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TELEVISION

BAIRD TO INVADE AMERICA?

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TELEVISION

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TELEVISION

THE
OFFICIAL ORGAN OF
THE TELEVISION SOCIETY

SYDNEY A. MOSELEY, *Managing Editor.*

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VOL. IV] SEPTEMBER 1931 [NO. 43

THIS MONTH'S CAUSERIE

THE outstanding features of the month are the visit to America of Mr. Sydney A. Moseley on behalf of the Baird Company, and the direct television broadcast from the B.B.C. Studio on August 19th.

* * * * *

Both these events have a far greater significance than might appear at first sight. On his journey to America Mr. Moseley was accompanied by two representatives of large banking interests in New York, the object of the journey being to arrange for the mass production in America of British television apparatus.

* * * * *

So much has been written about what America is going to do in regard to television, that it will probably come as somewhat of a shock to those who are in the habit of decrying Britain and everything British to learn that in this new science not only is this country ahead of America but, what is of even more vital importance, there are men in Britain with sufficient courage to invade America and challenge the Americans on their own ground.

* * * * *

The significance of the direct broadcast from a B.B.C. Studio lies in the fact that this step is evidence of closer co-operation between the B.B.C. and the Baird Company, and justifies the hope that before long it will be possible for owners of "Televisors" to see the B.B.C. artistes during the ordinary broadcasting hours, instead of being confined to the seven half-hour broadcasts weekly which is all they have been having up till now. It is not possible at the moment to say anything definite on this point, and all we can do is to hope that this new development indicates definite official recognition of the claims of this British invention.

* * * * *

Visitors to the Mechanical Aids to Learning Exhibition, which is to be held at the London School of Economics from September 22nd to 29th, will have the privilege of seeing something entirely new in television, something which has not previously been shown in public and which even the Press have not been permitted to see—the Modulated Arc. The work of Duddell and Ruhmer in connection with varying the light of an arc in proportion to speech currents from a microphone is, of course, well known, but it has remained for the staff of the Baird Laboratories to modulate an arc over a sufficiently wide frequency band, and with the necessary consistency and accuracy to make it satisfactory for television purposes. This has been achieved and it is possible with the modulated arc to obtain a brilliantly illuminated picture on a screen 5 ft. by 2 ft.

A Television Broadcast from a B.B.C. Studio

A HAPPY AUGURY

THE advances made in television are following on each other's heels, and during the last year hardly a month has passed without a fresh development in the science being recorded in this journal. And now the long-anticipated closer co-operation between the B.B.C. and the Baird Company has been established.

A Happy Augury

On Wednesday, August 19th, the usual half-hour morning programme, instead of being sent from the Baird Studio by landline to Savoy Hill, took place from the B.B.C.'s No. 10 Studio, near Waterloo Bridge. This in itself augurs well for the future, when those who support television as an entertainment visualise longer programmes and a higher status in the public consciousness for these same transmissions. The B.B.C. has prudently waited, and now that it is willing to acknowledge the sister science to the extent of welcoming it within its portals, this may be taken as a sign of definite friendship in place of the one-time bowing acquaintance.

Karin Ohman, in Swedish national costume, delighted those looking-in, with Swedish folk-songs.

One of the items in the television broadcast from No. 10 Studio was a dance by Miss Lulu Stanley, and she is shown here performing her act before the photo-electric cells (stand on left).

Members of the Press were escorted to the Studio on Wednesday morning by representatives of the Baird Company, and were accommodated at one side of the huge Studio, from which vantage point they could watch the actual transmission take place. This was effected with a portable transmitter.

A Portable Transmitter

The difference between this portable transmitter and the transmitter at Long Acre is that in place of the revolving disc is substituted a drum with mirrors. This drum has attached to its periphery thirty small mirrors, each being set at a slightly different angle. A beam of light from an arc lamp

(*Continued on page 246*)

My Television Trip to America

By SYDNEY A. MOSELEY

BY the time this article appears in print I shall be on the high-seas, sailing away to the United States of America, where I understand big things are happening in the world of television. What these things are I shall be in a peculiarly privileged position to tell the readers of the TELEVISION Magazine, and this I propose to do at the earliest possible moment.

I have already explained my reluctance to print, either in this magazine or the other journals with which I am connected, many of the extensive claims that have come from New York and elsewhere from time to time. This reserve has been justified on more than one occasion. Americans are adept in the art of publicity and I raise my hat to them.

So far as television is concerned, however, readers require facts and facts alone. Propaganda may be utilised in the world of commerce. We are more interested in the scientific aspect of the problem and have no use for the bombastic utterances that have been made by public men who should have been more measured in what they said.

A recent portrait of our Managing Editor, Mr. Sydney A. Moseley.

But the fact remains that the Americans are an enterprising race and have not been at all backward in developing the science of television any more than they were in achieving commercial success with the cinematograph-talkie apparatus. My ambition has always been to prevent a recurrence of that position. Americans were able to come into this country and make their own terms for the use of their invention.

Let me be quite frank. The claims from New York, Washington, and elsewhere with regard to discoveries in television have been so persistent of late that I am going over myself to discover what is being done.

So far, according to my information, claims of a revolutionary nature appear to hinge round two points: (1) The ultra-short wave; (2) the cathode ray.

Let me assure readers at once that if America bases its claims on these two points, we are quite ready for them. The ultra-short wave, I am assured by Mr. Baird himself, is of little use under conditions in this country, inasmuch as its radius is restricted to ten miles, while the cathode ray, which I investigated with him in Germany a few years ago, was found then to be entirely uncommercial.

However, there are definite threats or promises, one might regard it either way, that the Americans will put on the market before very long millions of sets, and I ask the traders of this country, as I have asked before, what they are going to do about it. Are they going to wait for an invasion from America before they "take steps"? Unfortunately, such an attitude is not without precedent. This country, as my American friends have pointed out to me again and again, does not see a step ahead.

As I prepare to leave for the United States I am

inundated with messages. The whole country over there is alive to the urgent promises of television and I have the matter fully in hand. You may be perfectly sure I, too, shall take steps to see that, if this is the case, we shall not be lagging far behind.

Meanwhile it is permissible to state that arrangements are being made for the Baird "Televisor" to be put into production throughout the United States. It is very evident that in regard to manufacture the United States will be the scene of activity before long, for the simple reason that so far as broadcasting facilities are concerned, America is better off than we are.

OFF TO THE U.S.A.

Mr. John Logie Baird bidding farewell at Waterloo Station to the party which sailed on the "Bremen" to conclude arrangements for the mass production in America of British television apparatus.

Second from the right is Mr. Sydney A. Moseley, a director of Baird Television Ltd., and, on either side of him, representatives of American financial interests, Messrs. Leon Osterweil and Nathan Goldsmith.

I am not raising the question as to whether the monopoly of the B.B.C. for the broadcasting of sound is preferable to the chaotic system now in vogue in America, but, at any rate, the multiplicity of broadcasting stations in the United States has enabled them to progress with television.

Let us hope that before I return from America the conditions over here will have changed, so that British television has an equal opportunity of development in the interests not only of science but of a great nation.

A Television Broadcast from a B.B.C. Studio

(*Concluded from page* 244)

falls upon these mirrors, and as the drum revolves, the beam of light is made to sweep over the scene being transmitted in a succession of strips. In effect, the scene is traversed by a rapidly moving spot of light. In front of the person being transmitted is placed a case containing a number of photo-electric cells, and these cells receive the light thrown back from the moving light spot. The amount of light reflected varies with the light and shade of the scene, and in turn causes a varying current to flow from the photo-electric cells. This varying current is again used to modulate the wireless waves sent out from the B.B.C. transmitter.

Listeners-in can hear the images as they come through the ether as humming sounds. Lookers-in provided with "Televisors," instead of hearing these sounds, see, reconstructed on the television screen, a moving image of what is going on in the B.B.C. Studio.

At former demonstrations it has been usual for the Press to see the received picture on a big screen or in the "Televisor," but on this occasion they were invited to watch the actual "televising" of the artistes taking part in the programme, and it proved most interesting. This, of course, prohibited any individual criticism of the quality of the picture, but from various reports the transmission was one of the best yet experienced, and marked a definite step forward.

Before long those people possessing vision apparatus will doubtless be able to see all the B.B.C. artistes as they appear before the microphone in place of the present restricted television programmes.

INTERNATIONAL EXHIBITION OF WIRELESS, TALKING AND CINEMA APPARATUS AT LYON

(September 12th to 20th)

At this exhibition hundreds of firms will be housed in the Palais de la Foire in Lyon. On the Press stand samples of the world's wireless periodicals are to be displayed and TELEVISION will occupy a prominent position. A cordial welcome is extended to all.

From My Notebook

By *H. J. Barton Chapple*
Wh.Sch., B.Sc.(Hons.), A.C.G.I.,
D.I.C., A.M.I.E.E.

Proper Tuning

MANY people still look upon tuning as a case of merely turning the condenser dials or other tuning knobs until the required station is heard on the loud speaker. Disillusionment may be a large pill to swallow, but quite frankly this does not represent the real truth of the matter. It is necessary to acquire a certain tuning touch or feel in order to get the best out of one's set. That being so, practice is necessary before any distant stations can be brought in properly without causing interference to one's neighbours, even with such a simple set as the straight Reinartz reaction detector and one or two stages of L.F. coupling, where generally there is only one tuning dial and one reaction dial.

It is on the question of interference where the pitfalls are encountered to such a large degree, and persistently to oscillate the receiver, deliberately or even unwittingly, when searching for stations is a

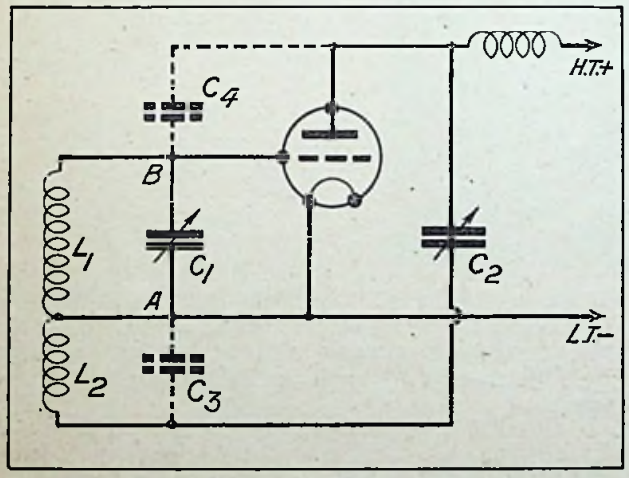


Fig. 1.—Showing how the different condenser capacities produce a slight effect on tuning in a Reinartz receiver.

crime of which, unfortunately, many listeners are guilty even in these enlightened times.

If ordinary plain dials are used, the size is of great importance, and, apart from the important panel finish, the engraved degree scale is more open than in the case of the smaller dials. This will ensure a greater increase in station logging, but, perhaps more important still, the larger dials, that is, the four-inch diameter ones, are much easier and more comfortable for the fingers to grip. Of course it is preferable to use some form of slow-motion dial provided it is of a reliable make, but for the moment that is beside the question.

A Case in Point

Let us for the sake of an example take the case of a Reinartz reaction set with one tuning dial and one reaction dial. First of all, with the reaction dial set at zero, tune in the local station. Now increase the reaction condenser until the set is in its most sensitive condition, that is just *off* the oscillation point. Then very carefully, degree by degree, rotate the tuning dial with one hand so as to receive stations above or below the local wavelength as desired. When increasing the wavelength the reaction condenser can be increased slightly and progressively in capacity as we go up the tuning dial, the reverse process operating when tuning from the higher to the lower wavelengths. On hearing signals from a station, the reaction control will probably need a slight further adjustment to bring up the signals to the required loud-speaker strength, but do not try to force matters.

To ensure that you are not oscillating, move the tuning dial *slightly* to either side of the station's logged position, and if there is a whistle or "tweet" (the noise is familiar), reduce the amount of reaction at once. It is only by going round the dial carefully like this that any real satisfaction is gained. Haphazard movement of the dials round to left or to right is only asking for trouble and also is not giving the set a chance to show up to advantage.

Tuning Slightly Altered

The Reinartz or capacity controlled reaction has the distinct advantage that the setting of the reaction condenser has very little effect on the tuning of the grid or aerial circuit as the case may be. There is a slight effect, however, and it is as well

to see how this operates. Referring to Fig. 1 where L_1 and C_1 represent the tuned circuit, we see that across the points AB, i.e. the extremities of the tuning condenser, we have other capacities. First of all there is the grid to filament capacity of the valve, valveholder and associated leads, but this does not have any bearing on the point at issue and hence is not shown. Then we have three condensers or capacity effects in series, which together are in parallel with C_1. These are the real condenser, C_2, the self capacity, C_3, of the reaction coil, L_2, and the plate to grid capacity, C_4. If this valve is working as a detector with a grid leak and condenser, then there will be an additional series capacity introduced by this grid condenser, but to simplify matters this has also been omitted.

Small Capacities

Now, C_4 and C_3 should be quite small and the resultant capacity of the three condensers in series will therefore be small, since it is always less than the smallest in the series. This capacity, however, although small, is actually across AB, or in other words in parallel with C_1. We can now see that any alteration in the reaction condenser C_2 will, very slightly, alter this added shunting capacity and affect the tuning.

On increasing the capacity of the reaction condenser, the tuning capacity will also be increased slightly and vice versa. I have come across instances where the tuning alteration has been quite marked, and investigation has shown that both the C_3 and C_4 capacities have been unduly high owing to the inclusion of shoddy components. Even with normal use, however, it is advisable to know how to compensate for this slight tuning alteration, as it may make all the difference between just receiving a particular distant transmission or losing it altogether.

A Useful Hint

The simplest way is to tune the grid circuit when the set is *not oscillating* to a frequency slightly higher than that of the broadcasting station whose signals you are desirous of hearing.

This is to say, the condenser setting must be made slightly *lower* than that at which you have heard signals, then, on increasing the reaction condenser to bring up the volume to the proper proportions, the tuning will be found quite accurate when the set is just off the oscillation point. Naturally, the slight amount of detuning necessary to compensate for this small change can only be found with a little practice, but having once determined this factor you will carry out the task in quite an automatic manner. As I have emphasised before, skill in tuning is only the outcome of a little practice, and one very soon becomes quite at home with the set.

By paying due attention to the little pitfalls that have been emphasised in the foregoing paragraphs, the Reinartz enthusiast will be in a better position to become thoroughly at home with his receiver and understand its inherent features. He will then get more acquainted with the handling of the set and appreciate the functions of the particular apparatus, and thereby derive the fullest benefit from what may be hitherto unsuspected capabilities of the set in question.

Mr. A. Serras, manager of Casa Serras, explaining to the President of the Portuguese Republic the working of a Baird "Televisor" on the occasion of the last Radio Exhibition held in Lisbon.

Radio Sound Pictures

The South German Broadcasting authorities have decided to transmit sound impressions of various everyday happenings. They are now engaged in recording on gramophone discs various impressions as heard by the microphone; these records will then be broadcast.

The first sound picture will be called "Life on

the Sarre," and will contain typical fragments of political and social life in the Sarre Valley. The second will be a sound impression of Treyes, and will be called "Treyes: Impressions of Labour and Work in the Borderlands." This broadcast, in addition to giving impressions of political and social life, will also include interviews with various persons, and will include radio reporting and excerpts from national songs. The third broadcast will be entitled, "A Large City Retires to Rest."

Wireless Licence Figures

I notice that the total number of paid wireless licences in force in Great Britain and Northern Ireland is still growing apace. According to the figures received on June 30th last they were 3,756,000, while the free licences issued to blind persons had reached the figure of 4,380.

