to the occasion, but there were exceptions. That retiring journalist, Mr. Swaffer, for instance, was undoubtedly impressed with what he saw at the Coliseum, for he not only came up to see me but invited Mr. Baird to go up and see him at his flat. I went with Mr. Baird, and took some pains to explain to Mr. Swaffer what was the exact position.

Nevertheless, on the opposite page of a newspaper which calls for "Britain First," he goes to the trouble of bringing in American claims which, at any rate, are not substantiated. The truth of the matter is that twelve months ago in the Baird laboratories a television screen, 4 feet square, was shown. This was witnessed and described by the Press and a number of responsible scientists, including Dr. Tierney, who gave a full account of what he saw.

The apparatus used was a disc of lenses projecting a spot of light on a transparent screen—a device almost identical with that used by the General Electric Company in the recent demonstration at Schenectady, New York.

The trouble with this screen was that it was lacking in brilliance, and could only be seen properly by those almost directly in front of the screen—when viewed at an angle the image practically disappeared, so that it was unsuitable for a demonstration in a theatre, as the people sitting in boxes at the side of the stage would not be able to see the images. *For this reason the apparatus was discarded.*

This difficulty has been eliminated in Mr. Baird's new screen, *which can be seen from any angle, and is vividly brilliant.*

Immediately upon hearing about the demonstration given at Schenectady, the Baird Company wired to their American Company in New York and asked if they had seen this show, which was advertised as appearing regularly in a theatre in Schenectady, New York. The reply received by the Baird Company in London was: "We were quite unable to obtain admission, as the show given by the General Electric Company at Schenectady was given to the Press only, and by special invitation."

This demonstration, therefore, although given in a theatre, does not in any way compare with the British performances at the Coliseum, which was included in the ordinary programmes, and were completely open to the paying public three times daily for two weeks; also, I am told, the General Electric Company's demonstration was given in a theatre controlled by one of their affiliated companies.

Mr. Baird claims that his demonstration at the Coliseum was the first *bona fide* demonstration of television as part of the ordinary programme in a public theatre open to the paying public.

And who can controvert this claim?

Why then is a member of the staff of a newspaper which flaunts its British bias permitted to discount a great British achievement by advertising unsubstantiated American claims?

I am not one of those paying a great deal of attention to what the aforementioned retiring journalist writes. The extraordinary part about it is that he and I know each other fairly well; yet he insisted on reminding me over the telephone that he was "a very distinguished journalist," although this view does not appear to be shared by the judicial bench.

You see, I write strongly, but not so strongly as Mr. Swaffer likes to boast about doing, although if it comes to the point I think there won't be very much difference between the strength of his vocabulary and my own.

(Since writing the above I have received more detailed information concerning this gentleman, and an article on this point is included elsewhere in this issue.)

At this late date it is unnecessary to reply to the attacks of Mr. Edwards and his protégé, Captain Eckersley.

The great Mark Sheridan's words, "Stand back, little boys, and let the tide come in," are perhaps the best admonition that can be given to those who attempted to stop the advance of television.

Nevertheless let me — very reluctantly — waste further words with the gallant captain.

He states that he is "unbiased"; yet he describes the image he saw on the television screen during the performance of the B.B.C. play, "The Man with a Flower in his Mouth," as "a monkey floating dimly and eclipsed by shoals of bananas." The speech accompanying the vision he describes as a continual mewing sound.

How does Captain Eckersley's description compare with the descriptions of truly unbiased observers?

Captain Robinson, like Captain Eckersley, was at one time one of television's most severe critics, but, unlike Captain Eckersley, he went to the trouble of thoroughly investigating television for himself. He obtained possession of a "Televisor," and tested for himself what television could do, and then had the courage to reverse completely the opinion he had previously expressed founded upon hearsay and supposititious knowledge. This is borne out by the extracts of Captain Robinson's notes which we published in our last issue.

Captain Robinson states that the images were clear and distinct.

Very well, then, if we may take it that we may trust the statements of these numerous quite unbiased observers, why does Captain Eckersley make these utterly unfounded attacks upon television? There must be a reason for it. Is it merely an inferiority complex or is it something more sinister? Has he some reason for these attacks, which have continued for the past four years; in fact, ever since television made its first appearance?

The picture presented by Captain Eckersley is one of intense pathos. It is reminiscent of the warrior who endeavours to live on his departed glory.

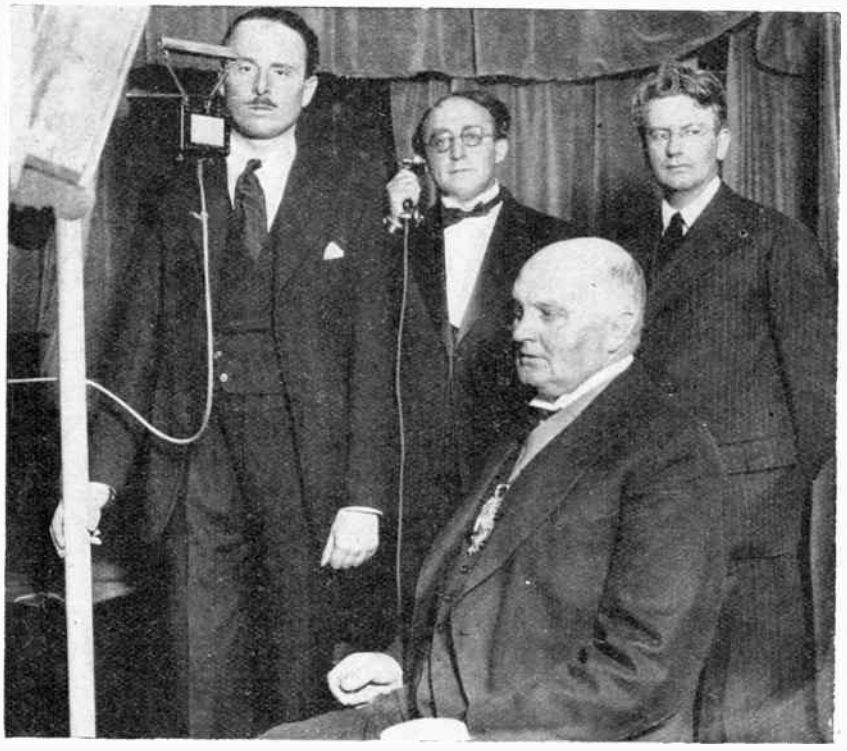
Once upon a time listeners recognised the status of Captain Eckersley, purely because he held some responsible position with the B.B.C. Since then he has no more status than an ordinary engineer, and therefore is, as an ordinary layman, entitled to express his opinions on events of the day.

My complaint is that he is still permitted to enter the councils of the B.B.C., and I should like to know what status Captain Eckersley actually holds.

It will be of interest to our readers to know what his position is.

As for his gratuitous attack on Mr. Sieveking, I think we may leave that gentleman to look after himself. Nevertheless, Mr. Sieveking has shown more enterprise towards a constructive dramatic policy at Savoy Hill than Captain Eckersley ever did or is ever likely to do.

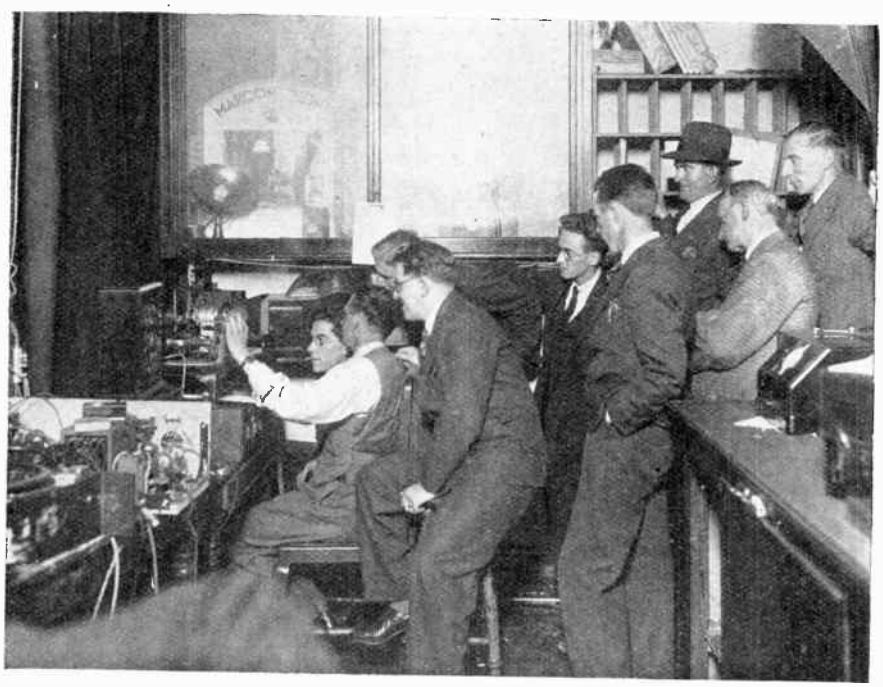
In case I may be inclined to exaggerate the importance of Captain Eckersley's diatribe—and very likely I am—I would like to make it clear that these outbursts of the Captain—to give him his military title—occur in a periodical which has been the mouthpiece of the opponents of this great science almost from its inception. It is fair to the rest of the Press to make this perfectly clear. There was a time when television was under a cloud, but the majority of newspapers have been fair enough to shift their ground of criticism, realising that the problem has sorted itself out and that Mr. Baird is achieving genuine and good work. I can almost say that with the exception of the papers under the control of my young friend, Mr. Edwards, newspapers have lived up to the traditions of the British Press in dealing with the rather exciting history of Mr. Baird's invention. But I make no



A peep into the studio on the occasion of the opening ceremony of the Coliseum Demonstration performed by the Lord Mayor (seated). Mr. Baird is on the right, Sir Oswald Mosley on the left, and, centre, Mr. Sydney A. Moseley.

bones about it. Mr. Edwards, as editor of two papers run by a firm for whose directors I have the greatest respect, has consistently pursued Mr. Baird and his invention, and has not hesitated to give publicity to foreign inventions and has sneered at achievements which have taken place under his very nose.

Captain Eckersley and Norman Edwards have joined forces, and a sorry pair they make in this eleventh-hour attack on Mr. Baird's work. Since the appearance of these absurd attacks by Captain Eckersley and Mr. Edwards' newspapers, a multitude of varied critics have had the opportunity of seeing television for themselves under the severest test conditions, in a music-hall in the heart of London. The remarkable success of television at the London Coliseum must make Captain Eckersley and his young sponsor feel very foolish and sorry for themselves. The Coliseum triumph is an answer to all those who would belittle one of the greatest scientific achievements of the age.



Watching the first television play at "Hogan's for Wireless, Henry Street, Dublin." According to the report received the whole thing was a remarkable success.

A friend of mine has received a letter from Captain Eckersley which is addressed from the Marconiphone Company. This may mean much or it may mean little. What special privilege does Captain Eckersley possess that he is permitted to address his letters from the headquarters of a company whose interests may very well be menaced by the advent of television, I do not know. Captain Eckersley is continually expressing, with his hand on his heart, his innate honesty and frankness. Will he tell us frankly what relations, social or otherwise, exist between himself and the company from whose headquarters he addresses his letter? It would help to illuminate many of the dark corners which have puzzled my friends and me for some time.

* * *

Incidentally, I received the following letter which is appropriate to include at this juncture:—

"I have read every one of your articles in TELEVISION, and those particularly in which you refer to Captain Eckersley, because I am an old R.E. wireless man. It has always interested me to find that he still maintains his air of superiority and his antagonism to the new science. Well, let him do so. I think the best thing to do in his case is to invite him to every one of the demonstrations until he is finally converted, as he must be before long.

"But enough of Eckersley—the name upsets me—for I have a suggestion to make, and that is: drop him, and work with all your might for an alteration in the hours of transmission. Keep the morning one for, say, twice a week and get the night ones altered to 11.0–11.45 p.m. The present hours are practically useless for 99 out of 100 would-be viewers. I myself could show something to people who would like to come, but how can one keep up the household and turn visitors out into the street at 12.45 a.m.? The half-hour is too short to allow a break to be made for alterations or adjustment. Better three-quarters of an hour twice a week than four half-hours. I took up wireless twenty-seven years ago, and had faith in it. I took up television in the early stages, and have just as much faith in it as I had in wireless. You cannot ignore doubters, but you can convert them in time.

"I see Captain Eckersley answers queries in a weekly paper which was, I think, one to throw cold water on television in the first instance, although they must have known that to get television you must use wireless apparatus. I could not understand their attitude, or the idea of people running down a science of which they know less. It may interest you to know I get fair results here, sixty miles from London in a direct line, using an ordinary 3-valve receiving set with 120 volts, and an ordinary neon lamp. I do hope you will excuse me writing, but I do feel you will do better by 'heaping coals of fire' on the head of our friend than by putting more in print about him. With best wishes and congratulations on the fine way in which you have worked for fair play for Mr. Baird."

* * *

I have hardly left space to deal with the big "tele-talkie" success. But I must mention that towards

(*Continued on page 295.*)

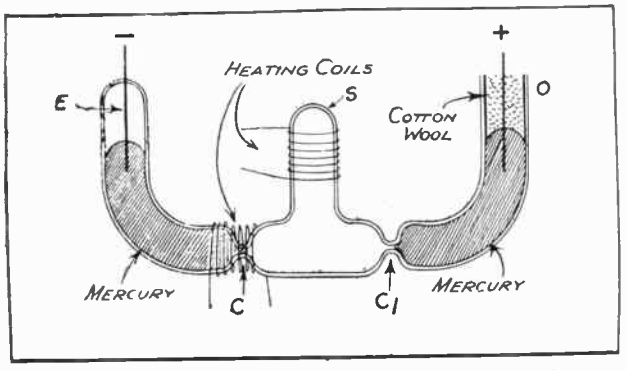
The Nature and Properties of Light

PART V.

By *H. Wolfson*

NO series of articles on the subject of light would be complete which did not include a discussion of the spectrum. This term is derived from the Latin *spectrum*, meaning *an image*, and is often used in a more general sense than that with which we shall be interested in this article. A heterogeneous system of vibrations or waves of different frequencies or wavelengths can be resolved by some means into its component parts, and this collection of resolved parts is called the spectrum. In our case, white light is not a homogeneous vibrating system, but by use of a prism or a diffraction grating it becomes possible to separate white light into a spectrum of colours.

We are all familiar with the spectrum colours which appear in the rainbow. These colours, seven in number, are as follows: Red, orange, yellow, green, blue, indigo, violet. It is really quite easy to memorise these colours with the aid of the mnemonic: "Richard of York gained battles in vain," the first letter of each



The bare details of a mercury vapour lamp designed to work at atmospheric pressure.

word being that of a colour, in the order in which they appear in the spectrum.

It must not be imagined for one moment, however, that visible light consists only of light of seven different wavelengths; this would be entirely erroneous. In actual fact, there are a number of different wavelengths whose existence can be proved up to a certain point. We are only limited in our power of separating these by the resolving power, as it is termed, of the instruments which we use to effect this separation.

Whatever method we employ to separate light into its component waves, we must have some standard method of identifying any particular individual wave. We can take its photograph, of course, but this does not help us much, since it is but a black and white reproduction of a "colour," or a particular "shade of colour." What we really require is something analogous to a finger-print, which we can measure by means of an instrument calibrated to a universal standard, which is, of course, quite arbitrary.

There are several units employed in which to measure the wavelength of any particular light wave, which is the scientific way of picking out one individual from the crowd. The most usual unit is the Ångström unit, or the tenth-metre, as it is sometimes called. This is equal to 10^{-10} metre. Another unit which is often employed is the micromillimetre, which is the one-millionth part of a millimetre, 10^{-6} mm. Thus we see that 1 micromillimetre (1μμ) is equal to 10 Å units.

Corresponding to each of the seven principal colours are seven wavelengths, which extend from about 3900 to 7600 Å, the latter being at the red end of the spectrum, and the former at the violet region. These wavelengths cover only that region which we call the visible spectrum, and it is important to realise that there are a multiplicity of vibrations extending far on either side of this very narrow band of wavelengths to which alone the human eye is sensitive. Beyond the violet we have the ultra-violet and, of still shorter length, the X rays. At the present time, though our knowledge has advanced considerably during the last ten years, there are certain portions of the invisible spectrum between the ultra-violet and the X ray regions about which we know little.

