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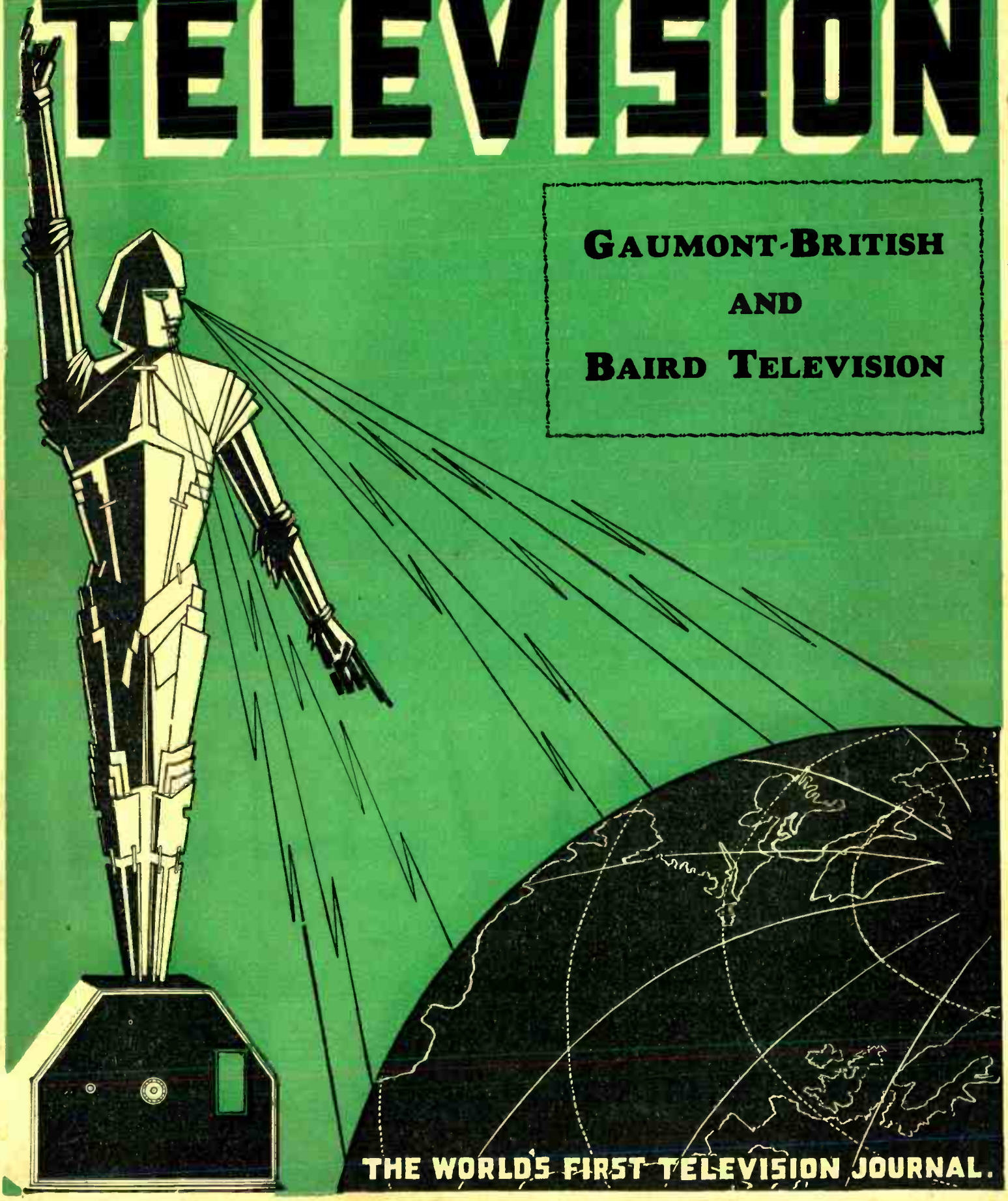
TELEVISION

GAUMONT-BRITISH AND BAIRD TELEVISION



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TELEVISION

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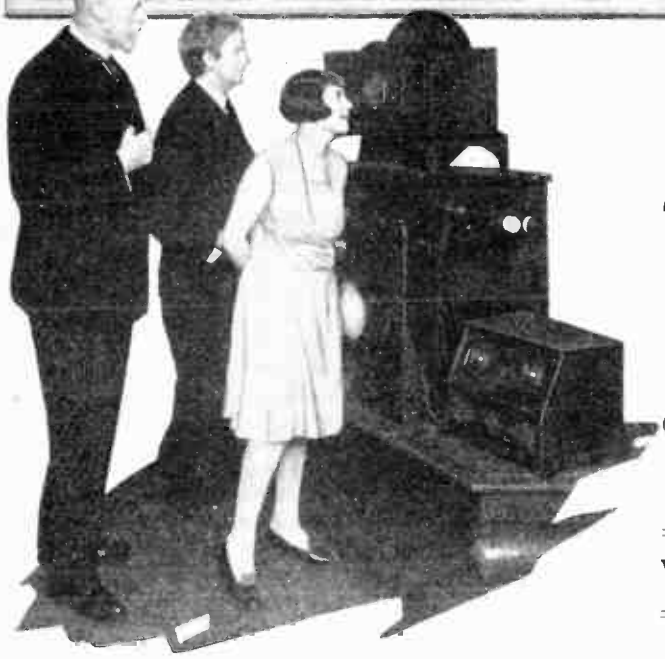

THE
OFFICIAL ORGAN OF
THE TELEVISION SOCIETY

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VOL. V] MARCH 1932 [NO. 49

THIS MONTH'S CAUSERIE

WELL, I am not going to let my readers down! I promised for this issue news of importance: and the news, as you may guess, has been the coming into Baird Television of the most powerful group of British cinemas in this country.