There has been an increase of 26,180 during June compared with 15,050 in June 1930, while during the last quarter the increase has been 113,080 as against 67,325 in the June quarter last year. At this rate we shall soon reach the four million mark, a wonderful tribute to the popularity of radio.

Vienna's Power Going Up

Four years ago Radio-Vienna by reason of its then high power of 15 kW. ranked foremost among the great European transmitters. Now its voice can only be faintly heard amid the roar of its more powerful neighbours, which have sprung up all round. It has therefore been decided to build a new and greater Radio-Vienna which will have a power of 100 kW., so that once more its voice will be heard above the radio chatter of Europe.

The new station will cost a large sum and will be erected about twenty-five miles from Vienna, so that it will not interfere with foreign station reception in the Austrian capital. It is hoped to have the new Radio Wien ready within twelve months.

Pentode Valves

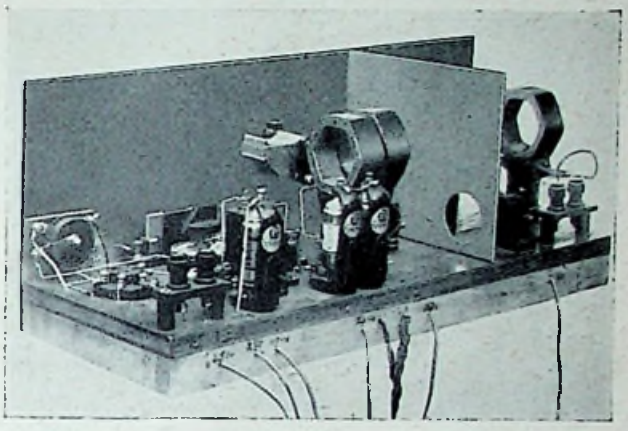
The pentode valve is designed for the last stage of a receiver as an alternative to the ordinary power or super-power valve. It is already in very wide use, but it is probably true to say that if its advantages and peculiarities were more widely appreciated the pentode would be employed even more generally than at present.

Everyone knows that when receiving a distant station louder signals are obtained by using a power valve than by using one of the super-power class, simply because the amplification given by the power valve is greater. In just the same way, the super-power valve is preferable for receiving strong signals, because the volume of pure sound it can hand on to the loud speakers, *provided the station is near enough,* is greater than the most a power valve can deliver.

In the pentodes the amplification of the power valve is combined with the power handling capacity of the super-power valve, so that when a pentode is put into the set, distant stations that before could only be heard at poor strength give volume comparable to local reception.

A Corrector Circuit

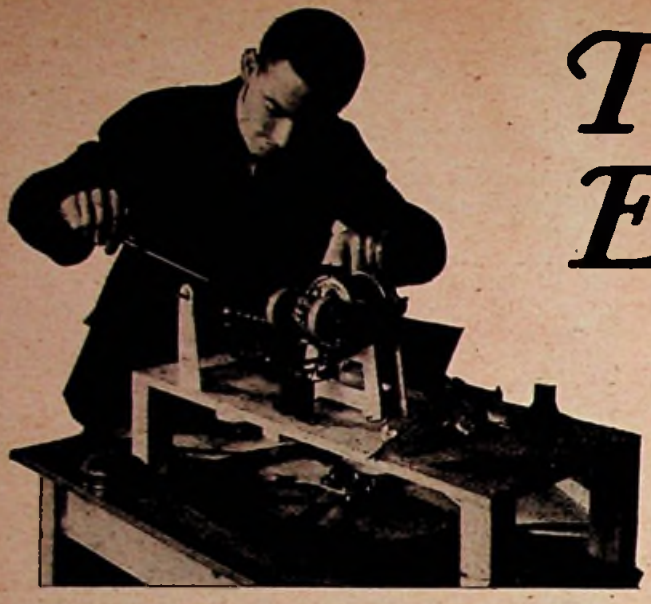
It has been said that the pentode valve does not come up to the ordinary valve in quality of reproduction. Since the conventional cone-type speaker was designed primarily to follow a power valve, there is some truth in this statement. The advantages of a pentode are sometimes not fully realised unless a "corrector circuit" is used. This corrector circuit is very simple, consisting only of a condenser



A special but simple vision wireless receiver which made use of the pentode valve in the output stage and was described in our October 1930 issue.

of 0·01 mfd. and resistance of 10,000 ohms, joined in series across the speaker terminals. The exact values cannot be prescribed, because they depend on the make of loud speaker; those given are reasonably satisfactory in all cases. If the utmost perfection of quality is desired, other values may be tried, taking those given as a starting point for experiment.

Provided that a corrector circuit is used where the characteristics of the speaker make it necessary, a pentode will always give quality equal to a power or super-power valve. The great advantages of the pentode make the extra trouble of the corrector circuit very well worth while.



The Enthusiast Sees it Through

THE month of September signalises the real commencement of the radio season, for the R.M.A. Exhibition at Olympia opens during the third week. During the "summer" (what little we have had) one's radio and television interests are not so pronounced. Holidays, outdoor sports, etc., have their place in one's activities, but with the approach of the longer nights the "experimental den" becomes a hive of industry.

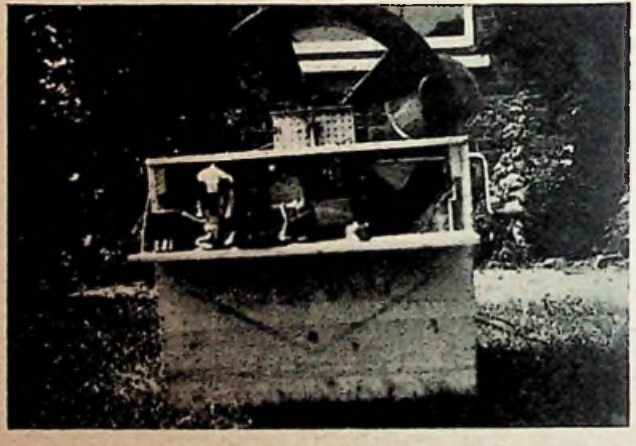
We know that new experiments in television will be tried out by our readers, and once more we renew our request to furnish us with full details of your work, together with photographs and diagrams whenever that is possible. The popularity of this "Enthusiast" series cannot be gainsaid, but obviously its continuance is dependent upon the material we receive from readers. Many letters have reached us pointing out that it was

A side view of the experimental apparatus made up by Messrs. Meadway and Gill. Note the spring which controlled the motor speed in order to "hold" the images.

through reading of the efforts of others that they first took the plunge themselves, and so we shall go on widening our circle of keen workers for television and still further increase popularity in the wonderful science.

First Efforts

To be able to receive any form of television image under difficulties must always be extremely



The wireless receiver used with this apparatus was a "Cossor Melody Maker" with the output circuit slightly modified.

gratifying, and in writing to us, Mr. N. P. Meadway, of "The Nutshell," June Lane, Midhurst, Sussex, points out that although he was studying for his Inter. B.Sc., he managed to find sufficient time to devote to the fascinating science of television. His first efforts are most promising, as will be gathered from the extracts of his letter which we print below:

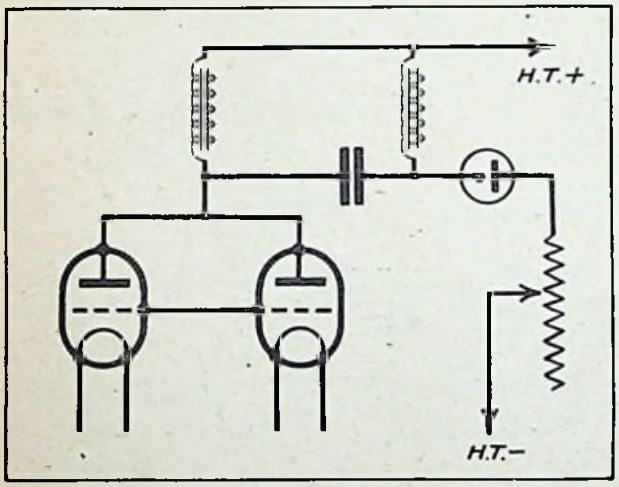
"It is now some time since you so kindly gave me all the advice and assistance you could to help me and my friend in building our experimental television apparatus, and although the experiment

was not entirely successful, I feel sure that you will be interested to receive a report of our work.

"I regret to say that the television apparatus is now dismantled, and that I shall be unable to do any more work on the subject for a little while at all events; this is because I have just completed my last term at Midhurst Grammar School, and am proceeding to Reading University next term to take a Science Degree, whilst my friend, J. C. Gill, has gone to Palestine.

"I should first explain that our work was carried on under unusual difficulties. In the first place I was working for my Inter. B.Sc., and had little time to spare, and, since the apparatus could only be in use for three weeks or so, we tried to make it as cheaply as we possibly could.

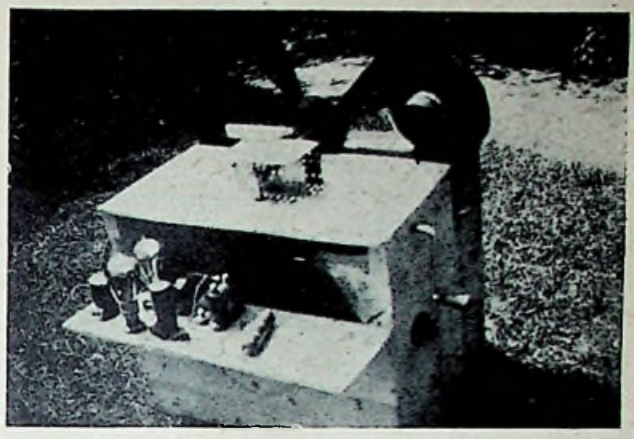
"The television apparatus had some very novel points. We had not got a suitable electric motor, and, after debating whether to buy a new one, we decided to employ a gramophone motor. We removed the governor altogether and discovered that the maximum speed was about 900 r.p.m.; the disc was of 22 S.W.G. aluminium, and the holes were $\frac{1}{30}$ in. in diameter, and countersunk. The disc was mounted on a Meccano axle, and Meccano plates were used for the bearings. The neon lamp was a Philips, striking at 110 volts. It was mounted in a parabolic motor-car reflector. One convex lens mounted in a coil-holder served to magnify the image.



In the output circuit of the wireless set the neon was joined up in the manner shown.

"The set used was a Cossor 'Melody Maker,' S.G., Det., and one L.F. Super-power Valve; the output was connected to two D.E.5 valves in parallel, and the neon was connected with chokes and condenser, as in the accompanying diagram.

"The apparatus was tried out several times, and though a definite result was obtained, it was not nearly so good as we could have wished. We had no difficulty in 'holding the image,' it was easily controllable by the tension of the spring of the motor by the handle. All the images seen, however, lacked detail. They were more or less shadowy outlines, the features not being easily discernible.



A gramophone motor was used to drive the disc, which in turn was mounted on a Meccano axle with Meccano plates for bearings.

"I attribute this largely to the fact that our scanning disc was probably not accurate enough for the purpose.

"I am enclosing photographs of the television apparatus in order that you may see what it looked like. I am also sending a copy of the school magazine in which our article on "Television" appears. I should be pleased if you would return this, as I have no other copy.

"Wishing you the very best of success with TELEVISION."

Uses Ordinary Apparatus

A reader who has been a constant supporter of the magazine since the first number, Mr. J. C. S. Davies, of Yardleys, 16, Milton Road, Harpenden, Herts, has been good enough to send us along a very interesting report concerning his reception of the Baird television transmissions. In printing extracts from his letter, we feel sure that others will find useful information in his remarks to enable them to go and do likewise. He says:

"Possibly the most interesting point about the apparatus used is the fact that it is all so ordinary.

"The actual 'Televisor' is made up from the Baird Television Company's standard kit of parts, and actually took two hours to assemble complete, which time included hunting for suitable pieces of wood to make the baseboard.

"The receiving set is the well-known 'Everyman Four,' the original model as described in the *Wireless World* for July 28th and August 4th, 1926.

and which I made up in November 1926; a design which, even now, takes a lot of beating so far as quality of reception goes.

"I am using 6-volt valves run off D.H.G. Type 'Exide' cells with a trickle charger to keep them full. The actual valves are H.L.610; H.L.610; D.E.L.610; and Mazda P.650 as the second L.F. valve.

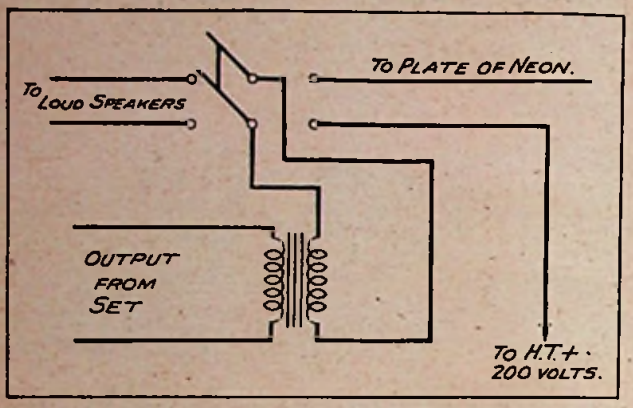


Fig. 1.—The arrangement used by Mr. Davies to tune in on the loud speaker and then switch over to his "Televisor."

"The only modifications I have made to the set are to line the case with tinplate and fit a small fixed condenser across the H.F. valve grid battery. The latter appears to make the tuning a trifle sharper, and the former was necessary as, being only eight miles from the aerial at Brookman's Park, the wires and coils inside the set picked up too much.

"The tinplate used is the kind known as 'Tagger,' which is used in the tops of air-tight tins and is cut out with a small cutter in the outer lid. It is excellent for this sort of purpose, being cheap and very easily worked, as one can cut it with scissors as easily as thick paper.

"The eliminator I made up a few months ago, and consists of a Rich & Bundy Transformer, with Westinghouse Type H.T.1 Rectifier, together with Ferranti components according to the circuit given in their booklet on eliminators, and it gives an absolutely humless output.

"The output from the set is connected to a Ferranti 1:1 transformer, the secondary of which is connected to the arms of a double-pole double-throw switch. The house circuit to various loud speakers is connected to one pair of contacts. Of the other pair, one is connected to the 200-volt terminal of the eliminator and the other to the neon lamp in the 'Televisor.' The arrangement is shown in Fig. 1.

"I can tune in and operate the set with the loud speakers and when the B.B.C. announcer says, 'We are now switching over etc., etc.' I switch over too and the picture speedily appears.

"Results obtained are on the whole good. The best I have had are quite comparable with those obtained in the Baird studios, and I have been able to see clearly the divisions between the teeth of a singer who smiled, and also the metal, not horn, frames of the spectacles of one of the Baird announcers, whom I had no difficulty in recognising when I went there recently to look in, at their invitation, to see what results ought to be like.

"As the room where the set is faces south and is therefore very light at the time of the morning transmission, I view the picture with the aid of an ordinary camera focusing cloth.

"I am using separate synchronising. A lead is taken from the grid terminal of the L.F. transformer in the set to a small fixed condenser, the other side of which goes to the grid of the valve, a Mullard P.254, with a ·5 megohm grid-leak. Actually the condenser, etc., is a Dubilier R.C. coupling unit I had by me, the wire from the L.F. transformer being connected to the terminal marked A. The arrangement is shown in Fig. 2.

"For the H.T. of the synchronising valve I use the 150-volt 'Exide' battery which I had for the set before I made the eliminator. The picture is not always as bright as I could wish, as there is a good deal of voltage drop in the rectifier and chokes. For instance, at the present moment the mains are 243, the output valve has 193 on it when operating the loud speakers, but this drops to 175 when I switch over to the 'Televisor' and the neon gets 190.

"Incidentally I have run the neon and output valve in series on this voltage and got results. I did not think that the neon would strike, but it did.