Beyond the red region we are familiar with the infra-red, which has been so successfully used by Baird in noctovision. Further still are the heat rays, and then come the radio waves so familiar in broadcast and television transmission. These cover the widest band of all, varying in length from, say, a centimetre to many thousands of metres.

It is often necessary for scientific investigations to be able to produce illumination of a definite wavelength. For instance, in the investigation of a photo-electric cell, to determine its colour sensitiveness we must provide ourselves with a device for giving monochromatic illumination. For this purpose elaborate

pieces of apparatus termed monochromators have been devised, but these are only available to research laboratories on account of their very high cost.

An approximation to monochromatic illumination can be obtained by the use of the sodium flame. A ring of iron or platinum wire is covered with asbestos cord, and this is then pasted with a mixture of common salt and water, which is allowed to dry. If, then, this is introduced into a Bunsen flame, a bright yellow flame is obtained. This does not give purely monochromatic illumination, since two closely adjacent lines are present of wavelengths 5890 and 5896 Å.

A far more satisfactory method is to use a mercury vapour tube, which gives a very brilliant line in the green of wavelength 5461 Å., while the other lines which appear in the violet and the yellow region of the spectrum are so faint as to be ignored. The simplest type of mercury vapour lamp is that shown in sketch on page 286, and this can easily be made at home. Its chief advantage is that it works at atmospheric pressure, thus doing away with the need for elaborate evacuating apparatus. A tube shaped as shown can either be made by those who can do a little glassblowing, or can be bought from a glass-blower or firm of scientific instrument dealers to this specification for a few shillings.

It will be noted that there is a sealed-in platinum electrode at E, and constrictions at C and C^1. The discharge occurs in the air space between these constrictions, and in order to increase the size of the discharge space a side tube S is sealed on. The end O is left open to the air, being plugged with cotton wool or asbestos wool. The end E is connected to the negative terminal, and the electrode at O to the positive terminal of a direct current supply. In order to start the arc discharge at atmospheric pressure, heating coils are provided at C and around S. Either or both of these coils may be used, according to convenience. Mercury can be introduced into the tube E by very gently heating the apparatus to drive out the air, and then inverting the open end in a dish of mercury. By repeating this process several times, the requisite amount of mercury can be obtained in E. Any which remains in the centre portion can be removed by shaking out. The tube O is filled by pouring in mercury to the right height.

We must now consider the different types of spectra, and the physical causes underlying their production. The continuous spectrum is produced as an unbroken band of light, varying in colour from point to point, shading off at either side of a point of maximum colour intensity. If the temperature of the substance giving rise to the radiation is raised, the point of maximum intensity moves towards the short-wave (violet) end of the spectrum.

A fluted spectrum consists of a number of bands, sharply defined at one end and shaded gradually at the other, and presents the appearance of pleated coloured silk. Upon closer examination with an instrument capable of greater resolution, the fluting is found to be due to a large number of fine lines, closely packed at the well-defined edge of the fluting, and more widely spaced towards the shaded end.

Most important of all is the line spectrum. In this case a number of dark lines appear upon the normal coloured spectrum, and may number anything from one to several hundreds. As we have seen, sodium produces two lines in the yellow, and it is interesting to note that iron is responsible for several hundreds of lines. The arrangement of these lines may appear entirely without order, or in the case of the simpler spectra may show some regularity. This latter type of spectrum is termed a *series spectrum*, and it is often possible to express the position of the lines by means of a mathematical formula, thus :—

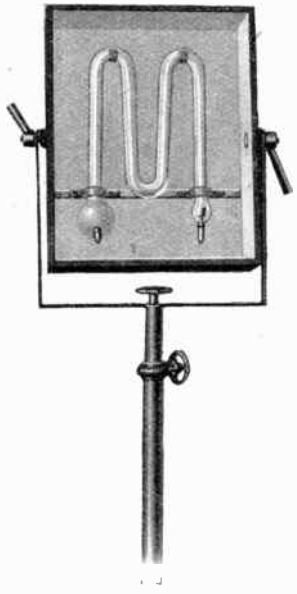
$$\nu = N\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

where ν is the frequency, and N, the Rydberg constant, has a value $3{\cdot}27 \times 10^{15}$. In the Balmer series $n_1 = 2$, and n_2 is equal to 3, 4, 5, 6, 7, 8, 9 successively. In this way we can obtain the frequencies corresponding to the seven hydrogen lines in the visible spectrum. To obtain the lines in the ultra-violet and the infra-red, called the Lyman and the Paschen series, we make the value of n_1 respectively 1 and 3, while n_2 has suitable integer values greater than these figures, *i.e.*, for Paschen series n_2 has values 3, 4, 5, etc.

It is possible to calculate wavelengths from a formula

$$\lambda = K\left(\frac{n_2^2}{n_2^2 - n_1^2}\right)$$

where K has a value 3645.6, and n_1 is given the value 1, 2 or 3 according to which of the three series above



Mercury arc lamps are employed a great deal in photography.

The illustration shows a copying and enlarging outfit with M-shaped tube as marketed by the Hewittic Electric Co., Ltd.

is desired. As before, suitable values of n_2 are introduced. By way of example, let $n_1 = 2$ and $n_2 = 3$.

Then $\lambda = 3645{\cdot}6\left(\frac{9}{9-4}\right) = 3645{\cdot}6 \times \frac{9}{5} = 6562$ Å., which is the measured wavelength within a unit or so of the red C line in the hydrogen spectrum.

The physical cause of radiation lies in the motion of the electrons which constitute the radiating substance. In the case of a gas or vapour emitting light or other form of radiation we must imagine that an

electron or electrons in the atom of the gas is set vibrating at a certain frequency, which is its natural period, and this vibration continues for some time. While it is thus vibrating ether waves of a corresponding frequency are sent out from it, much in the same way that sound waves radiate from a gong that has been set into vibration by some external agency. A heated liquid, such as a molten metal or a non-volatile solid, when heated, usually gives rise to a continuous spectrum.

An important fact in the study of the spectrum is that which we term absorption. We are all aware that some articles are white, others coloured, and others black. This statement seems childish, but we must have some scientific explanation of the facts as we observe them day by day. A white article

When Mr. Baird successfully accomplished colour television he took advantage of the fact that red, green and blue are the three primary colours from which every visual colour can be built up by combinations.

illuminated by white light appears white, because it does not absorb any particular wavelength, but reflects all to the same degree. A red object, viewed in white light, appears red because it reflects only the red constituent of the light while absorbing all the others. If, however, we were to view the same red object in a green light, which is, of course, entirely devoid of any red constituent, we should find that the object looked black. The explanation is that the body will absorb the green light, as usual, and since there are no other constituents to reflect the object will appear black. The truth of this statement can be proved by simple experiments with coloured bodies and coloured lights. From this we learn that a black body is black simply by virtue of absorbing all the light which is incident upon it. In fact, all colour is really only comparative, in so far that if daylight as we know it were to be robbed of one of its constituents our ideas of the colour of familiar objects would have to be completely revised. That is the reason why colour matching by artificial light is so difficult, and we all know that a colour which pleases by daylight may not give the same satisfaction by artificial light. The absorption of platinum-black or lamp-black is termed *general absorption*, since all wavelengths save only the very longest are absorbed and changed to another form of energy.

A second type of absorption is that which is termed *selective*. This occurs when a substance, placed in the path of the light, absorbs part of the light corresponding to a particular part of the spectrum and transmits the remainder. The absorption produces black absorption bands in the spectrum of the transmitted light. Transparent solids, liquids and vapours all have this power of producing absorption spectra. We know that sodium light forms two lines in the yellow part of the spectrum. If light is passed through sodium vapour and is then analysed by means of a prism it will be found that absorption bands are present in the position normally occupied by the *D* lines of sodium. This led Kirchhoff to formulate his important law: "A substance which emits waves of a definite frequency when heated will absorb waves of the same frequency when cool."

There still remain for discussion the infra-red and the ultra-violet regions of the spectrum. The existence of the infra-red was demonstrated by Herschel in 1800, who found that if the blackened bulb of a thermometer was placed beyond the visible region of the spectrum formed by a prism, a rise in temperature occurred, and the only conclusion that could be drawn from this fact was that radiation of some sort existed outside the visible spectrum. The chief difficulty in investigations of the infra-red is that the majority of substances absorb the radiation. Therefore it is essential that all lenses, prisms, etc., must be of a substance transparent to infra-red radiation. The most suitable materials are rock-salt, sylvine or fluorspar. Quartz is also suitable.

It is necessary also to use a very sensitive heat-detecting or measuring instrument such as the bolometer, thermopile or radio-micrometer. By means of a bolometer consisting of two extremely small pieces of blackened platinum foil, arranged as two arms of a Wheatstone bridge, so that one piece is screened from radiation while the other piece is exposed to the spectrum which is invisible to the human eye, Professor Langley has shown the existence of infra-red radiation extending from 7600 Å. to 53,000 Å. This is equivalent to three octaves of the spectrum, while that part which is appreciated by the eye comprises but a single octave. Previous to this Abney had photographed the infra-red region, and it was thought that it extended only as far as 18,000 Å.

It is difficult to carry investigations further than this, as fluorspar becomes opaque to infra-red light after a certain point, though the most recent investigators claim to have discovered about six and a half octaves of this radiation.

Some of the talented artists who will entertain you with "voice and vision" during the month of September. Compare your "Televisor" image with these photographs.

1. *Miss EILEEN MERRIE, a charming young artist, who has a large and varied repertoire of monologues.*
2. *Mr. KEITH MASON, a newcomer to television, who provides excellent entertainment with songs and stories, accompanying himself on the "uke."*
3. *Miss JENNIE BLEASDALE, the eminent operatic soprano, who has added television to her broadcasting experience.*
4. *Miss ROSALIND CHARD, the clever soubrette and child impersonator, who has done good work for television from the beginning.*
5. *Miss ELSIE OTLEY, the charming soprano, whose wide range and expressive face are great assets to television.*
6. *Mr. FREDERICK YULE, the well-known baritone, who, besides appearing at the ordinary television transmissions, has been seen and heard on the big screen at the Coliseum.*
7. *Miss JOAN COLLINS, another newcomer to the Baird Studio. She can put over monologues and character sketches in a most entertaining fashion.*
8. *Mr. JACK ROYCE in his "coon" make-up, which televises remarkably well, and which has entertained many listeners and lookers-in.*

The Enthusiast Sees it Through

IT is not surprising to find that the majority of letters that reach our editorial offices include, amongst other things, the plea for an extension of television facilities. We fully sympathise with readers on this point for, undoubtedly, it is apt to be disappointing, when one is so keen on this new science, to find that the hours of transmission are so awkwardly arranged that long spells at the "Televisor" controls are impossible. In spite of this, however, the enthusiast continues with the good work and achieves results that are little short of marvellous. This makes the matter all the more creditable for it indicates a keenness which cannot fail to make its presence felt, and the loyal band of television workers will rank in the same category as the early wireless pioneers.

A Plea from Holland

It is gratifying to receive letters from abroad, as it indicates how far-reaching are the quarters of the globe served by "Television."

Mr. de Gorter, of Kamerlingh Onneslaan 110a, Schiedam, Holland, is certainly a keen television experimenter, and, like so many others, expresses bitter disappointment at the paucity of time that the television signals are on the air. The periods are much too short when we remember that such a large percentage of our readers can only make use of the two midnight half hour transmissions. We join with our friend in Holland in expressing the keen hope that greater facilities will soon be offered.

We print below extracts from Mr. de Gorter's letter just as received by us:—

"I have very much pleasure in informing you that I am now looking in to the Baird television transmissions from April on, and, especially during the last month, I always get very good results. The only things that spoil reception every now and then are atmospherics, and then I use an indoor aerial which gives better results. I am receiving the speech and music too, which makes the transmissions much more interesting. I am enclosing a photograph of my station. From right to left you see the receiver for the television signals, a four-valve all mains set. On top of it the loudspeaker for controlling the television signal; amplifier for the television signal, and connected up to the neon lamp of the Baird "Televisor"; above this amplifier a second one, for amplifying the signal to the synchronising coils of the "Televisor." This one is also an all mains. To the left the Baird "Televisor." Behind the two amplifiers stands the receiver for music and speech with a Bicone loudspeaker.

"From the cards on the wall you will see that I am a keen short wave enthusiast, but at the present all my time is spent on television experiments.

"The British stations are coming in here with fairly good strength on ordinary three-valve sets, and since television signals are sent via the 361 metre

Mr. de Gorter is a keen wireless and television worker, as this photograph of his "den" clearly shows.

wavelength there is hardly any fading, which was often very bad on the 261 metre wavelength and always caused much trouble. The only bad thing is that I am only able to look in during the night hours, i.e., only twice a week during half an hour. *These periods are much too short.*"

A Birmingham Reader's First Letter

Mr. Vincent E. Protheroe, of 134, Harborne Road, Edgbaston, Birmingham, has "broken the ice" by sending us his first letter. It is a most interesting contribution to our columns, and we trust that Mr. Protheroe will now keep us posted regularly with the results of his television experiments so that we can pass the news on to our readers. He says:—

This is the first time I have written to you, although I have been a supporter of your excellent magazine, *which, by the way, should be a weekly and not a monthly periodical,* since the start and I still have in my possession the apparatus as described in the first few issues.

My present vision wireless set is a screened grid H.F., anode bend detector, one P.625 valve R.C. coupled and one P.X.650 valve as the output, coupled to the P.625 with a Ferranti A.F.5 used as an "auto" transformer.

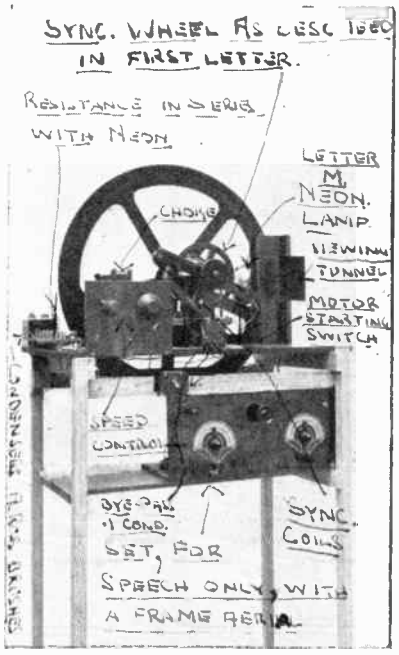
The television apparatus is entirely home made and consists of a 220 volt discarded "fan" motor, a disc of 24 gauge aluminium, the accuracy being such that the "field of view" is entirely free from those objectionable lines caused by inaccurate punching of the holes which are, in my case, square. The neon is a commercial type letter *M* with the resistance removed from the cap and one side covered with tinfoil to form a reflector.

The synchronising arrangement consists of a light wooden disc about 4 ins. diameter with thirty $\frac{1}{8}$-in. square iron armatures let in round the periphery; the magnets are horseshoe shape and complete in themselves. As there are two they are placed diametrically opposite and connected in series with each other and the neon. The whole being choke coupled to the output valve. So far, however, I have not been very successful with this synchronising arrangement and intend fitting another as per your instructions some time ago.

On Friday night, August 1st, while watching a lady play a violin (from London Regional), the strings of which could be seen at certain times and the beads round the lady's neck counted, the image began to fade *slightly* and when it came back to its normal "brilliance" there was an "echo" image (I believe you call them that) which lasted about three minutes and then faded away. This is the first time I have seen this since I started experimenting on the present transmissions at the beginning of this year. Both images were as "bright" and "clear" as one another, the one being placed about two or three "elements" above the other.

I have written you regarding this as I cannot recall having read or heard of "echo" images occurring at a short distance like this. The regional station does not, as a rule, fade in this district, in fact, as far as I can remember I have only "heard" it fade about twice, each time round about midnight; but the National Station not only fades badly but "twists" up terribly at rather short intervals, after dusk, so you may guess how thankful I was when the "vision" was transferred to the regional station.

It may interest you to know that on the same night (August 1st) I received some pictures from Witzleben, although the "atmospherics" were almost continuous, and looked like showers of confetti. However, I recognised a gentleman's face, then, after a severe "shower of confetti," enough for about a dozen weddings, two men, head and shoulders, appeared on the screen, in earnest conversation it seemed, with various gesticulations of their hands. In each case the images seemed much smaller than those of our own transmissions and as far as I could see they were rather lacking in detail. They were



An interesting photograph showing Mr. Protheroe's vision apparatus together with explanatory markings supplied by him.

received until about one o'clock when the "receiving" conditions were appalling, so I "closed down" and "turned in."

Wishing your paper continued success and hoping to see it a "weekly" soon.

[With reference to Mr. Protheroe's comments on his reception of the Witzleben transmission we would point out that the images are sure to be lacking in detail when compared with the Baird Company's. This arises from the fact that their picture ratio is 4 by 3 as against the British 7 by 3, showing that the Baird image possesses at least 50 per cent. as much detail, while, of course, the faces and objects will appear distorted owing to the picture shape being different. Added to that, of course, it must be remembered that the Germans use horizontal scanning as against the British vertical scanning, so that the head will have to be turned through 90 degrees in order to see the German images the correct way up.—ED.]

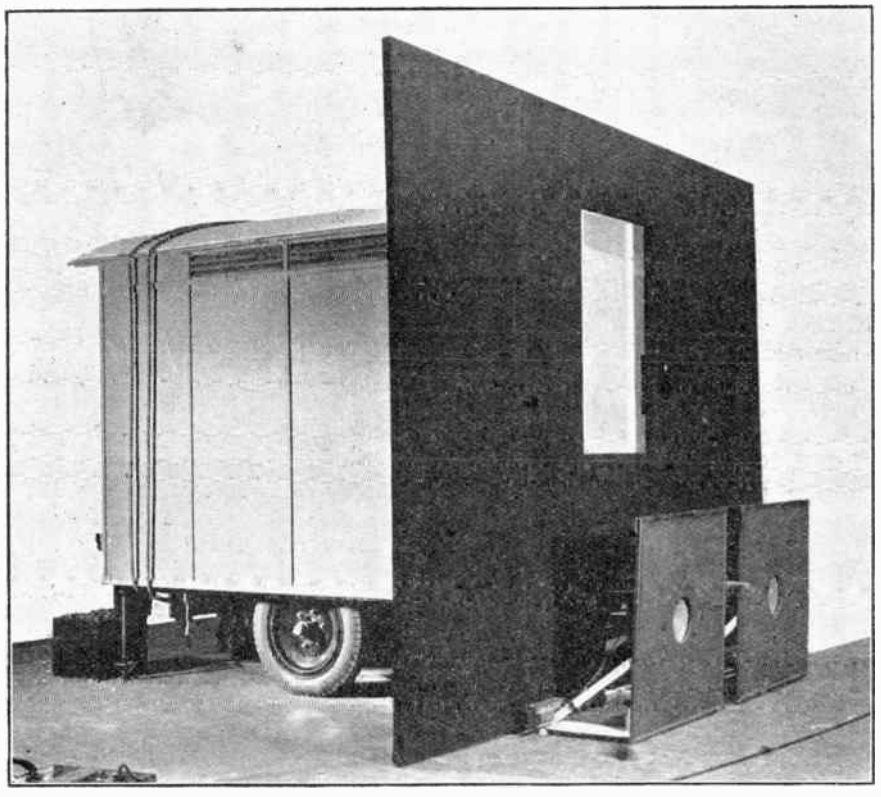
BAIRD SCREEN

THE COLISEU

Demonstrations form part of a Public
in the World

AS was reported in the August issue of TELEVISION, an experimental television screen had been in operation on the roof of the Baird Laboratories at Long Acre for some weeks, but demonstrations of this apparatus were limited to a few prominent people and members of the Press.

At somewhat short notice, however, the engineers were given instructions to install the apparatus at the London Coliseum, so that demonstrations of Baird television could form part of the normal programme to start on Monday, July 28th, three performances daily being the schedule. Previously all the apparatus had been contained in a temporary laboratory which held, in addition to the screen and commutator, a fairly extensive array of amplifiers, batteries, meters, switchgear, etc. It was fairly obvious, therefore, that for the test in view the complete outfit would have to be portable as a single unit, and in consequence a large caravan trailer was decided upon as the best medium to press into service,



The transportable nature of the apparatus can be gathered from this view of the "van" and screen as it was installed on the Coliseum stage. Notice the large loud-speaker.

Transportable Nature

Then followed days spent in the design and manufacture of the trailer, and the assembly and wiring up of what can be most appropriately called the world's largest "portable Televisor." By dint of hard work and close co-operation between the staff engaged, the apparatus was at last completed and tested out on the evening of Saturday, July 26th, and on the following day it was removed to the Coliseum and run on to the stage. Since the Coliseum has a stage which revolves in order to effect scene changing, it was not possible to connect permanently the various signal and power lines to the van. In consequence an ingenious arrangement of long flexible cables terminating in plugs was devised.

N TELEVISION

M TRIUMPH

Theatre Programme for the First Time
d's History

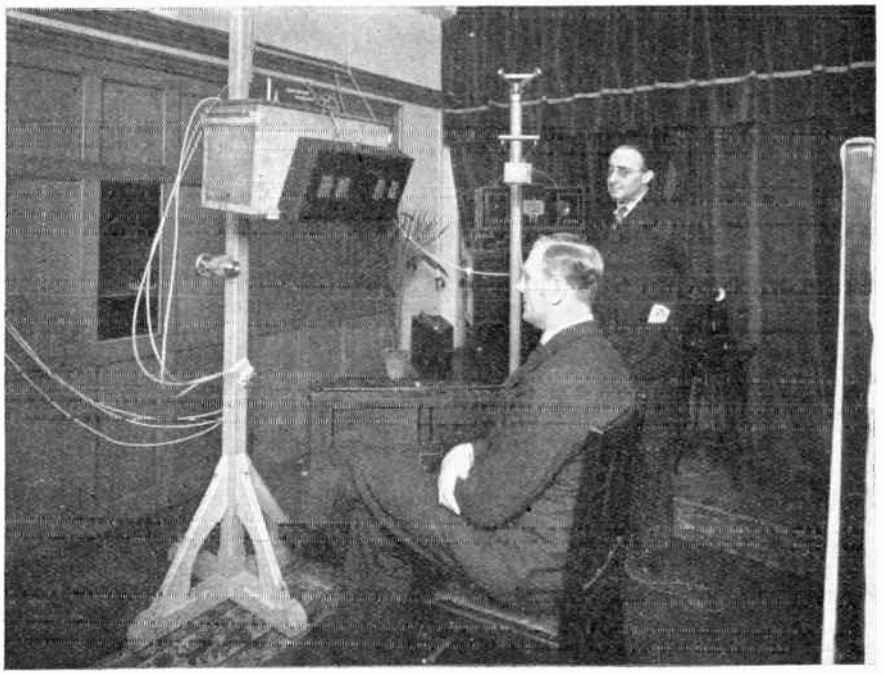
Monday afternoon of July 28th came and found several engineers (not to mention other people) suffering from a severe attack of stage fright, but determined to do their best in this new departure for Baird television. Happily for all concerned, matters went like clockwork.

The announcer, Mr. Radcliffe Holmes, appeared before the curtain and made a short introductory announcement as to the purpose and value of Baird screen television, pointing out that it was the first time in the world's history that a paying theatre audience had been privileged to witness television on such a large scale. The curtains parted and on the screen the audience saw Mr. Sydney A. Moseley, holding a small telephone receiver to his ear, in order to keep in touch with Mr. Holmes on the stage. Mr. Moseley gave a brief but general explanation of what the audience were seeing and hearing. On this particular afternoon's performance Bombardier Billy Wells was also seen, and he gave his views on the Scott-Stribling fight, due to take place that evening at Wimbledon. Then followed songs by Miss Pearl Greene, Miss Lulu Stanley, and Mr. Frederick Yule. Naturally the applause which followed this first demonstration was most encouraging to the staff who had spent so much time in erecting the apparatus.

The Press, in the reports which appeared up and down the country and abroad, were unanimous in stating that Baird screen television was the forerunner of epoch-making developments.

Working Details

Readers will undoubtedly be interested to learn a little of the inside workings of this spectacular event. Photographs are included in this issue showing the special studio and control room which was employed, and it is interesting to note that both these rooms will eventually supersede

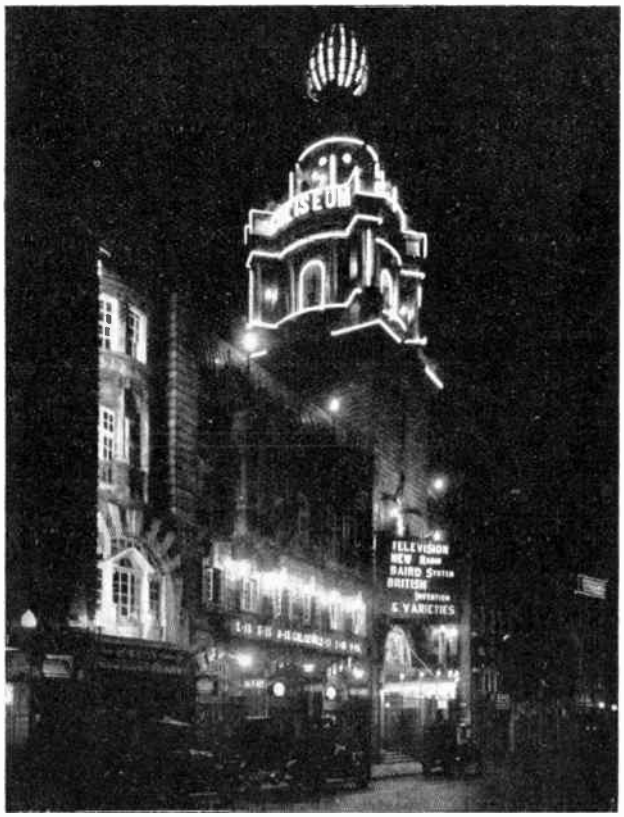


A view of the studio used specially for the Coliseum demonstration, the control room being situated behind the partition aperture on the left. The microphone, photo-electric cells and an amplifier box are conspicuous, while seated we have Bombardier Billy Wells, and standing Mr. Sydney A. Moseley

the existing ones now employed by the Baird Company for their daily television broadcasting.

Telephonic communication with the Coliseum was effected through two distinct telephone lines. One of these passed from the control room at Long Acre to a control board at the Coliseum, from which the engineer in charge had full view of the stage. The second line was from the studio to the stage, it being possible for the announcer on the stage to ask questions of the particular person who was being televised at the transmitting end.

The procedure was much the same as for ordinary television transmissions, of which readers of TELEVISION are now *au fait*. It should be noted, however,



The outside of the Coliseum by night, with the brilliantly illuminated sign advertising Baird television.

that for the first time in England a special method was employed for tilting the projection light, that is, raising or lowering the beam as required according to the different heights of the artists. This was effected by a special tilting head, and not by mirrors, as in America by the Baird Television Corporation.

At about 3.15 the engineer at the back of the theatre asked Long Acre to put the signals on the lines. These were listened to and adjusted, and the O.K. or otherwise given to the control room. Then, while the act preceding the television demonstration was finishing, occurred a wait which to the engineers seemed of enormous length and comparable to the approach of "zero hour." The cue was then given from the Coliseum wings to the Long Acre studio, and the quality of the picture was reported upon. After Mr. Holmes had made his entry and introduced the subject, the curtains were swung back and the audience saw the television screen in the centre of the stage, the illuminated screen standing out in a black background.

Operating the Controls

One of the accompanying photographs shows quite clearly what the apparatus looked like on the stage, two loud-speakers of the public address type being seen beneath the screen itself. The portability of the apparatus can be easily gathered from the nature of the van's exterior, while, in addition, interior views are given to make the story more complete.

The strength of the picture and the speech volume was controlled in the Coliseum itself, while in addition there was a line between the engineer watching the picture at the back of the auditorium and an assistant in the van itself. This assistant could see whether the picture was properly synchronised by means of a "peep-hole" in the large black screen seen in an illustration. He watched a reflection in a mirror, and if the picture showed any tendency to run out of synchronism he was able to make rapidly any readjustment necessary to "hold" it in place.

It is hardly necessary to add that every audience throughout the fortnight's run was keenly interested in the experiment, and delighted to see British television so far to the front. The turn lasted for about a quarter of an hour, and invariably concluded with "question time." This proved a very popular part of the demonstration, for members of the audience were invited to put questions to the announcer and, after these had been telephoned through to the Long Acre studio, they were answered from the screen. This was sufficient to convince anyone who displayed any scepticism. The requests which were passed on generally took the form of "Put out your tongue," "Ruffle your hair," "Shut your eyes," "Put your hand in front of your face," "Undo your tie." When the person being televised was in evening dress, and the tie a made-up one, it caused roars of laughter to watch the efforts of the man on the screen in his endeavour to undo the knot at the back.

During the fortnight a number of prominent people appeared on the screen, and amongst these may be mentioned the Rt. Hon. the Lord Mayor of London, Mr. A. V. Alexander, P.C., M.P., the Rt. Hon. George Lansbury, P.C., M.P., Miss Ishbel MacDonald, Mr. Frederick Montague, Colonel L'Estrange Malone, M.P., Mr. H. W. Austin, Young Stribling, Lord Marley, Sir Oswald Mosley, Miss Ruby M. Ayres, Miss Irene Vanbrugh, Bombardier Billy Wells, Sir Nigel Playfair, Mr. Herbert Morrison, Miss Ellen Wilkinson, Mr. Robert Young, M.P., Lt.-Commander Kenworthy, Sir Francis Goodenough, Mrs. Wentworth James, etc.

Apart from the apparatus itself, which, of course, was pre-eminent, the success of the undertaking was contributed to in no small measure by the splendid co-operation which existed between the engineers and programme department of the Baird Company and the theatre staff at the Coliseum. Then again the artists who were appearing at the Coliseum sometimes went to Long Acre to be televised to the audience.

Miss Beryl Beresford was the first artist to do this, while on two occasions Miss Jonstone appeared on the screen while her partner, Miss Yorke, was on the stage, the two artists singing a duet together although four hundred yards apart.

Baird screen television has taken the lead, and the invention will open up a new field of entertainment and utilitarian value and developments are now in progress to increase the size of the screen.

The Big Events

(*Concluded from page* 285.)

the end of the television demonstrations at the Coliseum the first public demonstration of "tele-talkies" was sent from the Baird Studios to the Coliseum on August 9th, 1930.

I had the privilege of being the subject of the first film. I went down to Isleworth at a moment's notice, and without being made up had to submit to the glare of the operating lamps, and deliver an impromptu speech to fit the occasion.

But more of "tele-talkies" by technicians. Sorry there is not more space to give you a glimpse of the personal side of this interesting adventure.