"The only real difficulty I have is keeping the picture steady, as there is an electric cooker and various other appliances at work in the morning which cause sufficient variations in the voltage to upset the whole bag of tricks.

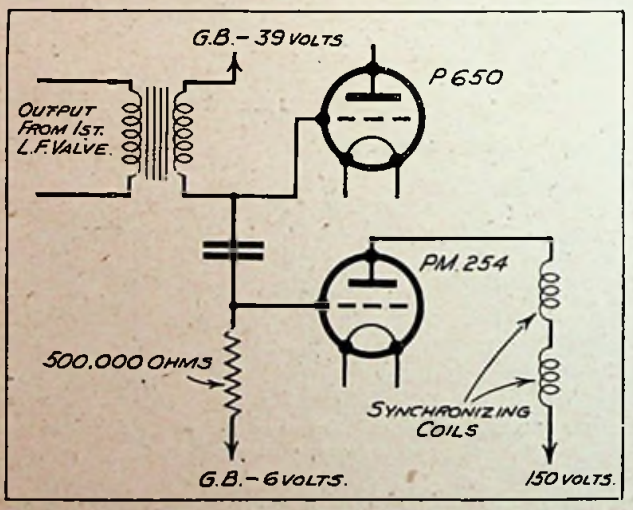


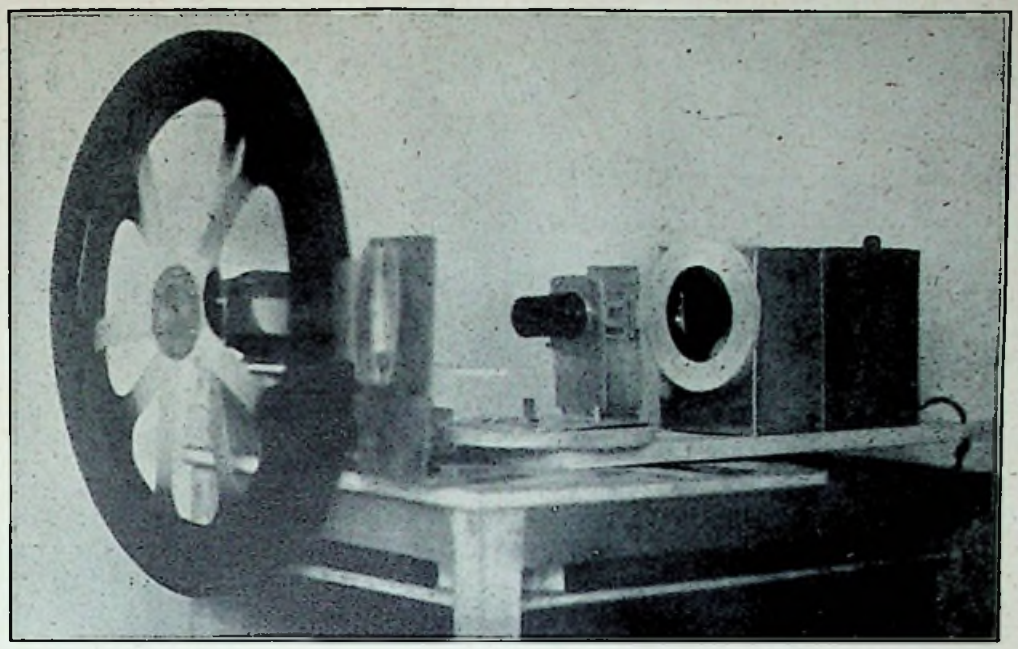
Fig. 2.—Separate synchronising is used by Mr. Davies in the manner shown in this diagram.

"Some day I mean to stop up and try the night transmissions, when things ought to be better.

"On the current issue of TELEVISION I see the words, 'Is television entertaining?'

"Well, I think I can safely say it is. A few weeks ago I had the Captain of one of the best-known pleasure cruising liners and his wife here for the day, and they came specially in time to see the pictures which luckily were going very well and

keeping unusually steady, and, judging from the movements of the focusing cloth and the sounds of mirth that came from beneath it, they found it

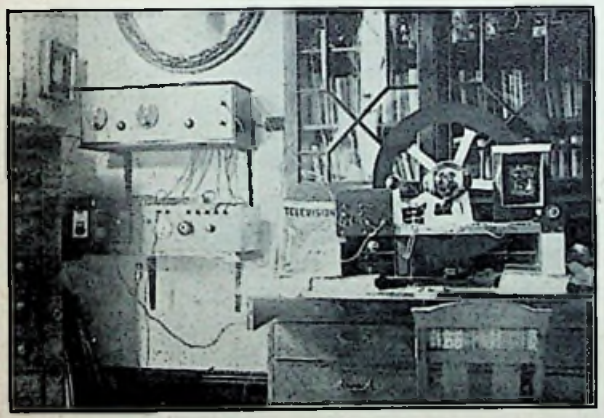


On page 256 Mr. Campbell deals at length with the question of scanned images. The simple apparatus he set up for carrying out the experiments is portrayed in this illustration.

most entertaining; in fact, they were quite amazed at the results.

"I make notes of what I see and send them to the Baird Company at the end of each week. They have not yet asked me to stop doing so, so I trust they find them useful. I need hardly say that I have taken in TELEVISION since its inception. Hence the results I get.

"As I have taken a breather during the course of writing this epistle for the purpose of receiving



An excellent photograph of the "television corner" set up by Mr. Davies and which he describes fully in this "Enthusiast" series.

the morning television programme, perhaps it will be of interest to your readers if I finish up with the actual notes which I made.

"*Monday, August 10th.* Announcer not visible.

"First item: Lady doing a monologue. Quite good. Could see ear-rings swaying about, also necklace, etc. Could see whites and irises of eyes clearly. Rather a lot of interference coming over.

"Second item: Dancer. Quite good for extended view. Could see quite a lot of details on dress and could occasionally see mouth. Still a lot of interference at intervals.

"Third item: Quite good. Could see details of dress and fur clearly. Also ear-rings and teeth. Bright lines developed down the right half of picture at intervals.

"Fourth item: Jazz drummer. Fair. Could see drumsticks. After first tune picture got very faint and ran away, but then came on strong again. Still a good deal of interference. Think it must be atmospherics. Picture got a trifle 'liney' towards the end.

"Fifth item: Not quite so good as second item. A trifle 'liney' and rather unsteady.

"These few notes in my log book enable me to compare results from day to day and also assist me to note the effects produced when any changes are made to the apparatus."

Baird Television at Scarborough

THE writer recently spent an interesting hour at the opening of a demonstration of the Baird system of television at Gala Land, Scarborough.

Although interested in the development of television, being a North-countryman, an opportunity of actually witnessing a transmission had not come my way, and therefore it was with great pleasure that on the first day of my sojourn at this well-known watering-place, I saw an advertisement to the effect that the Baird Television Company, in conjunction with the proprietors of Gala Land, were to demonstrate for some weeks both the transmission and reception of vision.

An Official Opening

The opening day, therefore, found me an interested spectator of the official opening by the Mayor and Mayoress of Scarborough, who were accompanied by many prominent local personages. By the courtesy of the proprietors of Gala Land and representatives of the Baird Company, I was privileged to be present in the studio when Sir Meredith Whittaker, Scarborough's "Grand Old Man," took his seat in front of the transmitting apparatus, and the Mayor and Mayoress entered the receiving-room. Sir Meredith, addressing the Mayor, recalled that it was fifty-four years ago that that building was opened, and he referred to the many changes it had undergone and to the great variety of attractions which had been staged there.

He recalled having been present at Hull when the first telephone connections were made to other cities, when conversations with speakers in London, Edinburgh, and Glasgow had been thought to be marvellous. He did not know what treat the Mayor might have before November 9th, but perhaps if he came back to hold that office in ten years' time and came to Gala Land, he would see something of even greater interest than they had seen that day.

Sir Meredith congratulated Gala Land on giving inhabitants and visitors the opportunity of learning something about television.

Showing the entrance to the Baird Television Exhibit at Gala Land, Scarborough.

Mayor and Mayoress Televised

The Mayoress next occupied the position of the sitter, and said that she was very pleased to be the first lady locally to speak through the marvellous machine, and she hoped the demonstrations, which were most wonderful, would be successful.

The Mayor, while being televised, said that he felt it a compliment to the Corporation for him to be invited to inaugurate those public demonstrations, and that he would like to congratulate the proprietors of Gala Land on their enterprise in introducing that invention to the public.

It was very fitting and thoughtful on the part of the proprietors, the Mayor remarked, to have invited Sir Meredith Whittaker, as the oldest gentleman in public service, to be the first to be televised.

A public opening ceremony took place from the stage of the former Indian Theatre before a large audience, where Mr. Rollason called upon the Mayor

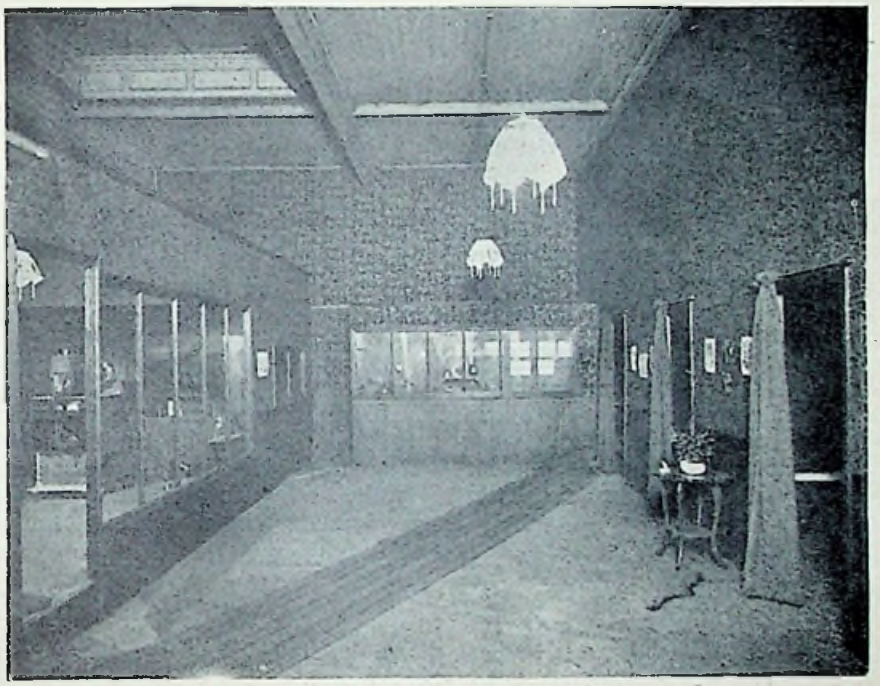
formally to open the exhibition, Alderman Sir Meredith Whittaker also speaking.

Recalling Early Days

The Mayor, in the course of his speech, said that Scarborough was progressive and always seized on anything that would interest those who came to visit them, and in that respect Gala Land did not take a back seat. He had great pleasure in declaring the exhibition open, and must congratulate the management on their enterprise.

Sir Meredith Whittaker recalled having been present at a school treat on that site seventy-five years ago, at the close of the Crimean War, and he went on to refer to some of the changes which had taken place since the building was opened in 1877. They ought to congratulate the management warmly in providing the attraction which they had just seen.

After a considerable wait, owing to the queue, I then entered the receiving stand and saw for myself the subject being "televised." Every detail of the face was clearly seen. An image of a young lady attendant at the exhibition was being transmitted, and the waves in her hair and even a ring on her finger were distinguishable, while at the same time she talked to us through a loud speaker, the microphone being installed in the transmitting room, and told us something of the history of Mr. Baird's wonderful invention.



Visitors can see the whole of the apparatus behind plate-glass windows, and in this way the whole scheme has become very popular in the North.

North Lacking Facilities

I felt, on coming out, that I had witnessed a most important event. Although we know that many people in the south of England have seen similar demonstrations and that daily broadcasts of television by the B.B.C. from Brookman's Park are being received in a number of homes around London, we people in the North have not the same facilities, and it was most interesting to hear the comments of the people as they left the hall after their first experience of a television transmission.

The majority of the onlookers expressed a desire to go deeper into the why and wherefore of this new science, and every effort has been made at this demonstration to meet these cases. There is no attempt at mystery, the entire transmitting apparatus and the control room is laid out behind plate-glass windows for all to see, and in addition a lecturer is available who conducts the parties around and explains the complete system in non-technical language, and, where additional information of a technical nature is asked for, the engineers of the Baird Company are available and willing to impart knowledge to the inquirer.

More Rapid Progress

I was told of the difficulty of the "fading" which occurs in the North from the Brookman's Park transmissions of sound and vision, and which is naturally a great drawback to enthusiasts in that part of the country, so my thoughts at once turned to the new wireless station at Moorside Edge, and the difference it would make to us Northerners who are interested, if television transmissions could be arranged to take place from this station.

My impression was that television has now advanced far beyond the stage wireless had reached eight or nine years ago, and that, granted broadcasting facilities, we should soon see even more rapid progress in technique, aided by the experiments of the enthusiast.

As a matter of interest I should like to mention that the transmissions at this demonstration were confined to the head and shoulders of the subject being "televised," but I am informed that during the daily broadcasts extended scenes are transmitted which enable one to view a stage, with a full-length view of dancers, acrobats, etc. This is obviously an advance, from the entertainment point of view, on the head and shoulders picture which I have described above.

Special Transmission

I was also interested to learn of the daylight

(*Continued on page 259*)

Scanned Images with Simple Apparatus

By *D. R. Campbell*

IN this short article it is the writer's aim to describe simple apparatus with which it is possible to produce images by the process of scanning, somewhat like those of television, but without the aid of expensive photo-cells, intricate amplifiers, and neon lamps. The images obtained by these methods give a very practical demonstration of how the photo-cell actually sees the scanned object.

Different Scanning Methods

Objects may be scanned by one of two processes, projected spot or projected image. In the first case a spot of light moves over the object to be televised, and the resulting light reflected back is picked up by the photo-cell or cells; while in the second case the image of the object is either moved across a fixed aperture, or alternatively the image is stationary while the scanning aperture is moved across the image. In both cases the photo-cell is behind the scanning aperture and therefore only receives at any instant that amount of light as may be passing through the aperture. The mechanical arrangement used in either case does not interest us, but in passing one might mention that for studio work the projected spot is supreme, whilst for outdoor work and the televising of cinema films the latter appears to be used.

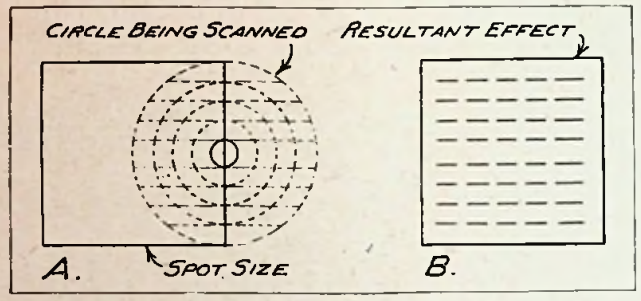


Fig. 2.—Showing how the light is diffused by the ground-glass screens, G and G_1, of Fig. 1.

Even the novice to television practices is aware that the more scanning lines that are used, the better the definition of the resulting images. Unfortunately, if the number of scanning lines be doubled, other problems, such as amplifier characteristics, light available both at transmitting and receiving ends, side bands when broadcasting, and many other minor points increase considerably, and so, for the time being, thirty lines are used in Great Britain, although television authorities in other countries experiment with various values from twenty-four to sixty.

Apparatus Employed

Taking thirty lines as our standard, it is desirable to see what can be transmitted with a sufficient degree of definition to make the transmission worth while, and with this view in mind the following experimental apparatus has been constructed.