* * *

Two more items. The *Radio Times*, in its always interesting notes by "The Broadcaster," states :—

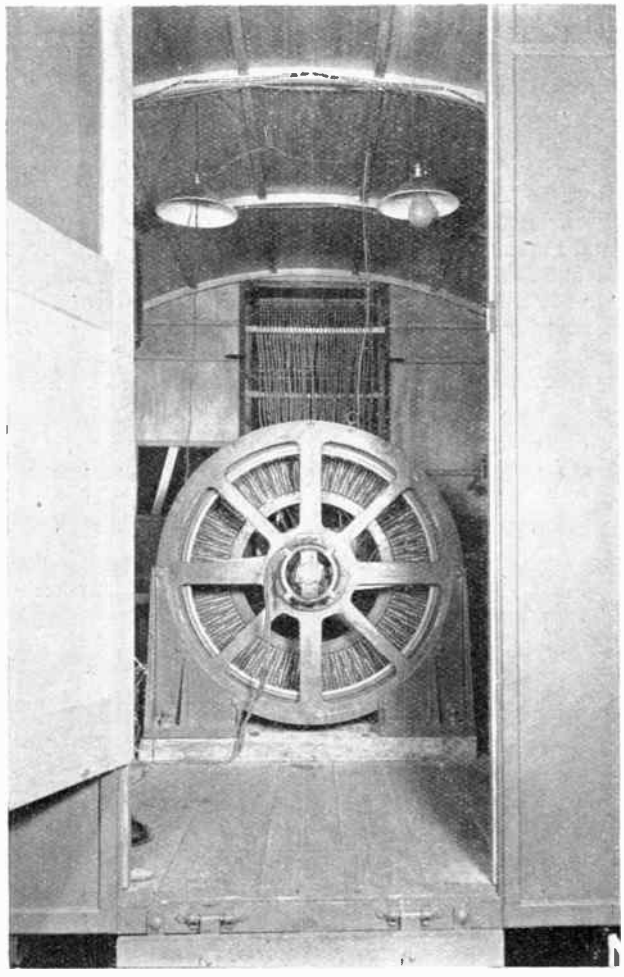
"When broadcasting began those who listened to it became known as 'listeners-in,' a not very fortunate term, which was obviously chosen to mark the difference between a man with the simple use of his ears and one who applied them to listening to wireless. The term may have come from America, where the expression to 'listen in on' or eavesdrop on a telephone conversation has long been current. Feeling that 'listener-in' was not the happiest of terms, several publications, including our honourable selves, invited the public to invent one neater and more expressive. Alternatives were mooted by the hundred. Wireless enthusiasts ran a grave risk of becoming known as 'auditors,' 'radiards,' 'etherphiles,' 'harkers,' 'radiofans,' and so on—but, once the fuss died down, the 'listener-in' had become the 'listener,' and that was that. To-day, though still teething, television is experiencing the same growing-pains, as witnessed by a correspondence in recent issues of our contemporary, TELEVISION. An objection raised to the term 'looker-in' has brought into being a number of alternatives: 'scanner,' 'gazer,' 'observer,' and so on. They all stress the visual side of the invention, disregarding the aural. 'Looker-in' is ugly; 'looker' worse. Someone will have to invent a portmanteau word which is both neat and inclusive."

We certainly shall have to get down to devising the perfect name, and any help from my august colleague in this connection will be welcomed.

* * *

It was not very long ago when the word "television" looked very solitary, and was exclusively confined to this journal. Now my news cuttings are mountainous. But among them I must quote from the article by "R. D. B.," who is Mr. Blumenfeld, the doyen of British journalists, and once upon a time my chief, when he says in an article which is rightly described as "exciting":—

"There will be (by the time 1940 is reached) many new theatres, and none of them with cellars, which were formerly utilised for the best places. Strange as it may seem to the reader of 1930 the theatre of 1940 will be popular because of its triumph over the so-called 'talkies' which were ruined by too much talk; whereas television theatres will be successful in connection with artistically produced cinema picture plays. Further, television, it is needless to say, will completely change the atmosphere of the home; for once the apparatus is established in private houses—and by 1940 it will be—the whole question of daddy's engagements in town, preventing his return by an early train, will no longer belong to the realms of mystery."



An excellent view of the back of the screen, complete with commutator and selector, as it was erected inside the caravan trailer.

"R. D. B." came along with me to the Baird Studios about a year or so ago, and in the visitors' book after his demonstration wrote:—

"Events proved him right."

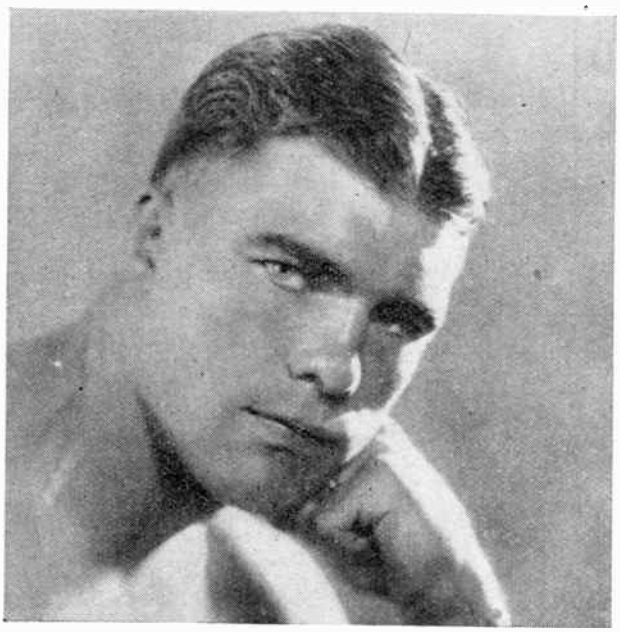
A Reliable Critic?

By *W. H. Knight*

IS Hannen Swaffer a reliable critic? I am prompted to ask this question after reading his observations on the television demonstrations at the Coliseum in the *Daily Express* of July 29th and 30th, and in the *Sunday Express* of August 3rd.

On July 29th he wrote: "Television advanced a long way yesterday, when Mr. J. L. Baird's invention formed part of the ordinary Coliseum programme. Speeches by celebrities were transmitted from Long Acre to the Coliseum stage. Mr. A. V. Alexander, First Lord of the Admiralty, 'appeared' on a screen and made a short speech pointing out the possibilities of such an invention for naval signalling, but hoped that it would be used for peace and not for war. . . . Television obviously still has a long way to go, but it proved last night that its young Scottish inventor has got something which will soon arrest the attention of the world."

That is fair criticism. Moreover, it pays a generous tribute to the work of the inventor, Mr. J. L. Baird,



Young Stribling appeared on the television screen at the Coliseum after his successful fight with Scott.

while at the same time making it clear to readers of the *Daily Express* that television is not yet perfect, and, finally, it offers encouragement to Mr. Baird to continue his efforts.

On July 30th Hannen Swaffer compares the advent of television with the appearance of the bioscope in the Palace programme twenty years ago, and adds that television is attracting much more attention than the bioscope did.

But between that date and August 3rd Hannen Swaffer appears to have had a bad attack of "liver," because in an article occupying the greater part of two columns of the *Sunday Express* he goes out of his way to belittle these demonstrations.

He offers a gratuitous and entirely unnecessary insult to the people who allowed themselves to be televised, describing them as "celebrities of various degrees of semi-insignificance." These celebrities seem to have worried Hannen Swaffer quite a lot. On Tuesday he wrote that "Speeches by celebrities were transmitted from Long Acre to the Coliseum stage." On Wednesday, "famous people are condescending to have their voices transmitted from Long Acre to the Coliseum stage," and by Sunday they have become "celebrities of various degrees of semi-insignificance." Is it honest criticism to describe Lord Baden-Powell, the Lord Mayor, and the First Lord of the Admiralty as "semi-insignificant," merely because they chose to give encouragement to the development of a new science?

On Tuesday, Long Acre was "a quarter of a mile away" from the Coliseum, but by Sunday the distance had reduced itself to 200 yards. Actually the distance makes no difference, but 200 yards sounds so much more contemptuous than "a quarter of a mile."

On Tuesday the First Lord of the Admiralty is described as having "appeared on a screen and made a short speech pointing out the possibilities of such an invention for naval signalling," while by Sunday that same appearance and speech have become "the First Lord of the Admiralty expressing a *blurred hope* that the invention would be used by the Navy."

Hannen Swaffer then goes on to complain that "Television apparently cannot spell—I mean like a programme does—because when I gave the man's name as Frederick Ewell, Frank Yule wrote in and said I meant him, and when I described the woman as Gwladys Stanley, the Lyceum's principal boy wrote from the seaside and said she was not there, but enjoying herself on holiday. It was really Lulu Stanley. I must have heard it wrong."

Apparently it is Hannen Swaffer who cannot spell, because if he believed the lady to be the Lyceum's principal boy, Gwladys Stanley, why did he, on July 29th, spell the name as Gladys? The man's name he has not managed to get right even at the second attempt and after receiving a letter from Mr. Yule, whose first name is Frederick and not Frank.

Incidentally, a few lessons in grammar might effect a marked improvement in the quality of Mr. Swaffer's articles. Any fourth-form boy could tell him it is not correct to say that somebody "*sung* a verse of a song," and the expression, "I must have heard it *wrong*," is not exactly classical English.

In the Sunday article we are told that "Stribling appeared both before and after his fight, and looked equally unhurt on both occasions." If Stribling's image on the screen was sufficiently clear for Hannen Swaffer to be able to say that he looked unhurt, that rather contradicts the description in the preceding paragraph of "someone blurredly shouting out into space." As a matter of fact, Stribling appeared only *after* his fight and not, as Hannen Swaffer states, both before and after. He certainly visited the Baird studios some days before the fight, but his visit then had nothing to do with the Coliseum demonstrations, which only commenced on the day of the fight, July 28th.

And then follows a statement which, in my opinion, is in even worse taste than the rest of the article. We are told that "Already television, like wireless, is being used for appeals—those annoying things in which broadcasting actors cadge for some charity on Sunday night."

The feeble justification put forward for this statement is that Lord Baden-Powell "asked the Coliseum audience to teach the boy scouts football," and Mr. George Lansbury "asked them not to throw paper or orange peel in the parks on Bank Holiday, and to behave decently on the Serpentine banks." How any sane person can describe those few words of sound advice as "cadging for some charity" I cannot imagine.

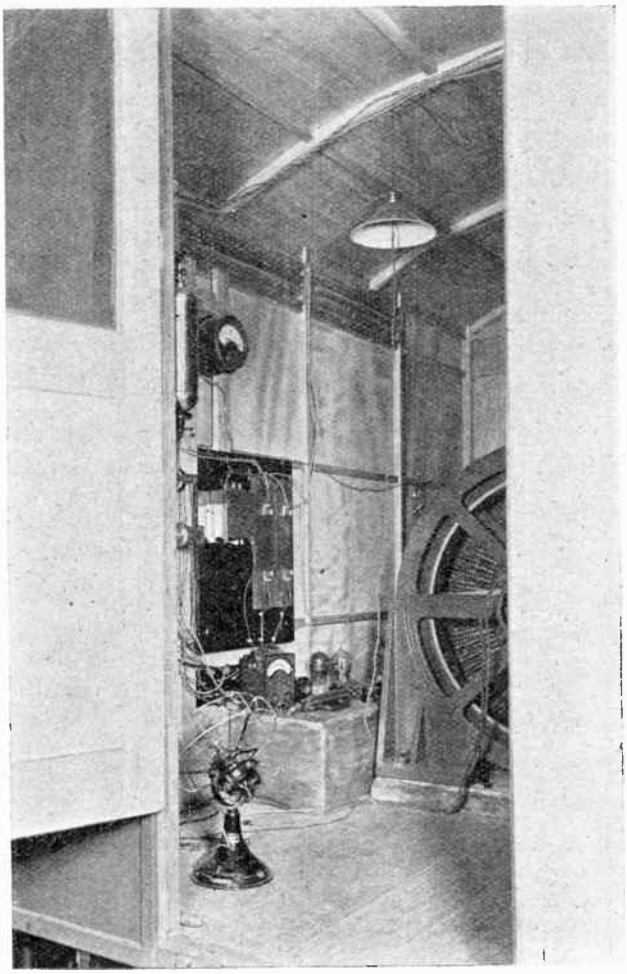
He then proceeds to quote Mr. Lansbury as having appealed to the audience to help the Government to solve the unemployment problem. As a matter of fact, he did nothing of the sort. What he said was that he welcomed television because it might be the commencement of a new industry which would provide additional employment, and he welcomed anything that would help the Government to solve the unemployment problem.

Just as a final gibe, Hannen Swaffer refers to the fact that Mr. Lansbury, "in pronouncing the word Lido, uses the broad 'i' sound in true Cockney style."

Had Hannen Swaffer written that Mr. Baird had entirely failed to give a practical demonstration of television, providing such was his honest opinion, that would have been fair criticism, but to attempt to confuse the issue by the introduction of such extraneous matters as the spelling of Gladys, the pronunciation of Lido, and the degree of semi-insignificance of Lord Baden-Powell, the Lord Mayor of London, and the First Lord of the Admiralty is, I suggest, liable to be misleading to readers of the *Sunday Express*.

It was not very long ago that a High Court judge made some strong comments concerning what he described as "undesirable and improper comments" which had appeared in an article by Hannen Swaffer. I quote from *The Times* of May 24th, 1930:—

"After reading further passages from the article, his Lordship said: 'Mr. Swaffer makes an unwarranted and unfounded attack on the great hospitals of this nation. He says: "Little is done in hospitals except to perform operations which only delay inevitable death." He knows nothing about it. We know now from Mr. Swan and others that in breast cases 80 per cent. of the operations are completely successful. In the face of that, can you imagine a man who states that he is a responsible journalist putting so monstrous an assertion into a paper that is going out to be broadcast among all readers?'



Here we see part of the charging apparatus and selector mechanism for the Baird screen as it was used on the stage of the London Coliseum.

"Later, his Lordship said: 'Dealing with so appalling a thing as cancer, I say, and say deliberately, that the writer of that article, who states that he is a well-known investigator of facts—and has investigated not a single fact, but has put a mass of hearsay in the paper with undesirable and improper comments about hospitals—is a menace to the community of sufferers from this terrible disease. I say that deliberately.'"

Television for the Beginner

PART IX

By *John W. Woodford*

I HAVE found that it comes as a great surprise to most people when they are made to realise that the actual television receiving apparatus, so well exemplified in the Baird "Televisor," is really quite simple in construction. "Just fancy, only a whirling disc and a source of illumination and a recognisable image is built up before your eyes—wonderful!"

That sums up the bulk of the impressions of people I have come in contact with and, of course, they are quite right in their remarks. What they so often overlook, however, is the time that has had to be spent in developing the apparatus to its present stage of efficiency.

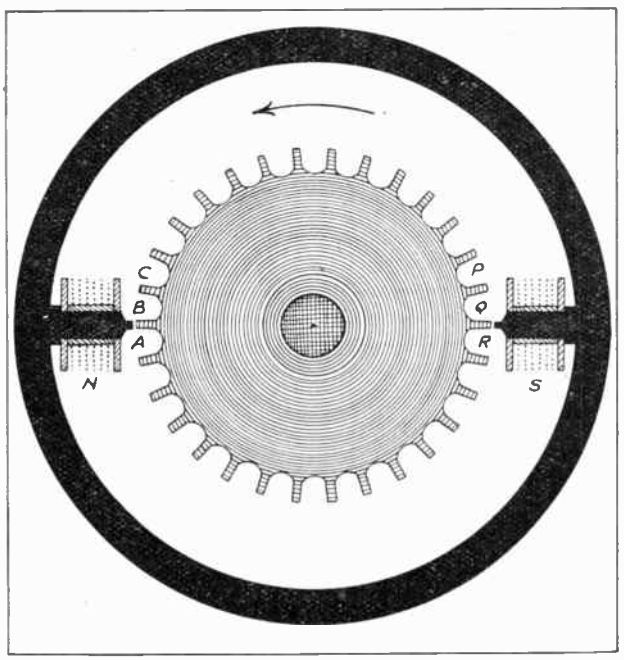


Fig. 1.—Using this diagram in conjunction with the text the action of the cogged-wheel synchronising mechanism will be quite plain.

The Working Mechanism

As I pointed out last month, not the least of these details is the automatic synchronising, and I gave certain information dealing with the construction of the apparatus. Some of the illustrations accompanying the present article will prove specially interesting, for they show the motor of a Baird "Televisor" complete with the synchronising mechanism mounted in place. In another is seen the motor bracket and straps, together with the coils, etc., removed from the motor carcase. This will enable you to picture mentally how the parts are assembled and make the action clearer.

Now let us examine the working of the mechanism. Referring to Fig. 1 we will assume that the field windings of the coils have been so connected to the set that any flow of anode current makes the left-hand pole piece of north polarity and the right-hand pole piece of south polarity. The cog-wheel rotates in an anti-clockwise direction just the same as the scanning disc, and when teeth *B* and *Q* are approaching the poles they are magnetically attracted.

Forces at Work

In consequence of this there is an accelerating action, the maximum accelerating force occurring at the moment when these teeth *B* and *Q* are half their facet width past these poles. This should be quite clear, for it corresponds to the instant when the scanning operation is just wholly on the black band of our scanned area. The band was indicated in Fig. 1 of the August issue.