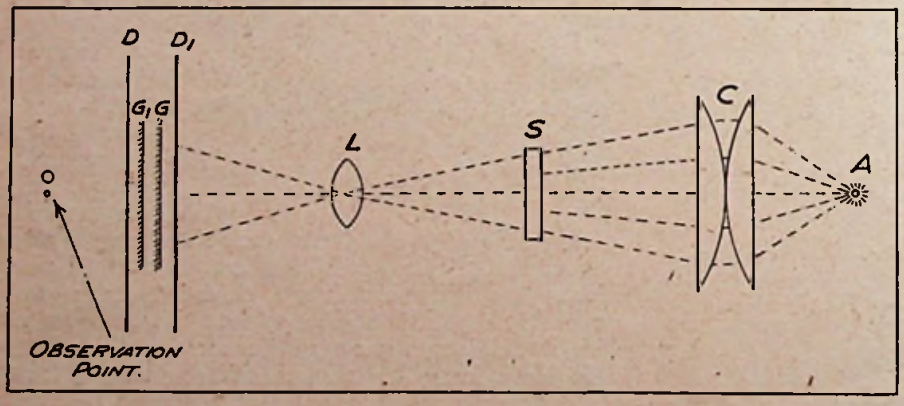


Fig. 1.—A theoretical diagram of the apparatus set up for projecting an image on to the scanning discs set up in the manner described.

Turn to Fig. 1, the theoretical diagram. A, a source of light and C, the condensing lens, are so arranged to light evenly a photographic slide, S, the image of which is projected by a lens, L, on to the scanning disc, D_1, the image being focused on

the edge of this disc in such a way that on rotation the image is scanned. Behind is a sheet of ground glass, G, as used by photographers, followed by a similar piece of glass, G_1, and finally another scanning disc, D. D_1, G, G_1, and D are separated by a quarter of an inch, the discs D and D_1 being identical

A "close-up" typically lighted in the way the cinema has educated us to expect a subject of this kind to be presented.

and mounted on the same shaft, aperture for aperture.

Effects Produced

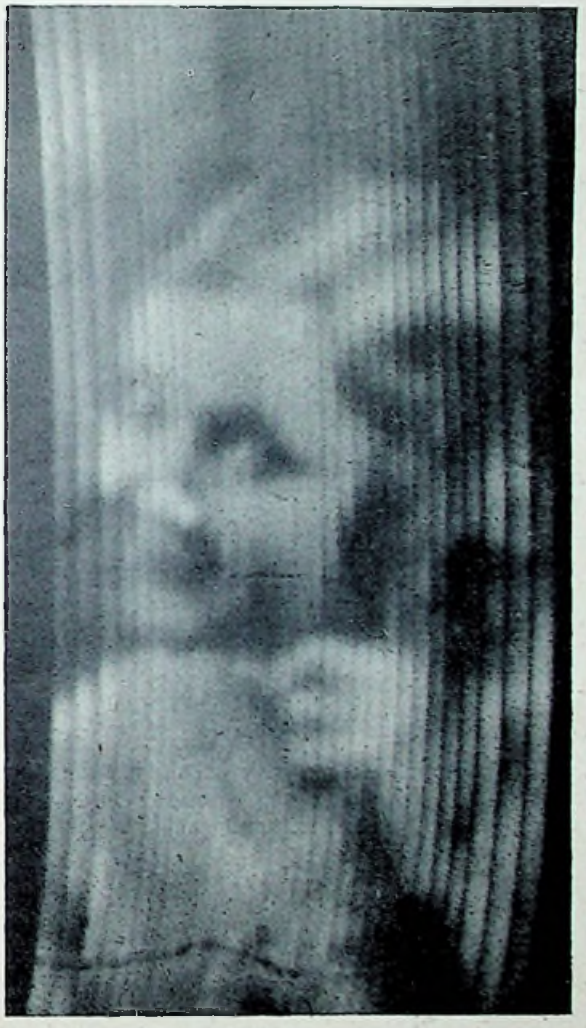
Now consider what this arrangement will produce. After the light which produces the image focused on D_1 passes through an aperture, it is thoroughly diffused by G and G_1, and while, at some given instant of time, the spot is scanning say half of a circle, such as A (Fig. 2), the result on the left-hand side of G_1 will be an even distribution of the light which originally made up the image of the half-circle, and this may be represented as B (Fig. 2). Then if G_1 is viewed through D from the point O (Fig. 1), remembering that this plate is being scanned by a changing light value, as a result of the scanning spot travelling over the image on D, an image will appear, built up of light values somewhat as the photo-cell sees it.

The apparatus can be seen from the photograph (page 253). On the right is the light source, consisting of a lantern box made of tinned sheet-iron, while the condensing lenses are mounted in a tube made up from a sheet of copper with a three-ply wood end, clearly seen in the picture. In the centre is the slide holder and lens mount.

This section has been made carefully from 1/12-inch aluminium sheet by the aid of rivets and bolts. The actual slide holder is made like a cine-projector "gate," and the lens mount is in a sliding runner so that the distance between the lens and slide may be altered for focusing purposes.

Useful Advice

On the left are two Baird receiving discs, mounted on the shaft of a small eight-volt motor,



The scanned image is shown here photographed. This should be viewed at a distance to secure the proper effect.

of the type that the maker has omitted to engrave his name on, while the ground-glass plates fixed

roughly to an old piece of aluminium bent into a bracket complete the job. The projecting lens and slide-holder unit are made for "slides" of standard cinema films, as it was found more convenient to use certain film pictures that were available.

Anyone making up similar apparatus would be well advised to obtain a cheap toy magic-lantern or cinema projector costing from 5*s*. to 10*s*., but it would be necessary to install a more powerful form of illuminant. The light source used by the writer is an ordinary 200-watt bulb, which, owing to the shape of filament, is very ineffective. A stronger source of light can be secured by using a 12-volt 8-ampere lamp specially made for projection work, but it is not always convenient to supply such a

Another subject which was used by the author of this article during the course of his experiments.

lamp with the necessary power. No doubt the more powerful type of motor head-lamp would be very suitable. A photographic artificial light enlarger would also serve as the projecting lantern.

Laying Out

Care should be taken in laying out the various pieces of apparatus. It is advisable to fix the motor, etc., while making the lens, slide holder, and lantern movable as a whole, to facilitate focusing, also the lens and slide holder relatively movable for the same reason. Take care that everything is in the same straight line. The setting of the two discs so that the apertures are exactly opposite is rather a more critical operation than it would first appear, also the setting of the ground glasses between the discs. This is best done by running the motor up to speed and then carefully sliding the glasses into position. When the motor is shut off, the discs will probably flap somewhat, and unless the glasses are firmly fixed they may be knocked out of position.

The speed of disc rotation is not important as long as it is up to 500 revolutions per minute, otherwise flicker will be rather too pronounced for comfort. Very useful knowledge can be acquired with this simple apparatus. Two examples have been photographed and reproduced. Here it must be mentioned that in true television, detail in the direction of spot traverse is improved by accentuation of certain frequencies dependent on the rate of scan and size of aperture in relation to size of total area scanned.

Actual Examples

In the first example we have a "close-up" typically lighted in the way the cinema has educated us to expect a subject of this kind to be presented. Comparing the original with that of the scanned picture, a general blurring of the finer details is noticed, though if looked at from a distance of, say, four feet, there is little to choose between them, the scanned image having a marked resemblance to the soft focus photographs one sees in so many high-class photographers' show-cases.

One particular detail has, however, been completely lost, namely that of the upright first finger. In the original, one sees the finger by the aid of the high lights on both sides, the main body of the finger being of the same tonal value as the dark mass of shadow and hair behind. In the operation of scanning four lines have been employed, and this has resulted in the high lights being so diffused as to be all but lost in the darker tones. While the finger has been lost by the process of scanning, one notices that the dark line forming the junction of the collar of the blouse and neck on the left-hand side is well produced, though relatively much smaller in detail than the finger. This is due to the angle to which this line lies to the direction of scan. Had it been vertical, it probably would have been completely lost.

Discussing Detail

Returning to the finger, one notices that four lines were used in its reproduction. If, however, the finger had moved very slightly either to the right or to the left into such a position as to require only three lines to scan it, the detail would have been improved, as one line would be only scanning the high light on one side or the other. Again, if the image was moving first to one side and then to the other it would be alternatively scanned and the general detail considerably improved.

In the second reproduction, that of a peculiar-looking steamboat with rather more rigging than is usual, only the outline survived the scanning, though careful inspection of the photographic original of

the scanned image reveals the outline of the deck housing amidships. Had this scene been in motion it would have been immediately recognisable to a "looker-in."

In both scanned pictures no attempt has been made to obliterate the scanning lines by retouching. At each side the lines will be noticed to be broader, actually three in number. This is the practice of Baird Television Ltd. to concentrate the detail in the centre of the picture. It also tends to give an overall effect of a more brilliant image and is known technically as "graduated exploration."

The Importance of Movement

Those readers who try out similar experiments are advised to try the difference between vertical and horizontal scanning of the same subject; while the results from using scanning discs with a larger number of apertures will yield some very interesting information, also the scanning at higher speeds. The problem of suitable photographic slides often can be overcome by judicious application to your local cinema management. Half a dozen odd frames give plenty of material which can be projected at different degrees of enlargement on to the scanning disc.

We who work on the practical side of television continually stress the necessity of movement for good results, a point that is far too frequently overlooked by those who should know better. One is hardly conscious of the importance of this until after careful comparisons are made of the moving image against a stationary one. It is for this reason that photographs of television images are really disappointing to most of us.

Photographic Data

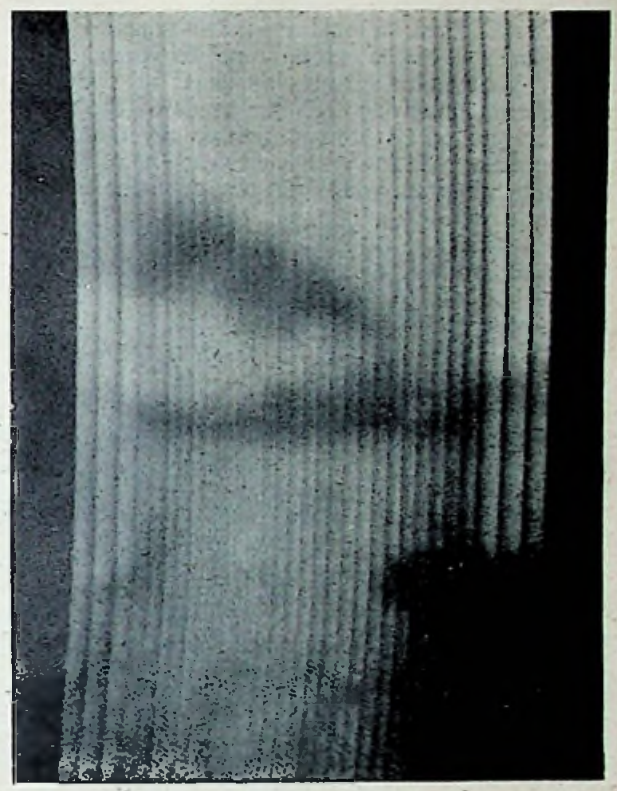
This advantage of movement can be shown quickly by an alteration to our experimental scanner. Remove the optical lantern with its accompanying lens, etc., and substitute a small cinema projector, such as the 9·5 mm. type. Project the image on the disc, carefully study one frame, and then set the projector in motion and the considerably improved quality of the image will be seen at once.

Before closing, should the experimenter wish to produce some photographic records, he must prepare for long exposures and fast emulsions. In the pictures reproduced, the exposures were 40 minutes, with a lens of F/4·5, using Ilford soft-graduation panchromatic plates; the lantern light being a 12-volt 8-ampere Philips projection lamp. The projection lens worked at F2. All extraneous light must be removed while the exposure is being made, to eliminate possible fog.

Baird Television at Scarborough

(*Concluded from page 255*)

transmitter which has been used on one or two occasions by the Baird Company, the most recent being at Epsom last Derby Day, when the Parade, a view of the crowd, and the actual finish of the race was broadcast from Brookman's Park. Although this was an experimental transmission, I believe that a considerable amount of success was obtained. It can well be imagined that any advance in this direction will create increased public interest in television, as one can well imagine the possibilities of plays and sketches with two or three characters being viewed in comfort in one's own home. This type of sketch has, as a matter of fact, already been broadcast, and it is known that the fortunate possessors of "Televisor" Receivers fully appreciated the advantage of being able to see as well as to hear the artistes concerned. I have myself very often expressed a wish, whilst listening-in to sound broadcasts, that one could actually view the B.B.C. artistes performing and the scene of action.



The absence of "motion" has caused this photograph to be rather blurred. Note the marked graduated exploration effect brought about by the Baird discs.

We have, from the earliest times, endeavoured to see over long distances. One can go back to the time of the watch towers on high points, and later on to the arrival of the telescope, both constructed with the idea of obtaining greater length of vision, and now at our doorstep we have television, which not only enables us to see over great distances, but also abolishes intermediate obstructions.

The promoters of this exhibit at Scarborough, both the proprietors of Gala Land and the Baird Television Company, should be congratulated for having between them afforded the North an opportunity to witness this wonderful demonstration.

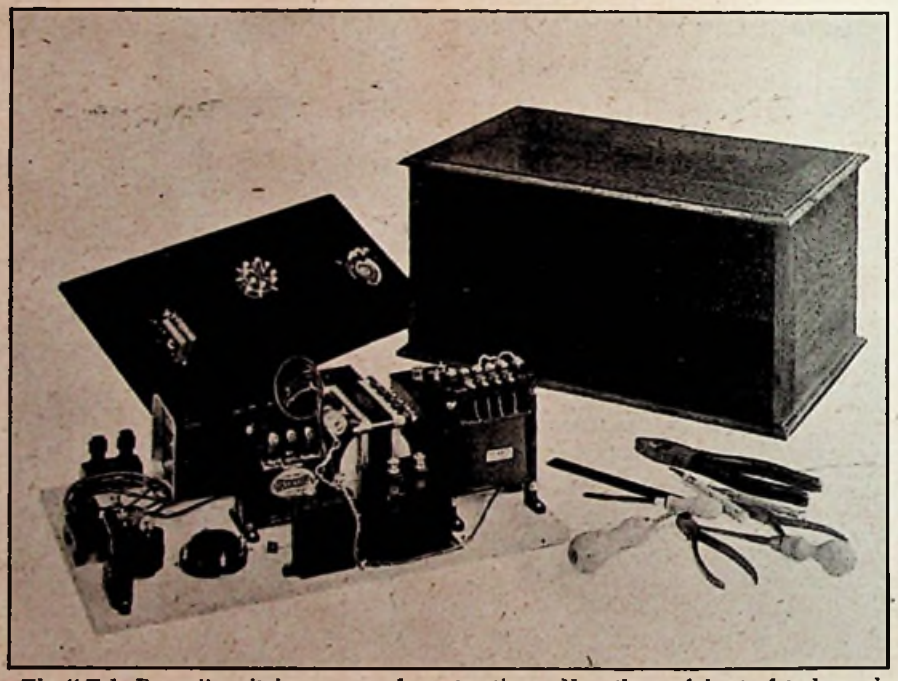
R. WALKER.

The "Tele-Power" Unit

By *H. J. Barton Chapple,*

Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

THE constructional apparatus which I design and describe from time to time in the TELEVISION Magazine has always been thought out carefully with the needs of the experimenter (and dealer) uppermost in my mind. My continued association with the science has shown me quite definitely on what lines must run the thoughts of those who are working earnestly and quietly in an endeavour to achieve the best results at the receiving end from the television image point of view, and I was therefore not surprised to find that the "Teleliminator," both the Major and Minor, together with the Output Power Unit were welcomed by many.