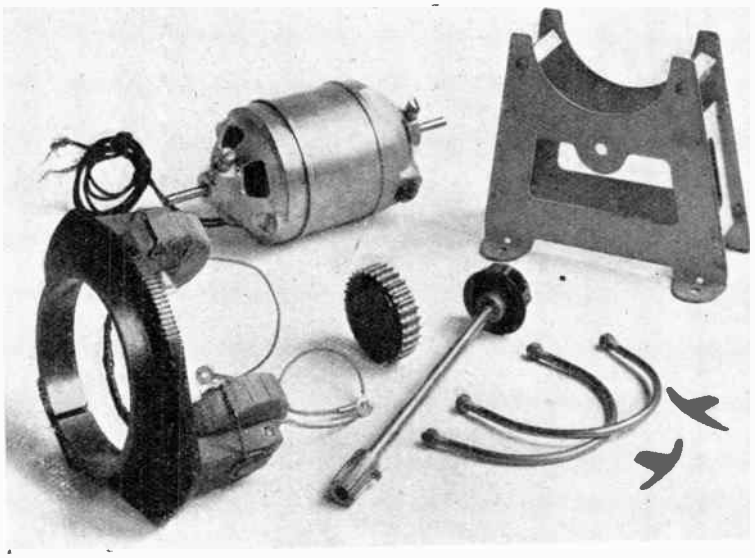
Now the signal current does not again flow until the next scanning hole begins its motion at the bottom of the area. The teeth *B* and *Q* will then be past the poles, and since the poles are again magnetic there will be a retarding force on them. These accelerating and retarding actions operate continuously, it being borne in mind that when, say, tooth *B* is experiencing its retarding force, tooth *C* is undergoing an accelerating force. The sum total of all these effects will thus cancel out for each cycle of changes of the wheel, and hence the receiver disc is in a state of isochronism with the transmitter disc.

Braking Effects

This is just what we want to maintain; but what change is brought about if, say, the motor of the vision-receiving apparatus tends to run a little faster?

Why, instead of the period of no signal current occurring when the teeth are leaving the poles, it will take place when they have passed. Once the teeth are past the poles, however, there will obviously be a magnetic attraction tending to pull them back, whereas at the isochronous speed this retarding

impulse occurred later in the cycle of changes. With the teeth tending to run ahead, therefore, the retarding impulse predominates, and the wheel, and in consequence the disc, undergoes a braking action and is forced to drop to its normal speed.



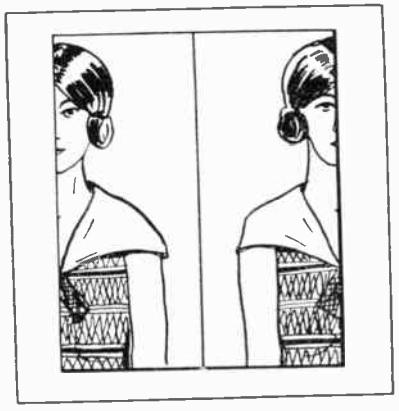
The motor equipment and synchronising mechanism dismantled. Note the teeth cut in the metal framework for raising or lowering the image.

Rapid Changes

Since the disc is rotating at 750 revolutions per minute, and there are thirty teeth to be acted upon, the rapidity of this speed-governing action is considerable, but even so it works in a most efficient manner. I have watched demonstrations where the speed control knob has not had to be touched once, the image being " held " throughout, except perhaps for an occasional hunt or floating movement about its mean position.

Coming now to the case where the motor tends to retard its speed an amount equivalent to " slipping a tooth," then the accelerating impulse will predominate and pull the disc up to its isochronous speed. There are no wearing parts or any parts that need constant or expert attention, and this is a great factor in favour of this system.

In order to emphasise one or two peculiarities which sometimes arise with vision-receiving apparatus built up on the Baird principle, let us imagine we are just preparing to look into the television transmission.



* * *

Fig. 2.
A difference of phase between the transmitter and receiver discs will produce this peculiar effect.

* * *

Image Movement

Naturally the first thing is to tune in the wireless receiver to the television signals, and it is best generally to check these by means of a loud-speaker, and when the rhythmic hum is heard at full strength change over to the " Televisor." On starting up the motor and looking into the lens, whirling reddish patches will be seen which, as the motor speeds up in its anti-clockwise direction, will resolve themselves into a succession of images moving rapidly *downwards*.

As the motor attains its correct speed this image motion slows down and gradually comes to rest when the speed-control knob is just set so that the disc executes 750 revolutions in one minute. If the disc should overshoot its normal speed then the images will move *upwards*, and the resistance control has to be brought into play in order to adjust matters.

Certain Peculiarities

Now can you imagine what is likely to happen—in fact it is a thirty to one chance ? Why, the picture will invariably be split vertically through the synchronising device pulling the receiving disc into place when its holes are out of phase with the transmitting disc. Depending upon the amount of phase difference your picture will be split so many holes to the right or left, the sketch (Fig. 2) showing one possibility.

Of course this matter can soon be rectified. Just allow the image to drift very slowly to left or to

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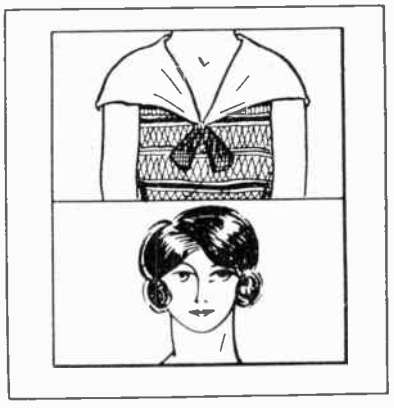


Fig. 3.
When the image is incorrectly framed it will look like this in the " Televisor."

* * *

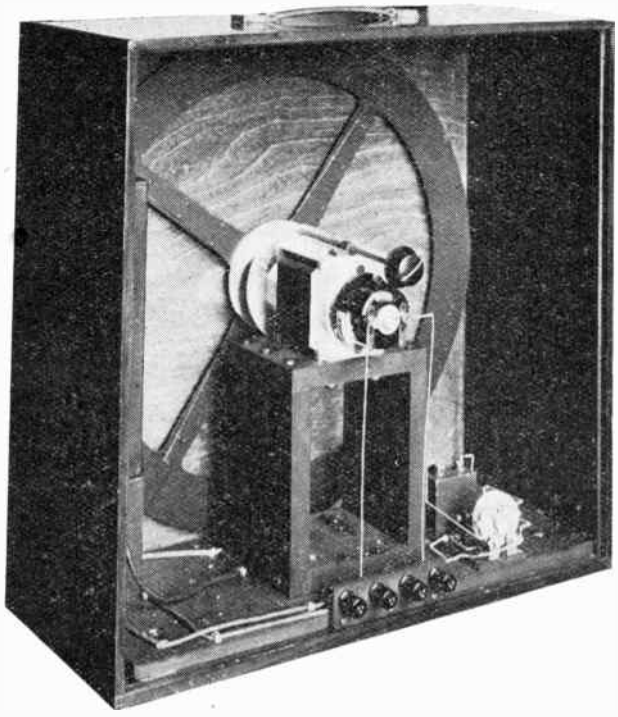
right by adjusting the motor speed rheostat, and when it is central or approaching that point move the knob back slightly so that the mechanism will pull the image into place. The knack of this is soon acquired after very little practice.

Above all, remember that "Televisor" adjustments must be made gently, any fierce knob movements will send the image spinning first one way and then another, and the desired result is nullified.

Framing

The second knob, that in the centre of the whole apparatus, is included for the purpose of framing the image. Perhaps you can recall having seen on the cinema screen a picture in which the actor's head was at the bottom and his feet at the top. This horizontal splitting of the picture is indicated in Fig. 3, and is brought about through the field coils of the synchronising mechanism being incorrectly set with reference to the disc holes.

A glance at the photograph showing the dismantled motor will indicate how this is put right. A little



In the older relay type of Baird automatic synchronising the "framing" was done by means of the arrow knob shown in the centre.

rack and pinion moves the poles and frame a certain distance round the motor carcase, and this has the effect of raising or lowering the picture so that it can be reset centrally in the lens aperture.

A British Triumph

With the older type of relay synchronising a small rack and pinion was operated by turning an arrow knob and this moved bodily the two staggered brushes which normally rested on the commutator with thirty segments.

The importance of automatic synchronising cannot be over-emphasised. It must be of universal application and independent of the type of supply used for driving the motor, whether house mains or accumu-

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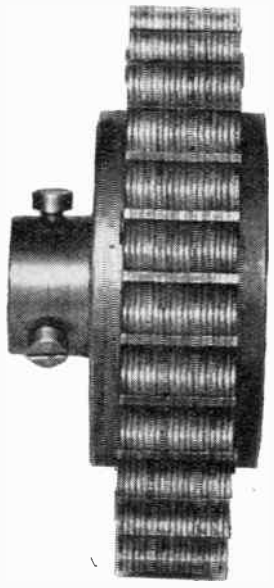
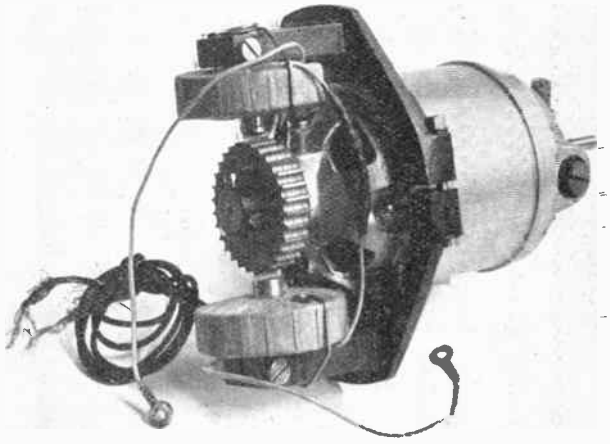


The laminated cog-wheel which is secured to the motor-shaft by grub screws and runs between two pole pieces.

* * *

lators. On this account the triumph of the Baird method—a British invention—is outstanding. No matter whether the reception takes place in England or abroad the images can be held, and the correspondence columns of TELEVISION bear witness to this by the enthusiastic reports sent in from Austria, Germany, France, Holland, etc.

In Part X. of this series I propose to deal with one or two other effects which must be noted in connection with the reception of television images and then pass on to a consideration of the wireless receiver, which is such an important factor if good images are to be the rule and not the exception.



Note carefully how the motor and synchronising equipment are mounted together.

The Television Society Visit the Central Telegraph Office

THE Central Telegraph Office is the telegraphic centre of the United Kingdom. From its four floors radiate wires to all the important cities and towns in the country, and to the towns in the Home Counties. From here also pass the wires which connect London with the capitals of the European countries, and with other cities on the Continent, while wireless communication is maintained with important centres on the Continent and with ships on the high seas through the medium of the high-power station at Rugby.

Having had the pleasure of conducting members of the Television Society through this office, a description of the tour should be of interest. On the fourth floor row upon row of Morse and teleprinter instruments are seen, and the party walked slowly past the chattering Morse sets with their complement of operators, controlled by telegraph concentrators, which are very similar in appearance and functioning to that of a telephone switchboard.

A demonstration was given on a forsaken and isolated manual Baudot. Roars of laughter greeted an illustration of our method for correcting errors, and, come to think of it, the humour of the situation might very possibly appeal to a sightseer. Then we came to a set of instruments known as telewriters, through the medium of which one can transmit a fair sample of handwriting.

On the third floor a page of "press," now in the form of perforated tape, rapidly wended its way through a Wheatstone apparatus. The item was being received simultaneously in Manchester and Liverpool. A piece of slip was "punched," which on being passed through a Creed reperforator printer formed the word "Television." Surrounded by a mass of telegraph apparatus, the party saw instruments working in direct communication with distant cities and towns of the United Kingdom. In what is known as the special section the Creed reperforators were reviewed. Here arrangements are made to deal with the telegraphic requirements of special events, such as race meetings, shows, regattas, conferences, etc. The bulk of incoming Press work is also received from provincial centres.

A "corner" of the Central Telegraph Office, which the Television Society visited recently.

Passing through the cable and wireless rooms we entered the phonogram room, where one is switched through to when "Telegrams" are asked for. In a large hall on the ground floor a number of young ladies were searching through files and card-index books. They were marking the messages intended for local delivery or from an office connected by pneumatic tube, such as Billingsgate, Smithfield Market, House of Commons, Piccadilly, etc.

The cable room, as the section which communicates with overseas is called, is a specialised unit in itself. Communication by wire is maintained with Austria, Belgium, France, Germany, Holland, Italy, Czechoslovakia, Switzerland, and Norway. Wireless communication is maintained with Italy, Hungary, Rumania, Poland, Finland, and Danzig, and with ships at sea through Rugby. Morse or Creed reception is used for wireless working, and in the wire section the Baudot is mainly in use and forms a very efficient means of communication. For some places the "Hughes" apparatus is used. This instrument was the first practicable type printing telegraph invented, and before the war was the principal means of communication with the Continent. It is still a practical and workable instrument, and a standby for Continental working.

Another instrument which is used only for Continental communication in England is the Siemens-Halske high-speed telegraph. The operation of this is purely mechanical. Punched tape is used for transmission, and the received signals are caused to print letters on tape at from 400 to 500 letters per minute.

E. PHILLIPS AND W. T. LOWE.

Any enquiries respecting the Television Society should be addressed to:—

The Joint Hon. Secs.,
4, Duke Street,
Adelphi, London, W.C.2.

The Last Miracle

How Television was introduced to the "Guinea" mind

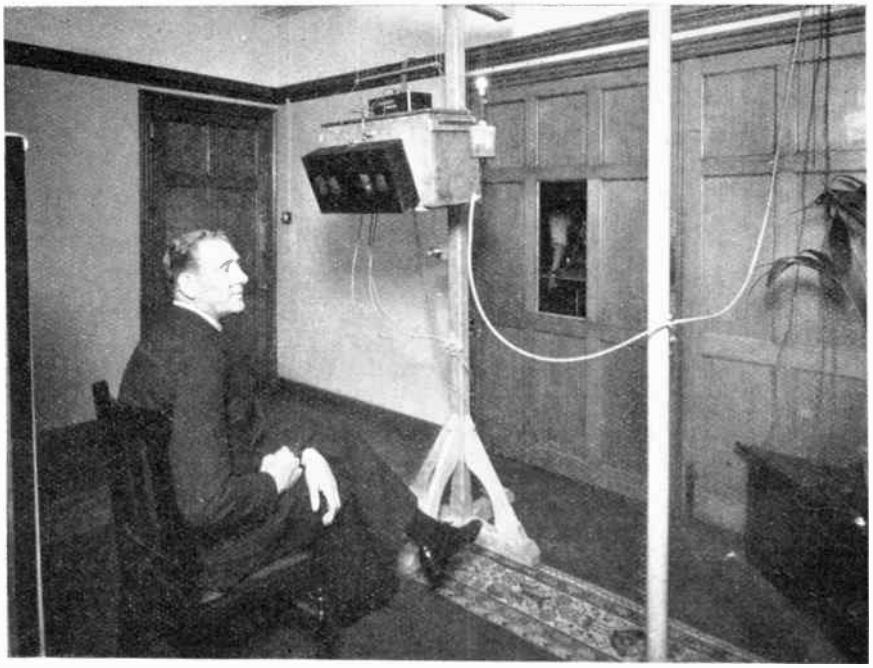
By *J. C. Evans*

ONE evening some months ago, while staying at the Ashanti colony of West Africa, I switched on my radio set and listened for a while to some German and British broadcasts which came through fairly well, despite the heavy *X*'s so fatal to reception there. Reception that night was so far above the average mark that I decided to give my favourite "boys" a treat by letting them listen to the music.

These "boys" were five in number, young negroes of twenty years or so from various parts of the colony, and were the best handful possible. Their moral and legal leader was a duke, Duke Dennis, heir-apparent to the throne of Takoradi (whence the new port derives its name). With him were his brother, Robinson Crusoe, an intimate friend, Assez-froid (Coldenough!), and two chums, Robert James and Henry George, both of whom were named after certain American negro heroes. Save for Duke Dennis, they were practically bushmen—certainly "raw," and their knowledge of modern things was practically nil.

They were all squatting on the verandah when I went out to them, all curled up in their long single body robes in the falling shadows, chattering away in their anthropoidic lingo—Fanti.

"Would you like to hear some music from England, boys?" They all sprang up with alacrity and a general "Yes, Massa."



Something in the nature of a miracle was achieved when Baird screen television was first publicly demonstrated at the London Coliseum, commencing on July 28th. Bombardier Billy Wells is seen in the Baird studio at Long Acre, the photo-electric cells being conspicuous. The control room is situated beyond the aperture in the partition.

They crowded about the open window as I brought out two pairs of 'phones, and, giving one pair to Duke Dennis and the other to Assez-froid, I gave them explicit instructions regarding the manner of putting them on—an achievement not attained without much struggling, for Assez-froid put them on just as we would a hat.

Duke Dennis was sufficiently modern to evince no surprise at anything, although he had not heard of radio before; but Assez-froid belonged to a different category, and I watched him particularly.

Slowly his eyes became fixed in amazement, and a grin, the silliest I've ever seen, stole across his face, broadening as the music went on until his mouth opened with such a burst of laughter that his face seemed in danger of being divided in two. Seeing only wonderment on the faces of his chums, who were at a loss to account for his merriment, he asked them if they could hear the band.

Emphatic negations caused his laughter to become something more akin to wonder. He wriggled out of the headphones and listened dog-like with cocked ears, but hearing nothing, he put them on again and became very serious.

"Medicine, Massa!" he cried, as I took the headphones from him to give them to another.

"Medicine, Massa!" was the general cry after all had been given a spell with the 'phones.

I told them it was not "medicine," and pointed indoors to the radio set.

"But how does the music come into these round boxes?" asked Duke Dennis.

I showed them the leads and the set.

The fact that it came from the "box" seemed to allay their wonderment; for they were less concerned with the cause than they were with its location.

"All de same one gramophone," Robert James sagely informed the others, who were evidently but little the wiser after this communication.

I explained to them that it was not a gramophone, and I took them inside to show them the interior of the set to prove that no records could possibly lurk within the box, explaining to them, or trying to explain, that the music came direct from England, using the very simplest of language and illustration.

Duke Dennis was lost in a profound reverie, but Robert James, with native genius, seemed to have grasped the big idea.

"Medicine, Massa; all de same dis!" And so saying he showed me a little scar on his chest, the mark of a wound which had been crudely stitched up with still cruder stitches.

Duke Dennis came to my aid with the explanation that it was "medicine," a charm seed buried in their flesh by the tribal medicine-man, and which was guaranteed by all the native gods to procure immunity from a certain disease.

I shook my head and explained to them that it was something quite other than black magic; but Robert would not be convinced. He left the verandah and returned some minutes later with six pieces of stone. He placed three in each hand, knelt on the floor, and, invoking all the charm gods of his race, he quickly dropped a stone from each hand, and as quickly picked them up again in alternate order. This he repeated twice, then, holding both his closed hands towards me, he asked me how many stones should be in each hand. As I had watched the process very carefully, I said three. He then opened his hands; in one hand were five stones, in the other was but one.

"Medicine, Massa!" he cried, "All de same dat!"

Before I had fully recovered they had departed, talking and arguing excitedly in their peculiar tongue, leaving me rather nonplussed with my "medicine box."

The following night I was mildly surprised to hear hymns soft and low sung below my verandah by a dozen or so hushed voices. Getting a little bored with the continual humming and chanting, which had lasted from dusk, I opened the window to bid them be still, but was immediately greeted with a dozen "Good-night, Massas."

Duke Dennis came to the balcony to explain, and, craving many pardons, he asked if I would be kind enough to let some friends whom he and his chums had brought along (and who would not credit what had been related to them) listen to the music and words which came from the medicine box where no music was.

I hadn't the heart to refuse, so two at a time they listened until all had had their turn. Then the arguments again commenced, and Duke Dennis turned to me and asked if it were not something like the telegraph down Lagos way. I nodded, and given this support he harangued the crowd into giving nodding assurances that his simile had carried.

"But, Massa, where is the wire?" he asked; then I had to explain all over again. This time I forced on him a fair idea and, seeing understanding dawning within him, and wishing to carry my point in one fell swoop by forcing upon him the full wonder of radio, I told him that by means of special apparatus one could see things and people at a distance by radio as well as hear.

That was the last straw; it clinched matters.

Dennis, herding his people together and ushering them from the verandah, turned to me saying in a pained and injured tone: "Massa, one may hear behind a house or a hill or round a corner, but one may not see!"

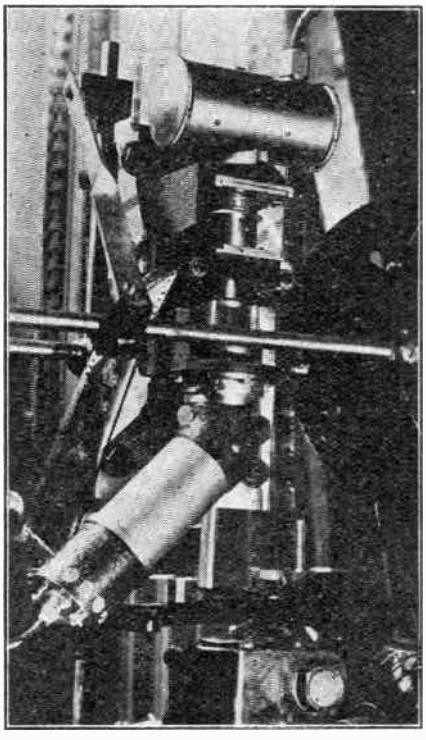
With a "Good-night, Massa!" Duke Dennis and his flock descended from the verandah, leaving me perplexed with the probabilities of an Ananias-like reputation.

Suddenly I had an inspiration, and, recalling Dennis, I went indoors and brought out a copy of TELEVISION. In the light from within I showed it to the doubting Thomas.

There on the cover was the familiar theatre scene, and in the "Televisor" was its reproduction.

Nothing could have been more to the point nor more convincing, and the amazement of Duke Dennis was even greater than was that of Assez-froid over the magic music.

After a few explanations and expressions of wonder, Duke Dennis went to rejoin his people and to tell his Fanti folks of television—the last miracle, and the only thing in all my long acquaintance with him which ever made him manifest any unseemly amazement and wonder before his people.



The First Public Tele-Talkie Demonstration at the Coliseum

By *D. R. Campbell*

* *

A well-known type of talkie reproducer.

* *

ON Saturday, August 9th, 1930, at approximately 3.30 p.m., the audience of the Coliseum Theatre, London, received a pleasant surprise. They were witnessing the demonstration of Baird screen television, this being part of the variety programme, and had "seen" artists singing in a studio some four hundred yards away. The announcer had taken the artist's place, and told the audience that his image was about to vanish and another, from a talking film, would take his place, and that the film would not be in the theatre but only the televised image of it.

The First Public Tele-Talkie

Following this announcement Mr. Holmes, the explorer, who had previously made some explanatory remarks about television in general, introduced Mr. Moseley, Director of Television Programmes, to the audience, explaining that they were about to see a talking film of Mr. Moseley by television, while they could see the original in the flesh on the stage. While Mr. Holmes was speaking the image on the television screen remained silent, apparently listening with rapt attention. Suddenly the image vanished, and in a few seconds another came into view. First it introduced itself, then explained what was happening, how the film had been made the day before, how the audience must not expect to see the usual beam of light behind them from the projection box, and after expressing a wish, hoping that the audience had been interested, the image vanished as suddenly as it had appeared. A talking film had been seen from afar by a *paying theatre audience* with the aid of television for the first time in the world's history. The picture was crude compared with that of the ordinary cinema film of to-day, but something definite had been done —another step made in man's means of inter-communication with his kind.

It is quite possible that many of the audience saw little difference between the image televised from a living person to that from a cinematograph film—but is that not as it should be? The reader may query the reason for bothering to transmit cinema

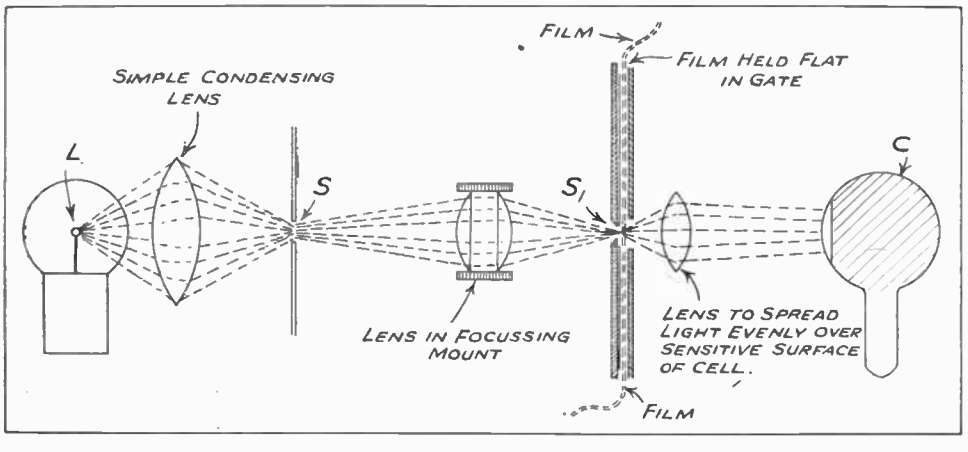


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Fig. 1.—A sketch showing how the sound record on the film is made to influence the photo-electric cell.

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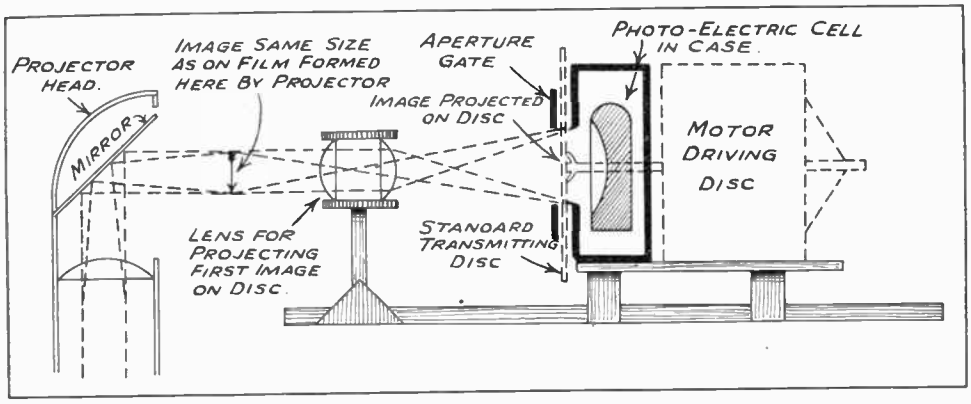


Fig. 2.—Indicating how the image of the film is projected on to the scanning disc, finally passing to the photo-electric cell.

films when the real person can be televised just as well or even better. There is much more reality in seeing by television persons while they are actually doing this or that. One must bear in mind, however, that it may not be convenient to "look-in" while such a thing is actually taking place, and a film is then our only method of reproducing any scene, after it has occurred, as often as we like.

How it is Done

Let us now consider how this is all done, starting with the talking film, a section of which is reproduced in one of the accompanying illustrations. How this film is made in the studio does not concern us.

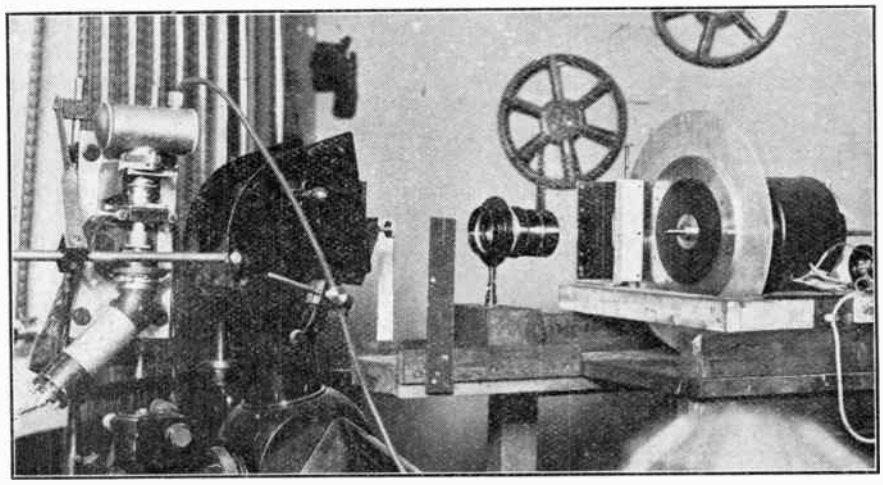
On the right-hand side we notice a ladder-like pattern. This is a sound photograph taken by the variable density system of recording. Each short line represents one of the many vibrations which together go to make up the speech of the artist. Nowadays, we are all aware of how these small photographic pictures are passed through a complicated magic-lantern-like apparatus, which projects them on to the screen in rapid succession. The picture is projected on to the screen, then the light is shut off while the film is jerked on to the next picture, and the shutter opens, the process being repeated at the rate of about twenty-two pictures per second.

It used to be sixteen before the advent of talking films, but it is not convenient to record all the frequencies required for good sound reproduction on such a short length of film. Though the part of the film on which is the picture is moved in a series of jerks, the sound record must run smoothly through the reproducer. We all know the unpleasant effect of a gramophone in which the record is running at a varying speed. Imagine how much worse it would be if we could stop and start the record in quick succession. Great care has to be taken, therefore, to see that the film runs smoothly through the reproducer at constant speed. Obviously the sound record at the side of a given picture does not refer to that picture, but to some other. In this country sound is nineteen pictures ahead of the picture to which it belongs.

The reproducer of photographic sound consists of a source of light, L (see Fig. 1), which is concentrated on a slot, S, the image of which is optically reduced and projected on to the sound track of the film in the form of a rectangle of light .08″ by .001″, S_1. As the film passes this "strip" a varying intensity of light falls on the cell, C, the resulting current pulses being duly amplified, and passed into ordinary sound apparatus used in the Baird Control Room, and also on to lines, etc., as required.

Transmitting the Film

We come now to the more important problem of how the picture or the film is televised. The intermittent type of film projector is not suitable at the moment, as it would require special mechanism to



Part of the experimental mechanism for the tele-talkie apparatus used by Baird. Notice the lenses, gate and standard transmitting disc.

adapt the twenty-two pictures to the 12.5 pictures per second of present-day television. There is a projector, however, in which the film runs continually, an optical arrangement of mirrors and lenses causing any two pictures to be superimposed or slid into each other, and no matter how slowly the machine is run there is no flicker.

This flickerless image is not projected on to a screen, but on to a standard transmitting disc, the image

Part of the first tele-talkie film used by Baird in his laboratories over a year ago. George Robey is shown as a blushing bride.

being not much larger than the original one on the film. On the other side of the disc is the photo-electric cell, which is enclosed in a box, except for an opening facing the disc, the whole being so arranged that only light falling on the cell has to pass through the apertures in the disc, which in their turn only pass the amount of light falling on that particular part of the shadow image projected on the other side of the disc. As the apertures travel over the image, therefore, a varying strength of light and shade is produced which makes up the picture, and this, as in the case of sound, is amplified and the signal faded into the usual vision circuits.

This system of transmitting is the converse of the spotlight projection system used for ordinary television, although television proper is sometimes done in a similar manner (floodlight or daylight working).

Common with both systems is the "gate," the name given to a mask which ensures that only one spot is scanning the image or object at a given moment. In the case of film-television apparatus, this mask is on the image side of the disc and can be seen in an illustration. The importance of the "gate" must never be overlooked, as it is the momentary break in the scanning between any two strips of signals which give the 375 synchronising signals per record, each of a duration of about .0002 second.

Changing Over

The changing over from television proper to film-television as in the Coliseum show calls for some careful synchronising. First of all the large motor of the Coliseum apparatus was synchronised from the ordinary television transmitter in the usual way. Besides synchronising the Coliseum receiver, the signal from the transmitter also had to synchronise the check receivers and the transmitting motor of the film transmitter, not only speed for speed, but aperture for aperture, otherwise at the change over the film picture would have been split in half. The moment for the actual change over was signalled from the Coliseum, and the person whose image was on the screen appearing to be listening so attentively was waiting for the cue.

No doubt before very long now the Baird experimental television transmission through the Brookman's Park Stations of the B.B.C. will be transmitting talking films. At first they will probably be limited to half lengths of persons, as in ordinary television, owing to the number of scanning strips which are limited by the side-band problem. One difference lookers-in will notice is the artistic lighting effects which so enhance a film close up. No doubt one day our news bulletins will be illustrated by the television of news reels which the public so much enjoy in all movie theatres to-day.