The "Tele-Power" unit in process of construction. Note the useful set of tools used for work of this character.

A Single Purpose

Readers will remember that the designs did not in any way confine themselves to a single purpose, for I endeavoured to make them in such a fashion that they embraced a wide service. The experimenter could then feel that any expense incurred was wholly justified, insomuch as the apparatus would step into the breach for many of the tests he may want to try out.

On the other hand, there are others who have expressed the desire for a single unit designed expressly to furnish any extra signal power that may be required to secure sufficient neon modulation, and in addition provide the external source of high-tension voltage to provide the necessary "polarising" current which obviously must be given to the neon lamp to make it glow.

I therefore decided to combine the experience I had gained by using the "Teleliminator Minor," described in the June issue, and the Output Power Unit, detailed in the pages of the July issue. This gave birth to the "Tele-Power," a complete all-mains unit, which will act as a further stage of low-frequency amplification and also give an additional voltage source.

The Need Proved

It so happens that I have been conducting a long series of tests with different wireless receivers—commercial and home constructed—to investigate their suitability for television reception, and no doubt I shall have more to say of this anon. The need for a unit such as I am going to describe was brought home to me very forcibly, however, and I am convinced that it will find favour amongst experimenters and those dealers who wish to demonstrate television with the aid of a neat and business-like coupling unit.

The whole scheme is really quite a straightforward one, and will present no difficulties to the

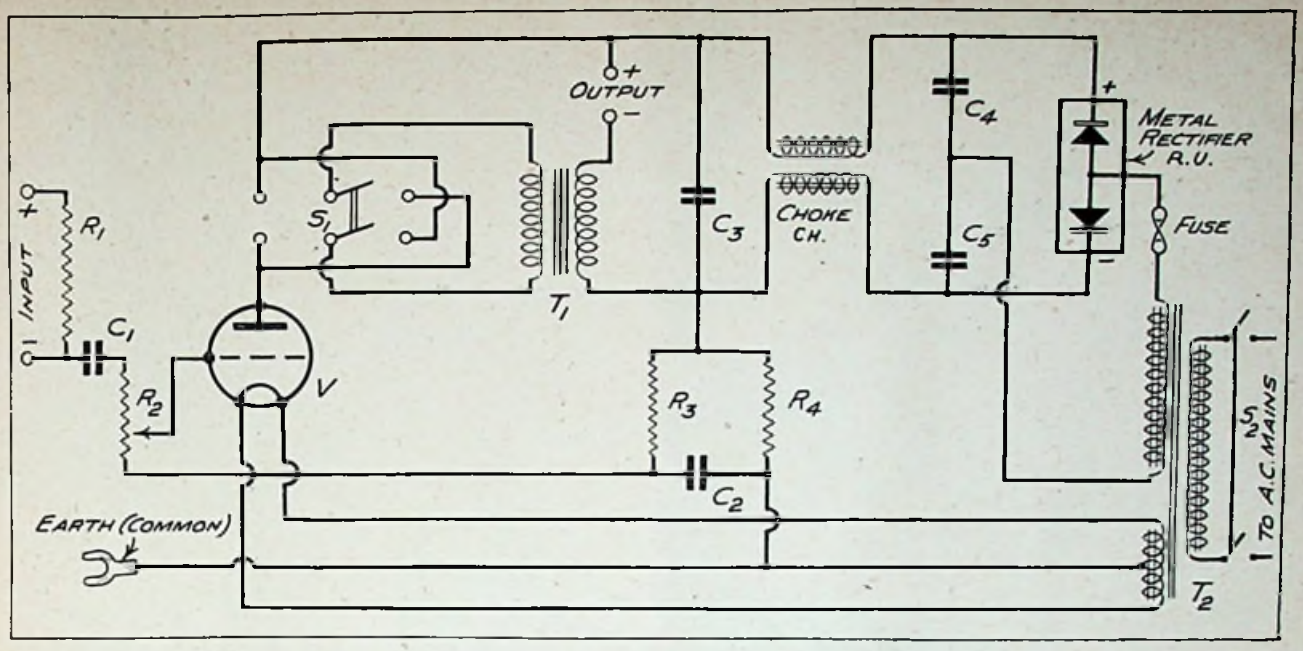


Fig. 1.—Study this diagram carefully in conjunction with the text, so as to familiarise yourself with the circuit connections of the "Tele-Power" unit.

reader of this magazine. No batteries or accumulators of any sort are required, as the whole of the energy is derived from the alternating-current house mains. (Note carefully, the Tele-Power is for A.C. and not D.C. working.)

Circuit Connections

Following my usual policy, let us begin by running over carefully the circuit connections in theoretical form as shown in Fig. 1. Reading this diagram from left to right, you will notice that in effect the last stage of your own wireless receiver which you are using to tune in the vision signals is transformed into a resistance-capacity stage coupled to an additional output power valve of the real "super" class.

This is effected by having a resistance R_1 shunted across the input + and input — terminals. By connecting these terminals to the output or loud-speaker terminals of the wireless receiver this resistance is then placed direct in the plate circuit of the receiver's last valve. Naturally the value of R_1 must be chosen to match the impedance of your last valve; that is to say, it should be of the order of two to four times the rated valve impedance.

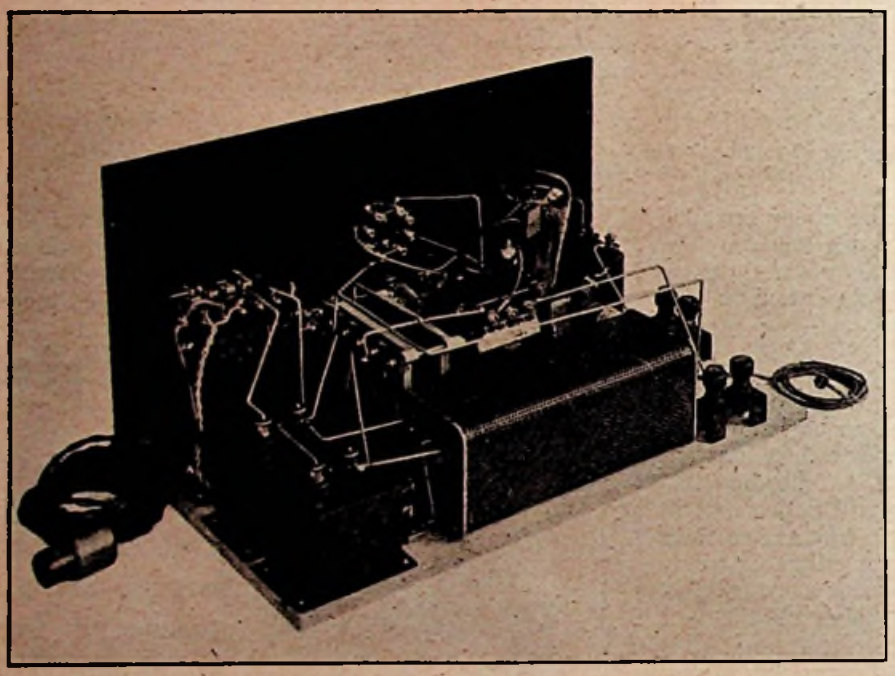
Let me forestall those readers who have a question on their lips—"What happens if the output of the wireless receiver is choke or transformer coupled?"—by saying that I will provide for this contingency when I come to the operating details, for it in no way effects the theoretical description of the functioning of the unit.

Effective Volume Control

To continue, a ·1 mfd. mica coupling condenser C_1 forms the connection to the grid of the output valve V in conjunction with a potentiometer resistance R_2. This component has a rated value of 100,000 ohms, and provides a smooth and effective volume control which in practice I have found most essential.

Coming now to the plate circuit of the output valve, I decided to employ a Ferranti OPM1c transformer. Strictly speaking this is designed to function in push-pull circuits, but by using the outer connections and ignoring the centre tap on both the primary and secondary, one is provided with a much larger inductance—a very necessary feature in television units of this class. Furthermore, provision is made to change over the connections to the transformer primary by the aid of the double-pole double-throw switch S_1. In this way the resultant television image can be made positive or negative at will as has been described in earlier issues.

One side of the secondary of the transformer passes to the output — terminal while the remaining side is joined to H.T. —. Leaving for the moment the arrangement for automatic grid-bias, we will trace the scheme adopted for providing the high-tension voltage and current. After careful deliberation I decided to employ the new metal rectifier H.T. 8 which has recently been put on the market by the Westinghouse Brake & Saxby Signal Co., Ltd.



A good view of the "Tele-Power" unit showing very clearly how the connections are made between the mains transformer and the metal rectifier unit. Note how compactly the components are placed.

A New Metal Rectifier

This unit, according to the makers, is rated to give an output of 60 milliamps., at a voltage of 250 *after* smoothing. Tests have revealed that this rating is quite conservative and is exceeded slightly, but the values given are sufficient to comfortably meet our purpose. Assuming, for example, that the neon of the vision apparatus, which will be connected across the output terminals of the unit, takes 25 milliamps., the normal working condition, this allows 35 milliamps. for the output valve.

In order to secure this output the rectifier shown as *R U* in Fig. 1 is connected up on the voltage doubler principle similar to the "Telelïminator Minor" of the June issue. The A.C. house mains output passes through a double-pole quick make-and-break switch to the primary of a special transformer, which has been made up for me by Messrs. Wright & Weaire, Ltd. Tappings are provided on the primary side to suit input voltages of 200, 220, and 240, but the makers are prepared to supply the transformer to suit any other voltage, and this should be specified when ordering.

Voltage Doubling

One secondary winding passes to the rectifying unit and two 4 mfd. condensers C_4 and C_5, so that a "bridge" formation is secured, and in this way the voltage doubler characteristics of the unit are secured. Note the inclusion of a 300 milliamp. fuse in one of the leads, in order to protect the apparatus from damage if for some reason an overload should occur. Be careful to see that the rectifying unit is joined the right way round, the positive and negative terminals being marked clearly.

The supply of rectified A.C. available in its raw state at the extremities of C_4 and C_5 is now smoothed by being passed through a heavy-duty Parmeko choke (Ch) wound in two halves so that one leg is in each side of the circuit. It will be noticed that this choke is lettered 1 and 0, and must be connected exactly as shown, otherwise the resulting inductance will be below the rated value. A 4 mfd. reservoir condenser C_3 completes this side of the circuit.

Automatic Grid-bias

To conclude our survey of this diagram we will next deal with the valve and grid-bias. I am specifying a Mullard DO/25, a large power amplifying valve which is suited admirably for this purpose.

In order to secure the maximum efficiency, the appropriate grid-bias must be applied. Any attempt to run the valve without grid-bias even for a short time will ruin it, and the most convenient way to prevent this happening is to employ the arrangement shown in Fig. 1. R_1 is the bias resistance of a value of 1,750 ohms, and must be of the wire wound type capable of carrying the full anode current of the valve. It has been made up for me specially by Messrs. A. F. Bulgin & Co., Ltd.

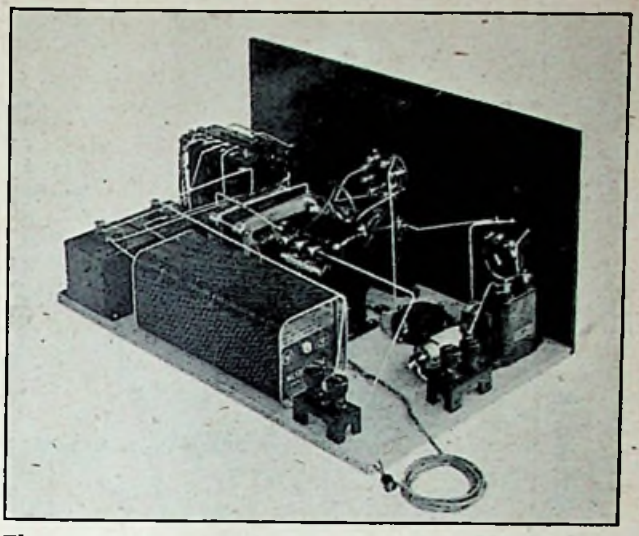
A decoupling resistance R_3 of 100,000 ohms in conjunction with a 2 mfd. condenser C_2 are also shown and the junction between these two passes to the extremity of the potentiometer R_2 to apply the correct bias.

The filament of the valve is rated to consume 1·8 amps. at 6 volts, and is supplied by a second winding on the secondary of the mains transformer. A centre tap on this winding becomes the common earth connection between the unit and the television wireless receiver.

Component Details

I think this covers fairly well the theoretical aspect of the "Tele-Power" unit, and we must now turn our attention to the constructional details. First of all as to the components required. These are detailed in full below, together with the names of the manufacturers, while, in addition, the symbol representing each component as shown in the theoretical diagram and wiring diagram is given by the side. This will enable the constructor to see exactly where each item is placed.

I have not suggested any alternatives, but should you decide on any for personal reasons, let me emphasise the importance of making sure that each substitute is capable of fulfilling its individual task efficiently and is of reliable make.



The earth lead, terminating in a spade tag, is seen as a flex coiled up at the bottom of the picture.

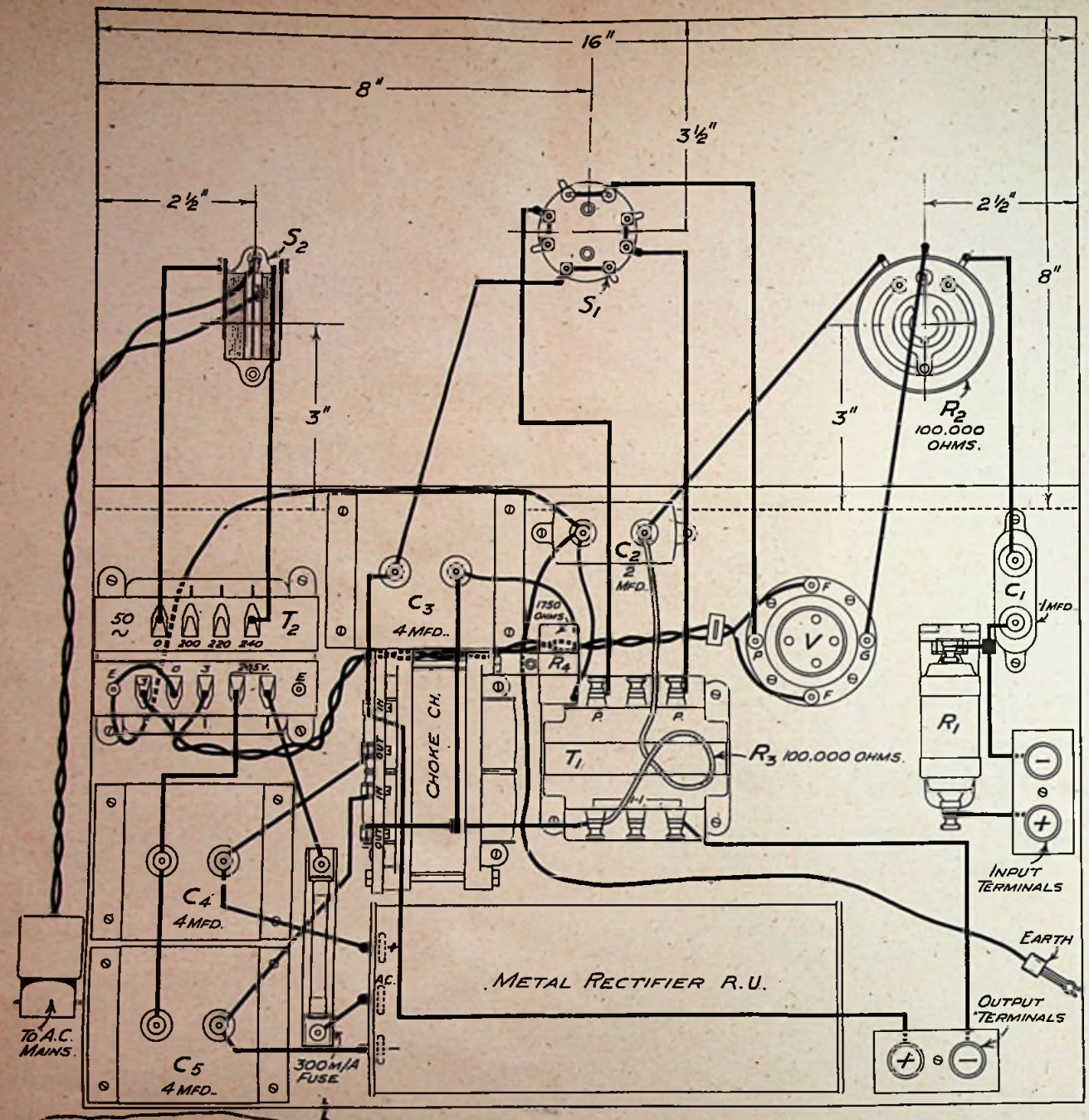


Fig. 2.—The complete panel and baseboard wiring diagram which should be followed exactly when wiring up the unit.

One mains transformer as specified and to suit your own A.C. house mains (T_2). (Wright & Weaire, Ltd.)

Three 4 mfd. Type LSB Condensers (C_3, C_4, and C_5). (Dubilier Condenser Co. (1925), Ltd.)

One 2 mfd. Type BB Condenser (C_2). (Dubilier Condenser Co. (1925), Ltd.)

One ·1 mfd. Type B 775 Mica Condenser (C_1). (Dubilier Condenser Co. (1925), Ltd.)

One heavy-duty smoothing choke, type 2 (Ch). (Partridge & Mee, Ltd.)

One metal rectifier, Type H.T.8 (R.U.). (Westinghouse Brake & Saxby Signal Co., Ltd.)

One output transformer, type OPM1c (T_1). (Ferranti Ltd.)

Four insulated terminals (output +, output —, input +, and input —). (Belling & Lee, Ltd.)

Two terminal blocks. (Belling & Lee, Ltd.)

One spade tag (earth). (Belling & Lee, Ltd.)

One antiphonic valve holder. (Whiteley Electrical Radio Co., Ltd.)

One 100,000-ohm Centralab potentiometer, type P100 (R_2). (Rothermel Corporation, Ltd.)

One 10-watt power resistance (to suit output

valve in set) with holder (R_1). (Varley.)

One double-pole rotary switch (double throw) (S_1). (Benjamin, Ltd.)

One 300-mA. fuse. (Microfuses, Ltd.)

One double-pole quick make-and-break switch, type S.56 (S_2). (A. F. Bulgin & Co., Ltd.)

One 100,000-ohm wire wound resistance link (R_3). (A. F. Bulgin & Co., Ltd.)

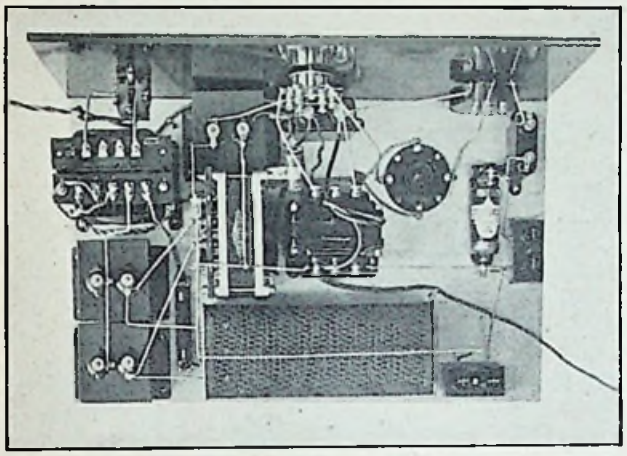
One heavy-duty A.C. grid-bias resistance (1,750 ohms) (R_4). (A. F. Bulgin & Co., Ltd.)

One ebonite panel 16 in. by 8 in. by $\frac{1}{4}$ in. (Trelleborg Ebonite Works, Ltd.)

One oak cabinet to take above panel with baseboard 10 in. deep. (Peto-Scott Co., Ltd.)

One super power valve (DO/25). (Mullard Wireless Service Co., Ltd.)

Quantity of Glazite connecting wire and 4 ft. of flex. (Lewcos.)



A good plan view which may be used in conjunction with Fig. 2 for wiring up.

Follow Original Lay-out

Having collected together all the components listed, our next step is to assemble them in position. The wiring diagram of Fig. 2 and the accompanying photographs indicate clearly how this should be carried out. I spent a considerable time on this section of the design and I strongly advise the constructor to follow my lay-out with meticulous care to ensure the proper functioning of the completed unit. You will notice that the Ferranti OPM1c transformer has had the feet reversed, so as to bring the terminals to the top for ease of connection.

First of all I advise you to fit the panel and baseboard into the cabinet to ensure a snug accommodation. Then drill the panel to take the potentiometer, rotary change-over switch and mains switch, the dimensions for this being given on the panel section of the wiring diagram of Fig. 2. As there are only three components it was felt unnecessary to furnish a separate panel-drilling diagram according to the usual practice.

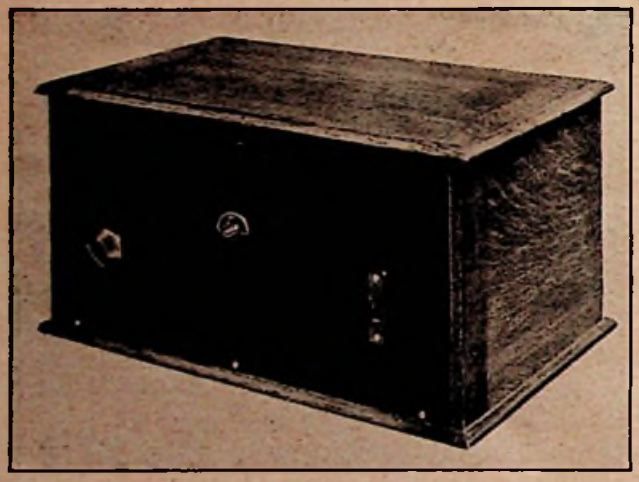
Wiring

Having screwed these in place, lay the panel on one side for the time being and devote your attention

to the baseboard. The A.C. grid-bias resistance is held by the clip on one of the fixing screws of the Parmeko choke for convenience, and if you have screwed all the components to the baseboard, proceed to the next stage in the construction, namely, the wiring.

I have carried this out in Lewcos Glazite wire, as it is firm and rigid and yet easy to work. Soldered joints have been made almost throughout, but if the constructor prefers he can bare the wire ends and loop them under the terminal heads.

For the filament supply from the mains transformer secondary to the valve holder it is necessary to twist together the pair of wires as shown and tuck them away neatly as indicated in the diagram and photographs, and this should be the first connection made. Then run the rubber-covered flex for the common earth lead, terminating the free end in the spade tag and clipping the lead to the baseboard by small insulated staples or soldering tags bent over.



A particularly neat appearance with simple controls characterises the "Tele-Power" unit.

All the other wiring is quite straightforward and simple if you follow Fig. 2 and use the photographs to guide you as to the manner in which the leads are run in perspective. Before attaching the panel, join the mains flex to an adaptor and then to the mains quick make-and-break switch.

Preparing for a Test

Having undertaken all the wiring possible on the baseboard alone, screw the panel to the baseboard, and complete the connections. In passing, let me draw your attention once more to the fact that only the outer terminals on both the primary and secondary windings of the OPM1c transformer are utilised, this being to obtain the larger inductance mentioned earlier in the text.

Now check your handiwork to ensure that every connection is sound electrically, and also that no wire has been omitted or a lead placed incorrectly. All is then in readiness for testing the "Tele-Power" unit under normal conditions of television reception.

If in the wireless receiver you propose to use for television reception, the output side is "open," that is, if it has no choke or transformer coupling, then the value of the 10-watt power resistance R_1 should be about three to four times that of the valve impedance. Then join the receiver output + and — terminals (or L.S. + and —) to the input + and — terminals respectively, and the output terminals of the unit to the vision apparatus; that is, the neon and synchronising coils, if the latter are incorporated.

A Useful Suggestion

It is quite a good plan to include a variable resistance in series with the neon and output + and — terminals, one capable of carrying the full neon current, for in this way the current flow through the neon can be controlled to suit your own fancy. The output from the eliminator is ample for all ordinary purposes, and that is why this idea may appeal to some experimenters.

In those cases where the wireless receiver is choke or transformer fed, and it is possible to get to these points inside the set, disconnect them and join the unit input terminals to the valve plate and H.T. +. If this plan is not possible, just join up the set output terminals to the unit input terminals and make R_1 about 20,000 ohms. The A.C.

(*Continued on page 278*)

The Reception of the English Television Transmissions in Berlin

By George Kette[1]

THE experimental television transmissions of the Baird Television Company have been observed almost regularly on Friday nights during the past year in Berlin-Steglitz. During the daytime practical reception of the English transmissions with the apparatus available was impossible, and would have been very difficult to attain also owing to the extremely low field strength of the radio wave in a city during the day.

Illustrating what has come to be known as ghost images and to which reference is made on this page.

The English transmit television proper in contrast to the telecinema transmissions of the Germans, *i.e.* persons and objects are transmitted directly, the image and the accompanying sound or music being transmitted over two radio transmitters simultaneously.

Quality

It is rather difficult to pronounce judgment on the quality of the image in the English transmissions, for we are dealing with television reception and all the well-known disturbances and disadvantages become serious. The quality of reception varies not only with the weather but also depends largely on the season. In addition, severe disturbance is sometimes caused through neighbouring transmitting stations; this is marked by shrill whistling sounds in the loud speaker, and on switching over to the glow-lamp the picture is covered by a fine-meshed net. Again, especially during strong fading, the modulation of a broadcasting station will penetrate and almost cover the picture modulation. The image is also spoiled and badly distorted by the atmospherics, particularly frequent during warm weather.

Recognisable through Atmospherics

Atmospheric disturbances in picture reception have not such a bad effect, however, as in the reception of sound, for owing to the movement of the picture it is still recognisable. The atmospherics corresponded, moreover, in time and intensity on both wavelengths (vision and sound), which was not generally the case with fading. Strong and continuous fading, however, may at times completely wipe out the image. In general, it may be stated with regard to the English television transmissions that, given favourable conditions for reception and particularly when there is no oscillation, it is possible to receive a good picture, with clear detail.

A rare and interesting phenomenon was observed on October 18th, 1930. This evening so-called ghost effects or echo phenomena were noticed for the first time. Whilst a head and shoulders image was being transmitted, two heads suddenly appeared one on top of the other, with all details exactly alike, but the second head was not quite so bright and clear as the original. Then a distorting and dark, blurring effect took the place of the second head. The image then became gradually clearer and was finally normal again.

Two Rows of Writing

The same phenomenon was observed once more with the writing; two rows of writing stood closely adjacent in such a way that the letters partly fitted

[1] Extracts from article in *Fernsehen*, July 1931.

into each other. Two rows of writing showing the same text were clear and plainly legible until distortion and fading took place and the reproduction gradually became normal again. These phenomena lasted for about one or two minutes. During the whole of the transmission there was strong fading and blurring of the image.

These ghost effects were later observed again on October 25th and December 10th, 1930, but they were then of brief duration and not so marked as previously.

The great advance shown in the nature of the programme given by the "extended scene" is proved by this illustration. According to observations in Berlin, it was pleasing to observe that even glasses and bottles, which stood on a table between the actors, were easily recognised, although the image at the receiver was comparatively weak that evening.

A Varied Programme

As regards the programmes in the television transmissions, it must be admitted that the Baird Company endeavours to offer as varied a programme as possible.

The heads or head and shoulders of men and women were shown during the first transmissions, and were at times very clear. I would like to add that the first impression at the simultaneous reception of vision and sound is surprising. It is probably a physiological effect which gives the observer the impression that the image is clearer because of the accompanying speech and the action more easily followed.

Later on two heads were frequently transmitted together. Besides singers and violinists, there also appeared lightning cartoonists and artists who demonstrated their "dark" arts before the light-spot transmitter. The hand with the charcoal and the sketch, as well as the tricks (*e.g.* with hens' eggs and other objects), were all very clear. Another time a big competition was arranged, which consisted in showing various objects and pictures with numbers, to be identified by the observers. The paper pictures by an artist were also very pretty; even the scissors in his hand were recognised. The different items in the programme were always given by an announcer.

The programmes for the following transmission were always shown in writing, with the names of the actors taking part.

Novel Features with Extended Scenes

Since March of this year a novel feature has been introduced into the transmissions. Besides the usual head-and-shoulders image, it is now possible to transmit the whole figure. For this purpose a new light-spot transmitter is used. Both transmitters are used alternately. Not long ago a concert party was transmitted; the director was shown full-length, as was also a dancer. In one sketch even three persons were shown full-length. It was pleasing to observe that even glasses and bottles, which stood on a table between the actors, were easily recognised, although the image at the receiver was comparatively weak that evening.

Observations on Battery Eliminator Condensers

By *John W. Woodford*

THE modern radio receiver utilising thermionic valves normally needs to be energised from three distinct electrical sources, namely, high tension, low tension, and grid bias. Now, these three sources of voltage and current can be obtained from the electric-supply mains by appropriate apparatus, and usually this is referred to under the name of "Battery Eliminator." Some battery eliminators supply all three sources of energy to the receiver, while others supply only the H.T. or only the L.T., leaving the remaining energy to be derived from accumulators or other batteries, but all types of battery eliminators make use of condensers in one form or another.

Filter Circuits Necessary

The general principles underlying the operation of battery eliminators as applied to high tension have been described in other articles in this journal, but it will be noticed that in all eliminators some form of filter circuit, consisting generally of inductances and condensers, is employed. The precise arrangement of the apparatus necessary to provide the H.T. or L.T. supply to a radio receiver depends in the first place upon whether the electric-supply network or system to which the apparatus is to be connected is a direct or alternating current one.

In the former case, a simple filter circuit can be adopted; while in the latter, rectifying apparatus is necessary in addition to the filter. In either case a

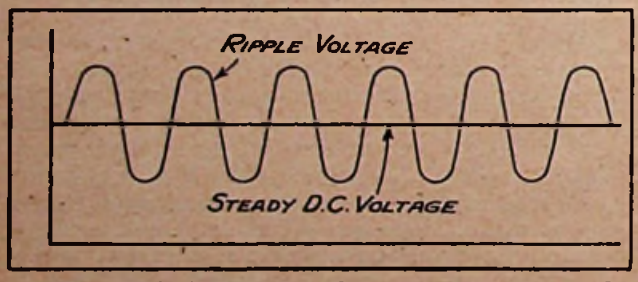


Fig. 1.—The ripple voltage superimposed upon the steady D.C. voltage causes a much greater strain on the fixed condensers used in an eliminator.

potentiometer device or similar means of subdividing the total potential output of the apparatus generally is incorporated, and in this connection also condensers are desirable to prevent reaction effects between the various stages of the radio receiver which is connected to the battery eliminator apparatus.

Conservative Ratings

Now, it will be appreciated that the type of condenser which can be employed in such an apparatus necessarily depends upon the normal working voltage, but a considerable variety of choice is open as to the exact arrangement of the condensers which may be utilised. In addition, since the apparatus is connected to the electric-supply systems, frequently of considerable size, it should be borne in mind that serious results may arise in the event of an accidental short circuit in the eliminator through the failure of a condenser dielectric and other conditions.