From the transmitting engineer's point of view, the transmission of talking films is much simpler than ordinary television, in as much as the lighting and posing, the balancing of the different sounds, has all been done for him. He has only to set his controls and the transmitter does the rest.

It seems that the motion picture theatre screen of the not-too-distant future will gradually evolve so as to be able to show its films transmitted from some central station. This will enable one film to be shown all over the country *at once*, the theatres being connected by land lines whilst, at the same time, being able to switch over to the topical events of the world as they are actually taking place. Who knows?

Receiving Baird Television in Berlin

By *Horst Hewel*

WHEN, in January, 1930, Baird's television experiments over the Brookman's Park transmitter were extended, and two half-hours a week for night transmissions were allowed by the B.B.C., I just had about ten months' experience in television (or, better, tele-movies) reception from our local transmitter at Berlin-Witzleben. I was the first amateur who received these transmissions back in March, 1929, with home-made apparatus. My receiving set consisted of two valves, an anode-bend detector R.C. coupled to a power valve, giving an undistorted output of about 1 watt. The neon (Osglim beehive type, covered with tinfoil, and having a window 35 mm. square laid over with very thin paper) was connected in a choke-feed arrangement in parallel to the output valve. L.T. was secured from a 4-volt accumulator, and H.T. from the 220-volt D.C. mains.

Vision Receiver Details

In July, 1929, however, I made some experiments with diode rectifiers. The "Kirkifier" type of circuit was performing so well that I included it in a new model of a set for local reception, consisting of a diode valve, followed by two stages of L.F. amplification (both stages in push-pull, first stage transformer, second stage R.C. coupled). The neon (normal current 30 m.a.) was coupled to the last stage of this amplifier (two pentodes in each branch) by a very simple arrangement described below.

In the apparatus of my own construction, built for reception from Witzleben, I was, and am still, using a 19-in. disc with 1·1 mm. holes, driven by a small universal motor of 1/35 H.P. at 220 volts. The image is 33 mm. by 46·2 mm. (German R.P.Z. standard 30 by 42 elements), magnified twofold by a 5-in. condenser lens. The speed of the motor is controlled just as in the Baird commercial "Televisor," *i.e.*, large fixed resistance in series with 150 ohms variable resistance. Synchronisation is by "thumb-control," or, much more comfortably, by short-circuiting a third resistance of about 50 ohms in the motor circuit with the aid of a handy push-button switch provided with a long cord.

A Superheterodyne

For the reception of the television transmissions from London, reports of which have been published in previous issues of this magazine, I am using a special four-valve "band-pass" superheterodyne

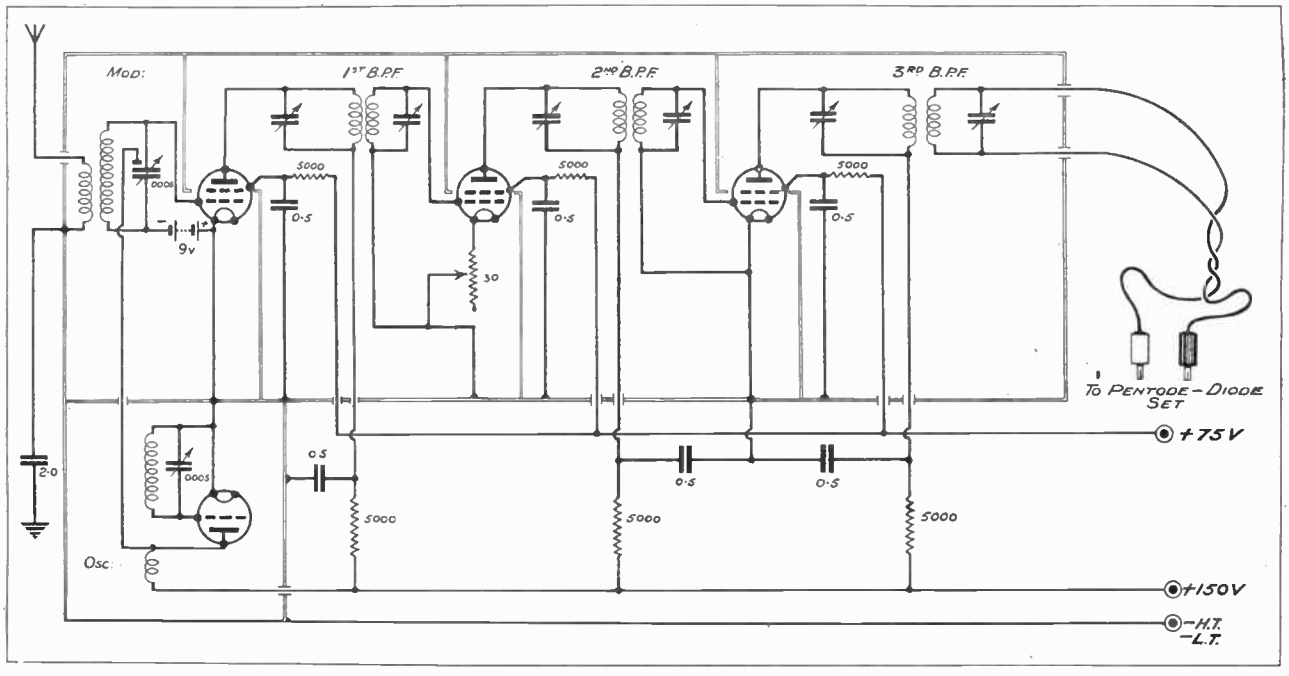


Fig. 1.—A special four-valve "band-pass" superheterodyne used by Mr. Hewel for receiving the Brookman's Park vision signals in Berlin.

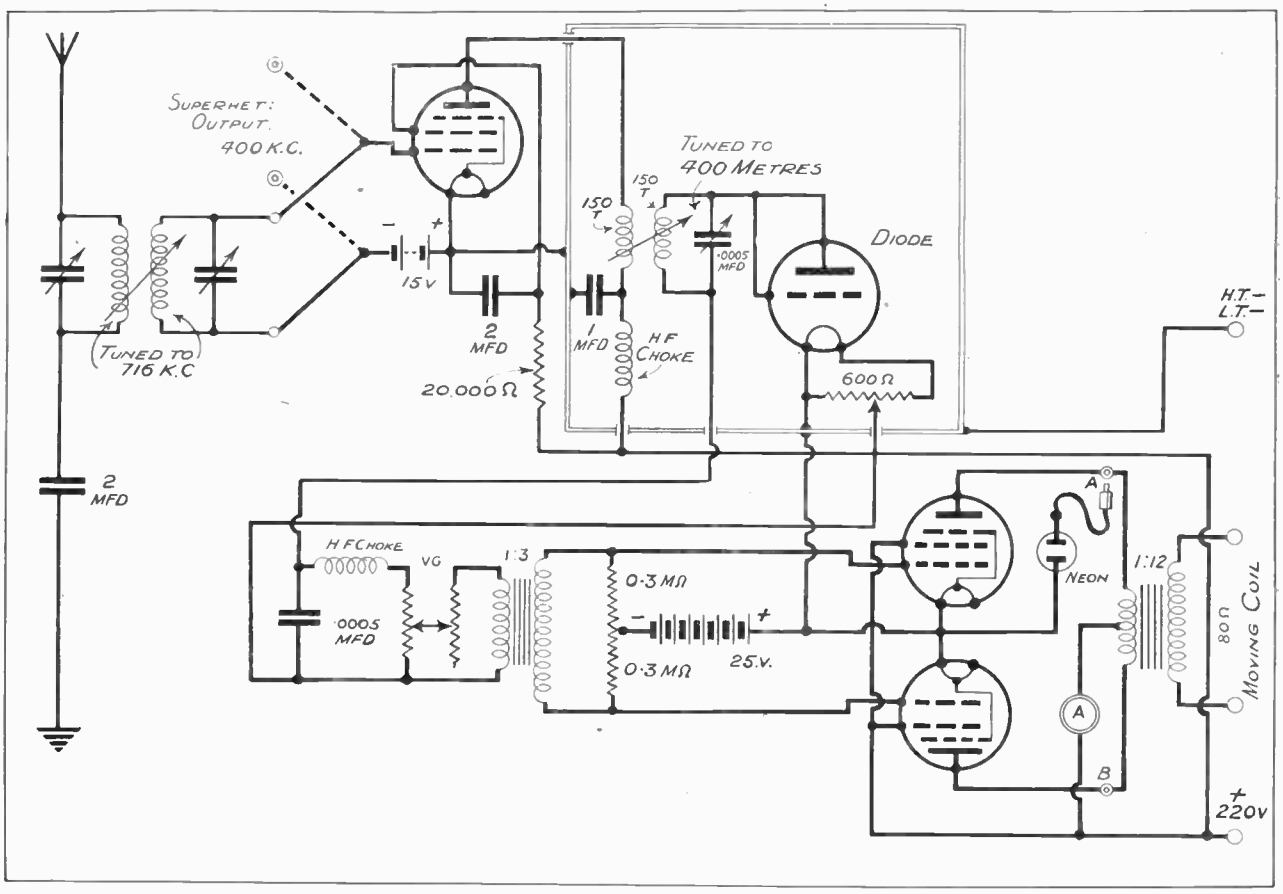


Fig. 2.—The rather novel circuit developed by the author for use in receiving the Baird television transmissions.

circuit (Fig. 1). It is not a complete receiver, but only a long-distance adapter, the H.F. output of which is rectified by the above-mentioned diode detector. The first valve, the frequency changer, is of the screened grid variety, while the oscillator is coupled to its grid circuit by a very small variable capacity. The beat or intermediate frequency is much higher than in the usual supersonic receivers, for several reasons, the principal one being the better band-pass action of the three I.F. filters at the higher frequencies. At 80 kilocycles a very high mutual conductance is necessary between the two tuned circuits of each band-pass filter, *e.g.*, 15 per cent. for passing a band of 12 kc. The two " humps " of the band-pass characteristic (at 74 and 86 kc.) are separated by a deep " bump " at 80 kc., therefore the low notes of the musical scale are suppressed to a large degree. At 400 kc., however, the frequency I am now using, a coupling factor of only 3 per cent. is sufficient to obtain the same band-width of 12 kc. The sides of the curve are steeper than before; the " bump " at the carrier-frequency is not so deep, and may be easily compensated by the " sharp-edge " curve of an additional tuning circuit.

The " double-spot " reading of the oscillator dial is quite eliminated, because the two beats are 800 kc. apart.

The screened grid and plate leads of each valve are properly by-passed by resistance-capacity filters. This filtering and the thorough screening of each stage (the whole set is built of aluminium) give perfect stability of the intermediate-frequency amplifier. By the use of plug-in coils it is also possible to receive the short-wave stations of all continents without using any reaction at all, wavelengths from 14 to 600 metres being covered with four sets of coils and with a tonal quality never possible with the usual three-valve short-waver.

The band-pass filter coils tuned by semi-variable mica condensers of ·0005 mfd. capacity have 150 turns of No. 30 D.C.C. wire wound in pancake fashion, with an inside diameter of 1 in. Two of these coils are mounted on a piece of 1-in. bakelite tubing, 4 in. long, their coupling being varied by sliding the coils on this former.

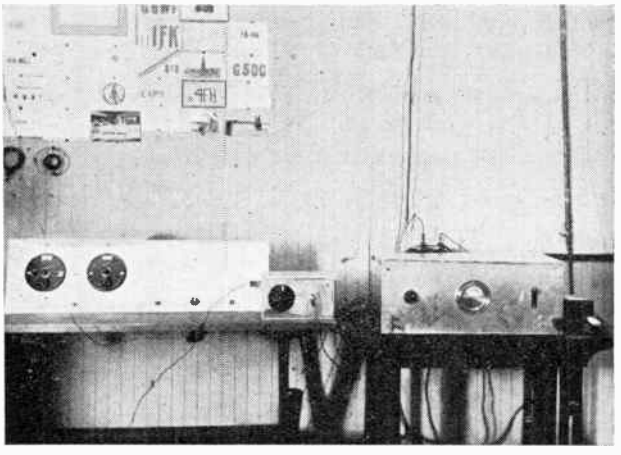
The L.T. source is a 4-volt accumulator, and the high tensions of 75 and 150 volts are taken from the voltage-divider of the D.C. mains unit.

Receiving the London Transmissions

For the reception of London images, undistorted in height, another 19-in. disc with 0·7 mm. holes was constructed, exploring an area of 21 mm. by 49 mm. To do away with the interference seen on the images in long-distance reception and caused solely by the sparking of my motor brushes, I simply connected a large condenser—0·5 mfd. was sufficient—directly across the brush terminals and one of these terminals to the motor casing. I also tried out this

scheme on other motors (pure A.C. and pure D.C. types) with the same success. All the other forms of interference eliminators did not perform so well in my case.

A short time ago I made an important change in the diode and two-stage L.F. amplifier circuit. Though the characteristic curve of a diode rectifier is *perfectly* straight for large H.F. inputs, it is curved on H.F. voltages below about 1 volt, giving rise to distortion, especially when high-percentage modulation is used at the transmitter. In local reception (from Witzleben, 1½ miles distant), for instance, I obtained an H.F. voltage of only 0·9 volt r.m.s., when the diode was coupled to the antenna tuning circuit (aerial consisting of 50 feet of four-wire cage).



Here we see Mr Hewel's receiving apparatus laid out in readiness for connecting to the "Televisor."

Modifications

I therefore resolved upon introducing H.F. amplification before the diode. The final circuit of the receiver is to be seen in Fig. 2. The two tuned circuits in the input of the H.F. amplifier act as a band-pass filter permanently tuned to the wave of the local transmitter. The L.F. pentode is giving an H.F. amplification of 20–25, the diode now has to rectify about 20 volts r.m.s., or when the 400 kc. output of the superhet. is led into this new arrangement a carrier intensity of 60 volts on many stations. It is obvious, therefore, that only one stage of L.F. is necessary. The L.F. impulses pass a volume-control and the primary of a permalloy-core transformer, the secondary voltage of which is split by two resistances and fed to the grids of the two 10-watt pentodes. The primary of the output transformer acts as a choke when the neon is put into the circuit. Positive or negative images may be obtained at will simply by connecting the neon to *A* or to *B*. The whole assembly of the receiving apparatus is shown in the accompanying photograph.

The automatic synchronising of the Baird commercial "Televisor" in my possession is so effective that it is quite difficult to cause the images to wander out by varying the control resistance of the motor. Statics do not cause much harm on the synchroniser, and in spite of fading it was possible to hold the images for periods of 15–20 minutes.

The German Radio Exhibition at Berlin

The German Radio Exhibition was held under the shadow of the Witzleben Tower in Berlin, on August 22nd to 31st. As last year, the Fernseh A.G. (the German Television Company, whose partners consist of Baird Television, Limited, Zeiss Ikon, Bosch, and Loewe Radio) staged a first-class exhibit, and in next month's issue we hope to furnish our readers with details of all that took place.

LETTERS TO THE EDITOR

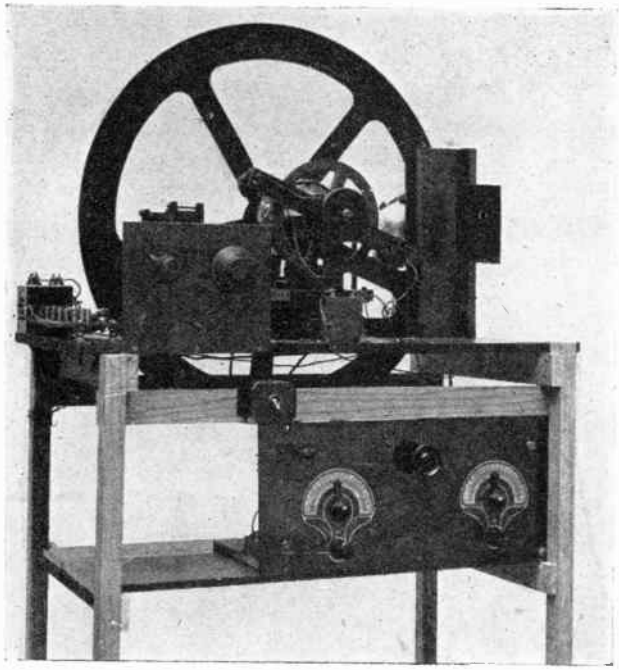
The Editor does not hold himself responsible for the opinions of his correspondents. Correspondence should be addressed to the Editor, TELEVISION, *505, Cecil Chambers, Strand, W.C.2, and must be accompanied by the writer's name and address.*

MR. BAILEY ATTACKS AGAIN.