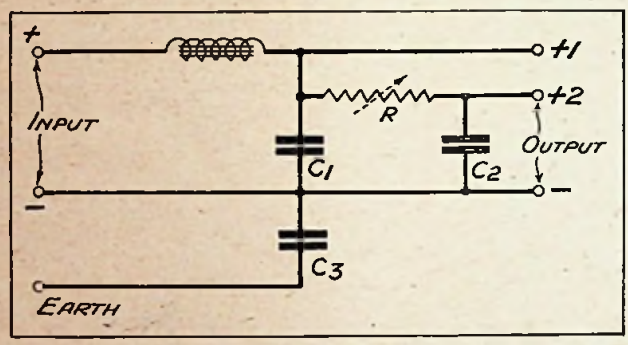


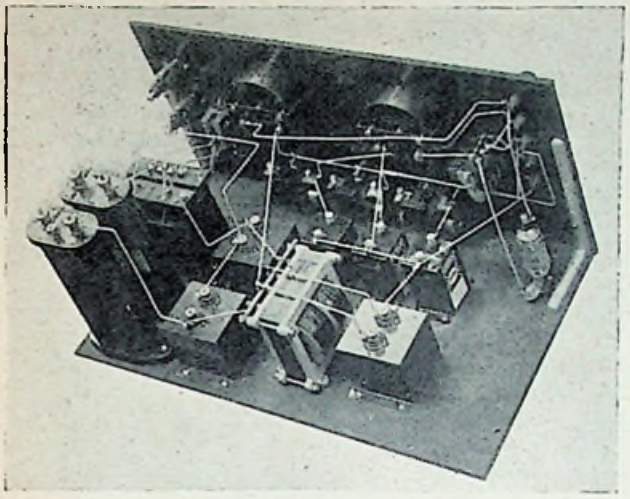
Fig. 2.—A simple single stage filter circuit employing an "earth" condenser.

For this reason a very conservative rating of the condensers is desirable, and only those of the highest efficiency should be considered for the purpose. Furthermore, do not forget that the condensers are called upon to smooth out ripple voltages from the circuit. These ripple voltages arise from commutator ripple, etc., on D.C. circuits, or from the rectified impulses in the case of A.C. circuits used with some form of rectifying valve or other rectifying apparatus.

This being the case, the voltage to which they will be subjected is one which imposes more severe stresses upon the condenser dielectric than does a steady D.C. voltage, the ripple voltage representing the superimposition of an alternating voltage upon the steady D.C. output voltage of the apparatus (see Fig. 1).

Typical Circuits

The peak values of this ripple voltage must therefore be studied to ensure that the peak voltage of the circuit, taking this to be the steady D.C. voltage added to the peak of the ripple voltage, does not exceed the rated D.C. (peak) voltage for which the condenser is suitable.



An example of a good quality battery eliminator employing fixed condensers in the manner described.

The accompanying diagrams represent one or two typical arrangements of battery-eliminator filter circuits. That of Fig. 2 shows a single-stage filter consisting of a choke coil with a condenser C_1 connected across the supply circuit, the output terminals being connected across the smoothing condenser. A further lower-voltage output terminal is derived by the use of a resistance R, which may be fixed or variable, connected in series with a further smoothing condenser C_2, the output terminal connected to this point giving a lower output voltage than from the main output terminals of the apparatus.

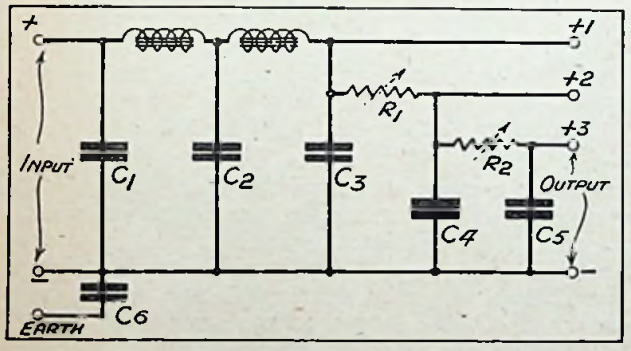


Fig. 3.—The input condenser C_1 is essential when this filter is used in conjunction with a rectifier on an A.C. supply current.

Avoiding a Short Circuit

In addition to these two condensers, C_1 and C_2, forming part of the filter circuit, an additional condenser, C_3, is shown connected between the negative side of the apparatus and the earth terminal. A condenser of this type should always be fitted between such apparatus and the earth connection of the radio receiver, in order to avoid a short-circuiting of the supply circuit to earth by the radio earth connection.

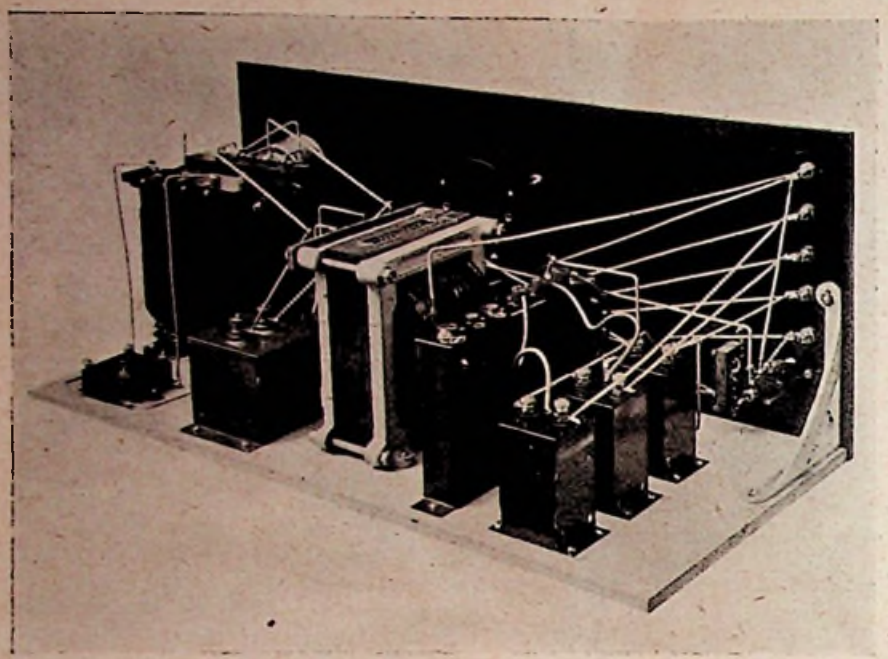
This conforms to the wiring rules issued by the Institution of Electrical Engineers. The three condensers, C_1, C_2, and C_3, in this diagram can either be chosen from separate condenser units or can be combined together into a single containing case, forming a condenser block.

A "Main" Condenser

A slightly more complex filter circuit is indicated in Fig. 3, and shows a two-stage filter with two choke coils and two output filter condensers, C_2 and C_3, and two additional condensers, C_4 and C_5, for two further output voltages, used in conjunction with the resistances R_1 and R_2. The earth condenser, C_6, will be noted, and in addition a further input condenser marked C_1. This last-named condenser is essential when this filter or that of any other design is used in conjunction with a rectifier on an A.C. supply circuit, as it provides the main smoothing capacity for the rectifier. This main smoothing condenser should be given as large capacity as possible, and a value of 6 to 8 microfarads is commonly adopted.

For the intermediate smoothing condenser be-

tween the filter chokes in the case of a double-stage filter, that is to say, the condenser marked C_2 in Fig. 3, a capacity of about 4 micro-farads is very commonly employed, while the output capacity marked C_1 in Fig. 2 and C_3 in Fig. 3 may also have a value of the order of 4 micro-farads, although smaller values are sometimes used if space or cost is a consideration. The condensers connected across the individual voltage output tappings—that is, C_2 in Fig. 2 and C_4 and C_5 in Fig. 3—should have values of not less than 0·5 micro-farad each, although a capacity of at least 1 micro-farad should be used whenever possible.



Whenever a high-class eliminator is made up such as the one illustrated (Teleliminator Major), then the fixed condensers must be very liberally rated to avoid any risk of the breakdown of the condenser dielectric.

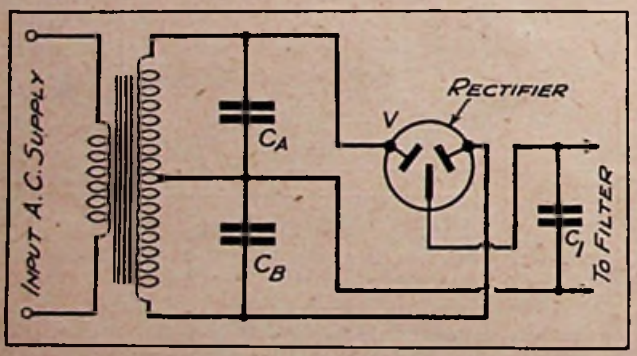


Fig. 4.—A suggested arrangement for a double-wave rectifier using "bridging" condensers.

The earth condenser in the two diagrams may conveniently have a value between 0·1 and 0·5 micro-farad, the exact value not being at all critical.

"Bridging" Condensers

Where these filter circuits are used in conjunction with rectifier apparatus on A.C. circuits, it is often desirable to fit bridging condensers across the transformer feeding the rectifying valve or other apparatus. In Fig. 4 two such bridging condensers, C_A and C_B, are shown connected across the two halves of the secondary winding of the transformer. The mid-junction point of these two condensers is joined to the mid-point of the transformer secondary and to the negative terminal of the output circuit. A rectifying apparatus of the double-wave rectifying type is indicated at V, while C_1 in this diagram is the main smoothing condenser which forms the initial condenser of the filter or smoothing circuit and is marked C_1 in Fig. 3.

This pair of bridging condensers is frequently made up as a single unit, either incorporated into the main condenser block or, preferably, used as a separate condenser. Capacity values of 0·1 micro-farad each or 0·25 micro-farad each are convenient values to be employed.

Liberal Rating

These two condensers, which, it will be noted, are connected directly across the transformer secondary, are subjected to alternating current voltages. They should therefore be liberally rated to avoid risk of breakdown of the condenser dielectric. Since with many rectifying arrangements used for battery eliminators giving H.T. supply to radio receiving apparatus an output voltage of the order of 150 to 200 volts is required on the D.C. side of the apparatus, and even higher for television purposes, the transformer secondary which feeds the rectifying device may have a voltage of the order of 300 to 350 volts A.C. on each half, so that the two bridging condensers should each be suitable for this voltage. Condensers tested at not less than 1,000 volts A.C., or, say, 2,000 volts D.C., are suitable for this use in order to ensure reliability of operation.

Making Wireless Calculations Easy

By *William J. Richardson*

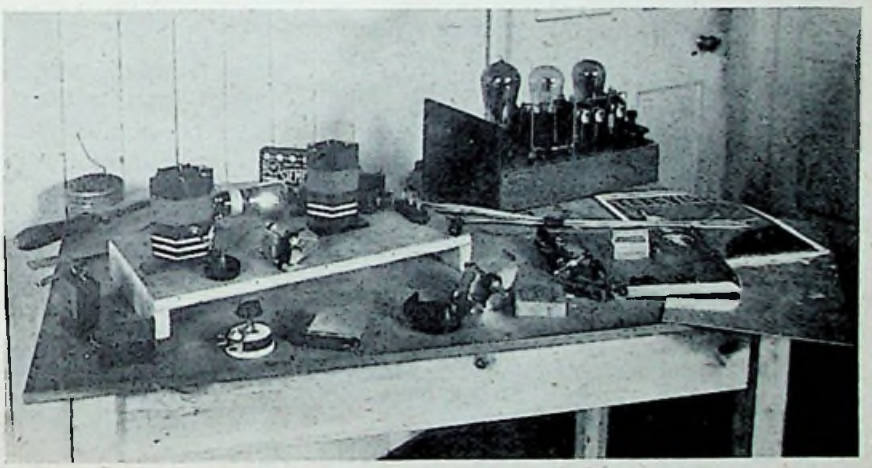
(Concluded from the August issue)

IT is very gratifying to hear from readers that the article which appeared in last month's issue of this journal proved both interesting and instructive. In many cases it was the first time that they had heard of the magic symbol "j," while others, although aware of its mathematical existence, had failed to appreciate its full significance and still less put it to practical use.

Application

I feel therefore that I shall help best by working out a few examples to show its application to radio working. From experience I have found that nothing is of greater importance than to demonstrate the working of a principle once that principle has been explained or established.

Let us take a simple case therefore, say, for example, the grid-leak and condenser which is used in such a large number of radio receivers to make a valve function as a detector, or to use a more



Before embarking on the construction or lay-out of apparatus it is better to study theoretically the points involved. A stage in the progress of Mr. Richardson's design work is shown here with his famous amplifier at the back on the right.

current term, rectifier. This is shown in Fig. 1, and let R and C represent the value of the resistance in ohms and capacity of the condenser in farads. For the purposes of explanation it is preferable to work in terms of symbols, and afterwards, when desired, figures can be substituted for the letters and a true result in ohms determined.

A Simple Case

Since the condenser and resistance are in parallel and we wish to find their combined impedance as a whole, we must first of all apply the law for parallel impedances which says that the reciprocal of the resultant impedance is equal to the sum of the reciprocals of the individual impedances. Calling this total impedance Z we have therefore

$$\frac{1}{Z} = \frac{1}{R} + \frac{1}{-\frac{j}{\omega C}}$$

Combining the two quantities on the right this becomes

$$\frac{-\frac{j}{\omega C} + R}{-\frac{jR}{\omega C}}$$

Therefore the impedance is given by the expression

$$Z\,\frac{-\frac{jR}{\omega C}}{-\frac{j}{\omega C} + R} = \frac{-jR}{-j + R\omega C}$$

Now from the rules explained last month our working expression therefore becomes

$$\frac{R}{\sqrt{1 + \omega^2 C^2 R^2}}$$

which of course is quite simple.

Tuned Circuits

Another very interesting case, and incidentally a most important one, is illustrated in Fig. 1. Here is shown an ordinary tuned circuit consisting of a coil possessing inductance and resistance in parallel with a condenser which can be fixed or variable according to requirements. This circuit crops up everywhere in wireless, and I doubt whether there is a single radio receiver which does not have at least one tuned circuit which must be employed to make it function satisfactorily.

Tuned aerial coils, grid coils, anode coils, rejector circuits, acceptor circuits, wavetraps, valve oscillators, tuned intervalve transformers for supersonic

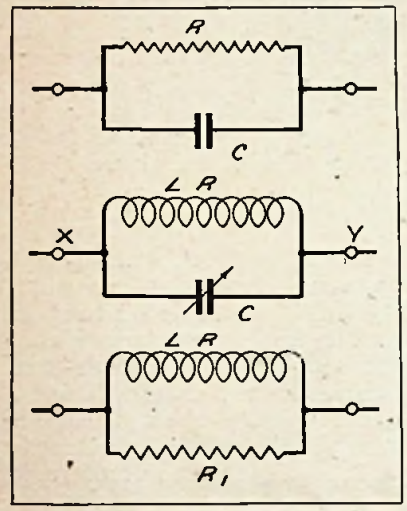


Fig. 1.—Showing the three simple circuits which are dealt with in order so as to indicate clearly how the impedance is derived.

reception—all these and many others come under this category, so that it will be most useful to ascertain the total impedance of the parallel circuit; that is to say, across the points X and Y.

Deriving the Expression

Once again the law for parallel impedances is required, and assuming the coil has an inductance L in henries and a resistance R in ohms, while the capacity in farads of the shunting condenser is C, we have

$$\frac{1}{Z} = \frac{1}{R+j\omega L} + \frac{1}{-\frac{j}{\omega C}}$$

$$= \frac{-\frac{j}{\omega C} + R + j\omega L}{-\frac{j}{\omega C}\,(R + j\omega L)}$$

Therefore the impedance Z is given by

$$Z = \frac{-\frac{j}{\omega C}\,(R + j\omega L)}{-\frac{j}{\omega C} + R + j\omega L}$$

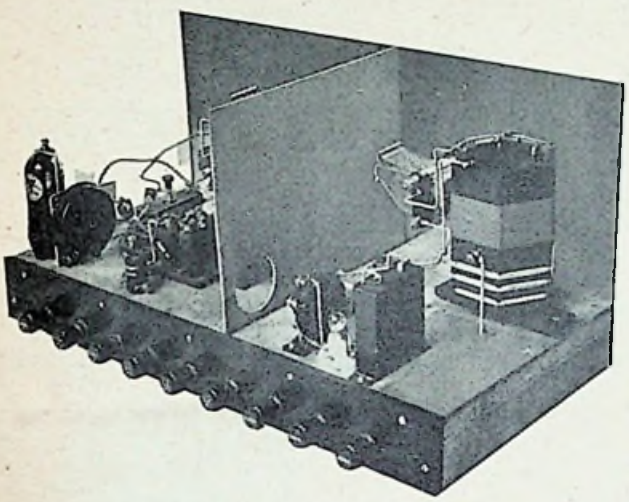
$$= \frac{\frac{L}{C} - \frac{jR}{\omega C}}{R + j\left(\omega L - \frac{1}{\omega C}\right)}$$

In simplifying this expression, readers will notice that we take advantage of the fact that j^2 is equal to minus unity (-1).

From this expression, and remembering our previous laws, we have the impedance given by

$$\frac{\sqrt{\frac{L^2}{C^2} + \frac{R^2}{\omega^2 C^2}}}{\sqrt{R^2 + \left(\omega L - \frac{1}{\omega C}\right)^2}}$$

Undoubtedly this impedance expression has a very important application when the circuit is in a re-



Calculations dealing with tuned coils are dealt with quite fully in the course of this article.

sonant condition, that is to say, the condenser is tuned so that the condition of resonance is satisfied.

At this point $\omega L = \frac{1}{\omega C}$ or $\omega^2 LC$ equals unity.

If we substitute this in the expression above we then have

$$Z = \frac{\sqrt{\frac{L^2}{C^2} + \frac{R^2}{\omega^2 C^2}}}{R}$$

$$= \frac{\sqrt{\omega^2 L^2 + R^2}}{R\omega C}$$

Now in actual practice the value of ωL in ohms is very much greater than R, so that for a very near approximation we can neglect R^2 in the expression just derived.

We now know that the approximate impedance is reduced to

$$\frac{\omega L}{R\omega C} = \frac{L}{RC}$$

Since $\frac{1}{C} = \omega^2 L$ we have once more approximate

impedance $= \frac{\omega^2 L^2}{R}$

We have already stressed the point that ωL is much greater than R, hence the square of this expression is considerably greater. The impedance of the tuned circuit at resonance is thus a very high quantity, and in effect becomes a "rejector" circuit to the frequency of the oscillations across the points X and Y.

Let us take one other example, say a coil of inductance L and resistance R shunted by a resistance R_1 as shown in Fig. 1. As in the previous cases we have

$$\frac{1}{Z} = \frac{1}{R + j\omega L} + \frac{1}{R_1}$$

$$= \frac{R_1 + R + j\omega L}{R_1 (R + j\omega L)}$$

Therefore $Z = \frac{R_1 R + j\omega L R_1}{(R_1 + R) + j\omega L}$

The true impedance can now be written down straight away as

$$\frac{\sqrt{R_1^2 R^2 + \omega^2 L^2 R_1^2}}{\sqrt{(R_1 + R)^2 + \omega^2 L^2}}$$

I could go on giving heaps of other examples, but I think the reader should have by now seen quite clearly how the principle works with the magic little symbol j. It would be advantageous for him to tackle some problems on his own and in this way the full benefits of the simplified calculations will be brought home very forcibly. Just exercise a little patience, and then see how easy it is to design a few wireless circuits in a workmanlike manner without any recourse having to be made to "trial and error" method.

TRADE NOTES OF THE MONTH

REPORTS ON APPARATUS TESTED

A Double-grid Valve

MULLARDS announce that the new P.M. 1.D.G. is a four-electrode valve of the "double-grid" type, designed particularly for use as a combined oscillator and first detector in super-heterodyne receivers. Its characteristics are as follows:

Max. Filament Voltage	2·0 volts
Filament Current	0·1 amp.
Max. Anode Voltage	80 volts
Max. Auxiliary Grid Voltage	20 volts
*Anode Impedance	5,800 ohms
*Amplification Factor	4·5
*Mutual Conductance	0·8 mA/volt
Price	20*s.*

*At Anode Volts 20; Auxiliary Grid Volts 20; Control Grid Volts Zero.

The inner grid, *i.e.* that nearer the filament, is

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In the P.M.1.D.G. the inner grid is connected to the side terminal seen on the outside of the four-pin base.

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connected to the side terminal of the 4-pin base, while the outer grid is connected to the "grid" pin of the base. The other pins are normally connected.

When used as a first detector in super-het. receivers it is usual to connect the inner grid via the heterodyne oscillator to the positive filament terminal, the outer grid being used as control grid and connected to the aerial circuit. The anode is fed, via the reaction coil and intermediate-frequency coupling,

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The 904V valve is of the indirectly heated type and is characterised by having a high amplification factor. Its several uses are mentioned on the next page.

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at about 50 to 80 volts H.T., although lower voltages may be employed.

Indirectly Heated Valve with High Amplification

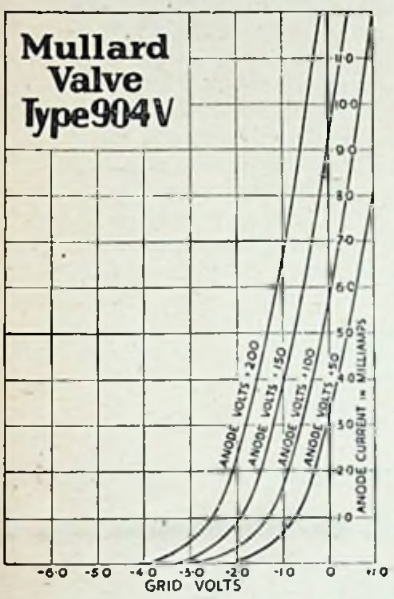
Another interesting product of Mullards is the

type 904V, an indirectly-heated triode having the large amplification factor of 85 and a slope of 5·0 mA/volts. The full characteristics are as below:

Max. Heater Voltage	4·0 volts
Heater Current	1·0 amp.
Max. Anode Voltage	200 volts
*Anode Impedance	17,000 ohms
*Amplification Factor	85
*Mutual Conductance	5·0 mA/volts
Price	15*s.*

*At Anode Volts 100; Grid Volts Zero

This valve is intended primarily as a detector preceding either a resistance-capacity or a resistance-fed transformer coupling. It gives excellent results as a power-grid detector. Type 904V is also suitable for use in the first stage of a normal low-frequency amplifier with similar types of coupling, and may also be used in the early stages of amplifiers used in conjunction with photo-electric cells, etc.



A study of the static characteristic curves of the Mullard 904V valve will enable you to judge exactly its suitability for use in the early stages of photo-cell amplifiers.

"Tell-tale" Accumulators

The majority of the low- and high-tension accumulators for radio purposes marketed by the National Accumulator Co., Ltd., are fitted with the well-known patented "Tell-tale" device which visibly indicates the state of charge of the cell at all times from fully charged to complete discharge.

Hitherto this has only been available in the standard ranges of low-tension accumulators in glass or celluloid cells, but this feature has now been extended to embrace the popular thick-plate type of low-tension accumulators and also the glass high-tension accumulators. In the latter case only two floats are used, and not three as in the case of the low-tension accumulators, one float being the charge indicator and the other the discharge indicator.

The standard series of accumulators without the "Tell-tale" device are also available, and there-

fore the range of Dagenite Accumulators is particularly comprehensive, there being a type available for every wireless purpose.

The only low-tension accumulators in which the "Tell-tale" device is not available are those made up in moulded composition containers and jelly acid types for portable receiving sets, the reasons being obvious.

Celestion Permanent-magnet Moving-coil Loud Speaker

We have recently had an opportunity of testing one of the new Celestion R.P.M.8 loud speaker units. The diaphragm is of the now well-known Celestion reinforced type, having a rather shallow cone designed to give a wider distribution of sound than is often found with some types of moving-coil speakers. The whole of the permanent magnet is enclosed in a very strong housing, and in this way prevents dirt and swarf from entering the magnet gap. The speech coil impedance is 4 ohms.

Note how the whole of the permanent magnet is enclosed in a very strong housing in the Celestion R.P.M.8 unit.

We employed one of the suitably tapped transformers which are supplied with these speakers, and our tests proved conclusively that the sensitivity of this instrument is quite good although not quite on a par with that of a first-class mains-energised model. The reproduction was clear and realistic, with a good bass, and ample volume was secured for all normal purposes without overloading. No harshness was noticeable, while, in addition, the response over the usual frequency range showed a very marked absence of resonance peaks. A chart is supplied giving the best output transformer ratios to be used for certain valve impedances, and these should be studied carefully by the user.

As the price of this unit is only £3 10*s*., together with 15*s*. for the output transformer, this Celestion model can be recommended with every confidence to readers of this journal. The name Celestion has always been associated with good-quality reproduction, and the present model fully maintains the reputation acquired by that company.

The "Tele-Power" Unit

(*Concluded from page 266*)

signal voltage will build up across this resistance in the usual way, and be amplified by the valve *V*. Scope is here provided for the experimenter if he so desires to try out one of two types of coupling between receiver and unit.

Final Comments

Join the earth spade tag to an earth terminal on the receiver, insert the Mullard DO/25 valve into its holder, plug the adapter into the house mains socket, and, having tuned in the receiver to the television transmissions, switch on the unit via S_2.

The valve will light and the neon glow (if you have followed the instructions carefully), and your image can be watched in comfort because of the extra power provided. Make good use of the volume control R_2, and remember the reason for including the switch S_1—to ensure a positive image.

I have been delighted and surprised at the way the "Tele-Power" unit functions, and I am sure every constructor will find it an admirable piece of apparatus to meet those cases where insufficient power is available to obtain good television images, or alternatively a source of H.T. has not been available for feeding the vision apparatus.

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.*

A PETITION?

To the Editor of TELEVISION

DEAR SIR,—Why does the B.B.C. wait for the improbable, perhaps the impossible? Are they afraid of being incorporated in Television? Have they not been promised security of post with due advances and pension scheme complete? I imagine so. Why, then, do they wait for some impossible valve scheme to do what is now effectively done by mechanical means? Did the world wait for a valve for the kinematograph? For wireless transmission of power to vehicles?

What if they had done? What if there were no steam engines, steamships, motor-ships, motor-cars to-day! Is the wireless transmission of power any nearer? Will any non-mechanical television system be practicable in a hundred years' time or in a thousand, or ever at all?

In these days, fancy holding back a great invention! Abysmal ignorance! Commercial suicide!

When iron, coal, steel, cotton, and decent ships were new industries, England was in advance, and for years after kept her lead and trade. Our population must die, die out, go abroad (if allowed to land), and again become in advance with new industries; not the old ones, be it noted, for we have taught the world, and the world now knows them.

Of course the B.B.C. must be afraid of this manly, clever child—television; but ought a parent to murder a child because it has the makings of a man, and a better man? What do we understand of the spoken part of foreign broadcasts? How much more should we understand our brothers if we could see them, their normal lives, their ambitions, motives, humour, and art!

What a retardation of civilisation, what wars, misery, and suffering may be occasioned by many a month's delay in perfecting this new means of communication! The great impossible, the X to the X power, must surely watch with an anxious eye the souls that may make or unmake the world for another thousand years. That little hut in Langham Place controls the world's future. On the decisions of a few bits of humanity that will be gone and replaced in a few years, the lives and sufferings of millions and millions probably depend.

We, too, must do our bit. Give us, therefore, the form of a petition to our M.P. for better hours, such as Sunday, 6–8 p.m., when the B.B.C. broadcasts nothing at all. Everyone has heard of television. Everyone is curious to see it. The public mind is fair, and the public would surely sign it in millions be it but presented to them for the purpose.

Yours truly,

EDWARD WOTTON.

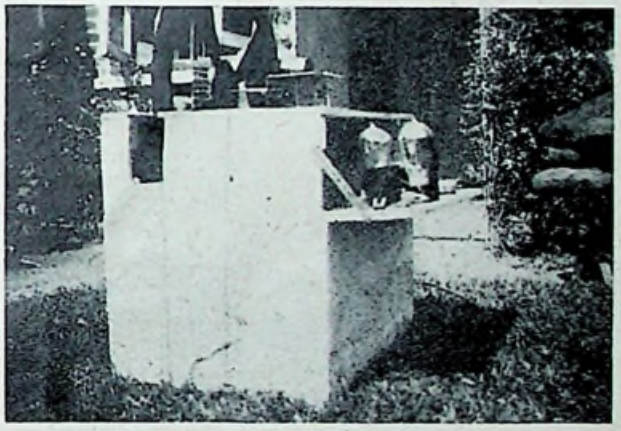
Durlock Lodge,
Minster,
Thanet.

July 28th, 1931.

COMMENT FROM SPAIN

To the Editor of TELEVISION

DEAR SIR,—I have safely received *Television To-day and To-morrow*, for the prompt dispatch of which many thanks. It has exceeded my expectations.



Part of the Television Apparatus made up by Messrs. Meadway & Gill and to which reference is made in our "Enthusiast" series.

By the way, would it be possible to secure a copy of TELEVISION for June, 1931? I left it in a train. I wish to build the "Teleliminator Major" (I believe *this* was its title), a mains rectifier for H.T. supply.

I have not as yet had any experience of television (I have not even seen a demonstration), but this coming winter I intend to take it up. My amateur wireless experience dates back to 1920, but have lost touch with it for the last few years; when "anybody" could build a set from "an empty tin and a bundle of firewood" I lost interest in it. The

most thrilling time was when a single valve cost between 25*s.* and 30*s.* (and ran down a car-starter battery in a few evenings), and the most thrilling sounds were received from "North Foreland" or "Eiffel Tower"—and there were *no* popular radio magazines in those days. This winter I hope to let you know how television comes through in sunny Spain.

Thanking you in anticipation,

Yours faithfully,

"A Coming Enthusiast."

July 29th, 1931.

Barcelona.

[*For the benefit of all readers may we point out that back copies of our journal can be obtained direct from us at a cost of 6d. per copy, plus 1½d. postage.*—Ed.]

APPRECIATIVE READERS

To the Editor of Television

Dear Sir,—As a private follower and worker for television, and one who is looking forward to a great advancement in the near future, I again congratulate the Television journal on keeping up to such a high standard, and I am grateful, as all readers must be, for the great part it has done and will do for television. I have never doubted the coming of television, but as an investigator and worker in the background, I have fully understood the patience and uphill work to be breasted. I have an accumulation of ideas and lots of details in hand to be sifted out at the first opportunity and tried for television.

Yours faithfully,

R. S. Pedlar.

Bugle, Cornwall.

August 3rd, 1931.

To the Editor of Television

Dear Sir,—May I offer you my congratulations on the success of such a popular magazine as Television has proved itself to be.

As a technician I am particularly interested in the most useful articles both by William J. Richardson and H. J. Barton Chapple, which have been responsible in many cases for solving various problems which have confronted me.

Apart from these articles, the "Studio Topics" each month are very interesting, and "The Enthusiast Sees it Through" is another series which I hope will continue for some time.

With best wishes,

Yours faithfully,

J. H. Searle.

London, N.W.1.

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