To the Editor of TELEVISION.

DEAR SIR,—I am glad to see that Mr. Rennie in his letter in your July issue definitely attacks one of the links in the chain of syllogisms I set out showing the dependence of sidebands on fundamental electrical theory. He questions the use of the word " adequate " in the statement that the sine-function is an adequate representation of an ether wave. I mean adequate to the purpose under discussion. If they are not adequate, it remains to qualify them till they are. I shall try to qualify them as much as possible, and then to show that the qualifications are unnecessary.

2 buses+2 trams=4 vehicles. Algebraically this is hopelessly incorrect. In order to finish the equation it is necessary to qualify it by a " conversion-factor " of buses and trams to vehicles. 1 bus=1 vehicle.



Mr. Protheroe's home-made vision apparatus, to which reference is made on another page of this issue.

1 vehicle=1 bus. Obviously untrue. The equations I gave were algebraically identical (not equivalent, identical by the ordinary mathematical definition). So Mr. Rennie's second point is the same as his first point.

It is quite in order, I think he will agree, to supplant one expression by its algebraical identity (*i.e.*, another expression which is equal to it *for all values of the " arguments "*). But if the first expression is not an adequate representation of certain physical quantities or properties, the second won't be. Mr. Spreadbury says the same, more precisely. " What grounds are there for applying this equation to wireless waves, the very nature of which is obscure, and which comprise two entirely independent waves, namely, electric and magnetic waves, having a phase difference of 90° ? " The best of grounds ; that the equation is a solution of Maxwell's ether equations. If the nature of ether waves is obscure let us content ourselves with talking about their properties. The two components are not independent ; either can be calculated in terms of the other and their surroundings. As to the bit about 90° ; did Mr. Spreadbury put that in as a joke ? Of course, they are *in phase* in open space, and can never be made to be as much as 90° out, unless oscillating circuits are arranged to set up a special backwash of electric force.

The rest of Mr. Spreadbury's letter, about non-existent frequencies and such bogies, is largely irrelevant gibberish, and it would take much space to clear up what is really only the effect of loose thinking. May I recommend to Mr. Spreadbury Bridgeman's " Logic of Modern Physics," which will remove a number of his difficulties ?

The expression I quoted applies to plane waves in open space. It describes either the electric or magnetic vector, whichever you like ; in free space they are equal. The three components are coplanar, and have a special phase relationship. Are these conditions too special ? They correspond to the qualification of a vehicle as a bus. No one doubts that you can separate out two carriers *because* they have origins in different points of the compass, or *because* their polarisations are different ; a frame aerial will suffice. I only maintain that according to classical electrical theory you can't separate them *just because* they are not sidebands, and to conduct this argument I ask for conditions sufficient to eliminate the effects of directional aerials, etc., which are already agreed about.

Certainly a receiver could be evolved which would distinguish between a *pair* of carriers and a modulated wave, which is equivalent to three carriers. Also there is the special phase relationship which is a characteristic of sidebands ; this might be used somehow, but if these receivers are evolved it will probably be the end of this talk about the " case for

sidebands," for practical calculation without sidebands will not be merely rather difficult but really appalling.

Yours faithfully,

C. E. G. BAILEY.

14*th July*, 1930.

THE WORLD'S FIRST PUBLIC PERFORMANCE OF TELEVISION IN A THEATRE

BAIRD TELEVISION

at the

LONDON COLISEUM

commencing

JULY 28th, 1930

LIVING CELEBRITIES AND ARTISTES
TELEVISED THREE TIMES DAILY
BY THIS MARVELLOUS INVENTION

A replica of the striking poster which announced the world's first public performance of television— a Baird triumph.

GOOD RESULTS IN ABERDEEN.

To the Editor of TELEVISION.

DEAR SIR,—Living up to our traditions we ought really to keep a good thing to ourselves. However, it may interest you to hear that we have since March been receiving the Baird midnight programmes, more or less consistently, and occasionally the German ones. We are fairly pleased with the results we have so far obtained, and are looking forward and expecting much from the Richardson unit, which we have made up. Very little improvement on last night's reception would give us perfection up to a point which would satisfy us at present.

Last night's reception was as follows :—

London.—*Announcer*: Gentleman. Lady: Expressions excellent. Gentleman: Taking off wig, fixing on beard, and making much of hand movement in front. *Sketching*: (1) Girl or child with stuck-up cap. (2) Man with pipe. (3) Clover leaf (which he converted to old man with side whiskers). *Screen News*: Monday at 11 a.m.—Frederick West (too fast), tenor (very fast), soprano. *Announcer*: (We have generally no difficulty reading screen news, but it was rather fast for us last night.)

Berlin.—Three-quarter face of dark lady, and full face of fair lady, practically monopolised the entire programme. Photographs of man with side whiskers and uniformed man. The word "Pause," but wrong way round and lying diagonally—top left-corner to bottom right—instead of bottom left up to top right. (This would denote German station sending, or rather scanning, top to bottom.)

Yours faithfully,

8, Tullos Circle, Balnagask, Aberdeen. W. S. MOWAT.

9*th August*, 1930.

[With reference to our correspondent's statement concerning the Berlin reception, we would point out that the Germans use horizontal scanning, and their picture has much less detail than the Baird image. —ED.]

A QUERY.

To the Editor of TELEVISION.

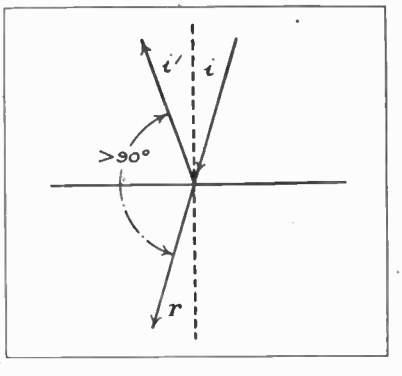
DEAR SIR,—Referring to the March, 1930, issue of TELEVISION, page 16, first column, thirty-seventh line, Mr. H. Wolfson (the author of the article) intends to prove that $\tan i = \sin i/\cos i = \mu = \sin i/\sin r$, therefore $\cos i$ is equal to $\sin r$.

In order to say that $\sin i/\cos i$ is equal to $\sin i/\sin r$, he must have supposed, or assumed, that $\cos i$ is equal to $\sin r$, or that the angle r is equal to $(90° - i)$. If this were the case, then, the angle between the reflected ray and the refracted ray would be 90°, as it is intended to be proved, but, incidentally, this is not the case, nor the angle "r" is necessarily the same to the angle $(90° - i)$. The first assumption was a cause of the second. Thus he assumes one thing, and proves just what he assumes.

* *

The case referred to by Mr. W. du Pont in his letter.

* *



In the accompanying diagram, which is approximately an actual case, it will be noticed that the angle between the refracted ray and the reflected ray is much greater than 90°.

If the case were as it is intended in the magazine, then $\mu = \sin i/\sin r = \sin i/\cos i = \tan i$. That is, the

index of refraction would be independent of the media, but dependent of the angle of the incident ray which, in fact, it is the opposite; it is independent of the angle of the incident ray, but it depends on the two media.

Mr. Wolfson's article is very good, and although an unnoticeable error incidentally happened, it practically undisturbed the article.

Yours faithfully,

WILFRED DU PONT, Assoc.A.I.E.E.

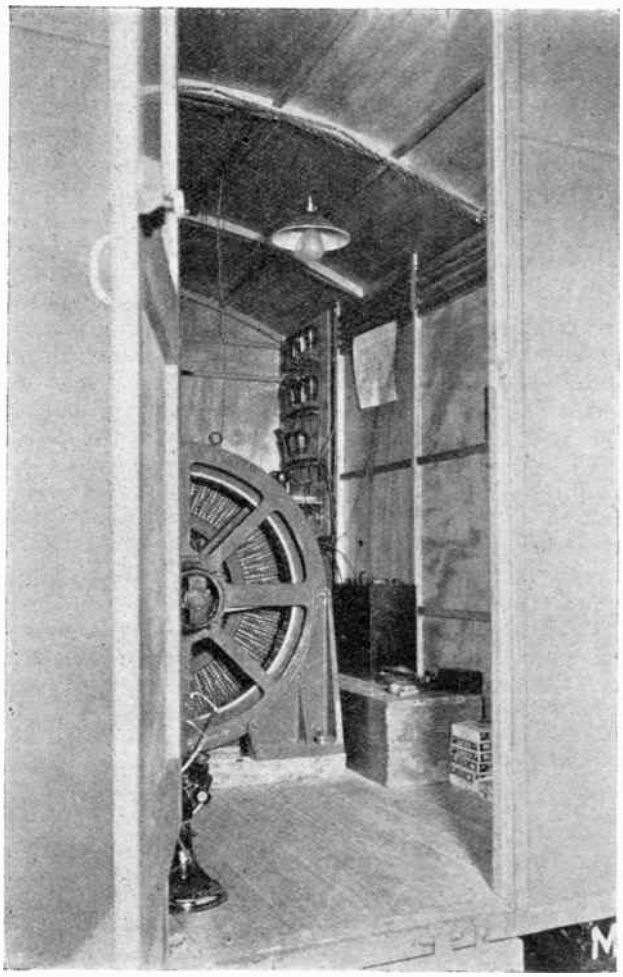
525, 67th Avenue, Milwaukee, Wisconsin, U.S.A.

MR. WOLFSON REPLIES.

To the Editor of TELEVISION.

DEAR SIR,—I am pleased to be able to reply to Mr. W. du Pont in connection with his query concerning my article in the March issue of TELEVISION. I am afraid that Mr. du Pont has misread that part of the article which he quotes. I do not set out to prove the relationship

$$\tan i = \sin i/\cos i = \mu = \sin i/\sin r,$$



Another view of the interior of the mobile transport which was used for the Baird screen television demonstration at the Coliseum.

merely stating that it can be proved. Perhaps if I were to enlarge upon the reasoning given in the article it would help to clear up Mr. du Pont's difficulties. The reasoning given in the article is, in its old state, perfectly correct.

To obtain the series of identities quoted above. We know that the *tan* of an angle is equal to the *sin* of that angle divided by the *cos* of the angle. This gives the first identity, viz., $\tan i = \sin i/\cos i$.

Referring to line 30 of the article, we find that, by Brewster's law, $\tan i = \mu$. This is the next stage in the identity (equation). Moreover, from Snell's law, $\mu = \sin i/\sin r$, which gives us the last stage.

Since all these related quantities are identical, it follows that $\sin i/\cos i = \sin i/\sin r$, and since these numerators are the same, the denominators must be identical, or equal, *i.e.*, $\cos i = \sin r$, which it was intended to prove in the article.

The next step is pure trigonometry, since the sine of an angle is the cosine of its complement, *i.e.*, $\sin r = \cos(90° - r)$, or, in other words $= (\pi/2 - r)$. Thus $\cos i = \sin r = \cos(90° - r)$, or $i = 90 - r$, which means that $i + r = 90°$.

Reference to Fig. 1 will show that this relation can only be satisfied when the reflected and refracted rays are at right angles, and I regret to point out that Mr. du Pont's diagram is incorrect, inasmuch as a ray travelling as shown would be bent in toward the normal, as is seen in my original diagram.

He must remember, however, that this is not an ordinary case of reflection and refraction, but deals only with polarisation. The angle of incidence, i, is also the polarising angle, referred to in Brewster's law. Thus the refractive index depends both on the medium and on the polarising angle of incidence i. This reasoning is only intended to apply with *one particular value of i, for each polarising medium used.* I think this accounts for, and disposes of, Mr. du Pont's third paragraph.

Yours faithfully,

H. WOLFSON.

"The Dingle," Grove Lane, Headingley, Leeds.

August 12th, 1930.

A TERSE COMMENT.

To the Editor of TELEVISION.

DEAR SIR,—A few weeks ago at Ealing an old woman interrupted a cricket match by sitting on the pitch. Mr. Verne V. Gunsolley reminds me of that old woman. He interrupts a theoretical discussion on the sideband theory to remind us that theoretical conditions are hard to obtain in practice. Too true! Nevertheless I think he has a cricket bat concealed up his sleeve, and it is to be hoped that he will produce an explanation of his modulation invention and join in. If one can judge from the stuff he talks about "imaginary suppressions" it is probably fallacious.

Yours faithfully,

C. E. G. BAILEY.

30th July, 1930.

THE RADIO EYE!

the dream of this wonder age now a solid fact . . .

SEE the greatest development of radio research—SEE the actual actions of living people and things reproduced instantly before your eyes on the screen of the wonderful Baird "Televisor" Home Reception Set. Don't be content to just listen—enjoy the perfect synchronisation of sound and action, the most wonderful achievement in radio.

The Baird "Televisor" is no more trouble to operate than any ordinary wireless set. No other Receiving apparatus gives this real life reproduction—the Baird "Televisor" Home Reception Set leaves nothing to be desired for quality and permanency.

Daily broadcasts of both sound and vision from the National and Regional Stations at Brookman's Park have been a feature since March 31st.

Particular care has been taken in the production of a kit of parts for home constructors, bearing the Baird Brand. This brand name will be an effective protection against the purchase of inefficient components. Why not try building a "Televisor" Reception Set ? Ample service is arranged for and you will be creating for yourself a new interest.

Prices for the complete Receiver and "Televisor," "Televisor" only and Kit of Baird branded parts will be sent on application to :—

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BAIRD TELEVISION

"TELEVISOR"
(Regd. Trade Mark)

for the home

The Television Triumph

at

The London Coliseum

WHAT THE PRESS SAID:—

DAILY MAIL.—"With a dramatic success which convinced the most sceptical, television established itself at the London Coliseum yesterday. . . ."

DAILY TELEGRAPH.—"Television was successfully exploited as a feature of a music-hall programme at the Coliseum last night. . . . Both visual and aural effects were satisfactory."

DAILY EXPRESS.—"Television is attracting much more attention than the bioscope did, for famous people are condescending to have their voices transmitted from Long Acre to the Coliseum stage. . . . I wonder how long it will take before television brings a theatrical performance to our own home? . . ."

MORNING POST.—"Television proved itself an accomplished fact at the London Coliseum yesterday."

DAILY HERALD.—"Altogether a memorable evening, and the Coliseum is playing its part in the making of scientific history."

NEWS CHRONICLE.—"The singing of a song by Miss Joan Revel from the studio in Long Acre further demonstrated the great possibilities of this modern wonder."

DAILY EXPRESS.—"Television advanced a long way yesterday, when J. L. Baird's invention formed part of the ordinary Coliseum programme. . . . Television obviously still has a long way to go, but it proved last night that its young Scottish inventor has got something which will soon arrest the attention of the world."

THE ENCORE.—"The Baird television demonstration at the Coliseum is a milestone in the wonderful progress being witnessed by the present generation. Any criticism of the imperfections of the Baird system as now being demonstrated to the public is futile. Television is right here in our midst . . ."

SUNDAY REFEREE.—"History was made at the Coliseum yesterday when, for the first time in the world's history, a talking picture was transmitted by television."

SUNDAY PICTORIAL.—"Mr. Baird's invention looks like being the most effective means yet devised of keeping the children in the home."

SUNDAY DISPATCH.—"Tele-talking films seen and heard at the Coliseum yesterday. . . . As the film was made only on Friday and was transmitted from the Baird Studios to the Coliseum without rehearsal the results were excellent."

SUNDAY EXPRESS.—"Television has come . . ."

SUNDAY REFEREE.—". . . capital living portraits of sundry well-known folk follow each other on the screen. . . . In this case I can promise those who take them along that they will not have cause to grouse at having to 'take the children to a show.'

REYNOLD'S NEWS.—"I went to the Coliseum to see the television number, and found it fascinating."

SUNDAY TIMES.—"By far the most interesting thing in last week's programme at the Coliseum was the seventh item, 'Television'; the Baird British invention . . . The experiment so successfully undertaken at the Coliseum is not essentially miraculous; it is exactly what one has long expected."

BAIRD TELEVISION, LTD.,
133, Long Acre, London, W.C.2.

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