Gaumont-British have properties and other assets amounting to nearly £20,000,000. This does not mean, of course, that all this money is going to pass to the disposal of the Baird Company! What it does mean, however, is that some of the men who have been responsible for this remarkable achievement, in the world of business against American competition, are going to give their experience and advice for the development of British television.

* * * * *

I have known the President of the Gaumont-British group, Mr. Isidore Ostrer, since boyhood and have always had a feeling of great regard for him. It is therefore an immense personal pleasure to find that he has come in with me in holding the fort against all comers.

* * * * *

The effect of all this is yet to be seen; although it should be understood now, that underlying the move is simply this—that when foreign interests endeavour to seize control of British entertainment, as they were able to do when talkies first came out, we shall be prepared. We will use our own television screens.

* * * * *

When America came to this country with its talkie apparatus, it was able, quite naturally, to impose what terms it liked on British theatres. Not only that, but such was the tie that the owners were able almost to say what films were to be shown!

* * * * *

People in this country take a long time waking up to the fact that all this is absolutely fundamental. It does not only mean a question of pounds, shillings, and pence, it means the future culture of the whole British Empire. Outside broadcasting, the greatest medium for education is the film. Youngsters get all their impressions from what they see on the screen, and nations abroad sum up European nations by what is shown them in the cinemas.

* * * * *

This has been so manifest for years past that it is amazing that the country as a whole has not risen as one man to fight this menace. Isidore Ostrer was really the one man in this country who stood up to the foreign menace in regard to films. He proposes to do the same in regard to television.

The next item of the utmost importance this month is the agreement with the B.B.C. whereby transmissions now are guaranteed for a minimum of two years. This, to my mind, is tantamount to a permanency; for with the new arrangement, where the B.B.C. will be broadcasting for four nights a week, the public for the first time will have *some opportunity* of looking-in. If public interest has been maintained with the present restricted facilities, it is obvious that it will be an accumulating interest from the time the new arrangement is made effective.

* * * * *

The Baird Company will be installing their transmitting apparatus in the new Broadcasting House, and, for the first time, the programmes, which will be televised by the B.B.C., will be arranged with an eye more on the visual than on aural effect.

* * *

Another big event is the arrangements which are being made as I write this in regard to America. If these arrangements are consummated on the lines which are being debated at the present moment, there will not only be Baird permanently in the picture in America, but it will help the London company to a vast extent.

* * *

A good deal of talk still goes on regarding the development of the short-wave cathode ray, and goodness knows what else. An altogether erroneous impression exists that the Baird system is synonymous with *one* system, for the fact is that in the laboratories in London there are many systems. Work is being done on each of them, and the one that proves the best will win the day.

* * * * *

I am always lost in admiration of the American methods of publicity. As one who has always admitted the sweet uses of advertising, I have no hesitation in saying that even to-day America holds the field in "putting it over." You would think, reading the delightful matter sent out from New York, that England had lost the day in television, and that an "entirely new system" was imminent, which would "kill the disc system" and make the present television transmissions look rather childish.

Mr. Isadore Ostrer, President of the Gaumont-British group, who has entered the fight for Baird television.

It was about six months ago in New York that I announced the fact that the disc system had almost had its day, although some of these so-called old systems have a manner of coming into the picture again, even our old friend the cathode ray which was despaired of by some of the big foreign corporations.

Indeed, Mr. Baird tells me that it was never healthier than at this minute. But who knows?—to-morrow it may give its last kick and expire. We shall see.

Again we hear a lot about ultra-short waves, as if this were something that had fallen from the skies. The fact is, experiments have been going on in this direction as in other directions. The uses of the ultra-short wave are well known, as are its obvious handicaps. It may be necessary to dot this country with ultra-short wave transmitters in the interests of a more detailed picture; on the other hand, is that the only solution—is it?

In the meantime, I warn my numerous friends and readers again that the commercial enemy is trying to get into this country under various guises. In the past we made a combined effort to keep him out. In these days of "Britain first," it becomes imperative to hold fast.

Well, big things have happened — and bigger things are on the tapis. As I say, wait and see.

* * *

So that all together my tip to readers to order this month's issue ahead was justified. I do not believe in holding out promises which cannot be fulfilled, and all through the picture I have endeavoured to reveal the position in proper perspective. I now suggest to readers that this is not the end of all the excitement; it is indeed only the beginning. Things are moving behind the scenes, and at the right moment I shall not hesitate to reveal them.

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.

Valve Life

ONE of the questions to which the radio expert is frequently called upon to reply is: "How long should my valves last?" In one way this question is very easy to answer; in another it is most difficult.

The simple reply is, that while no manufacturer can be expected to guarantee any definite life figure, because the valve is used under conditions over which the maker has no control, the user can quite reasonably expect a minimum life of about one thousand programme hours, provided the valves are not subjected to improper treatment, such as overrunning the filament (i.e. operating on too high a low-tension voltage), or called upon to pass too great an anode current (due to serious under biasing or operation without grid bias).

Indeed, numerous instances have been reported in which working lives of two, three, or even four thousand hours have been obtained from standard receiving valves.

The difficulty in giving sound advice on this point arises out of two or three facts. In the first place, although the filament may be intact after several thousand hours' life, it by no means follows that the emission of the valve is also unimpaired or that its characteristics are as good as when the valve was new. In these circumstances, of course, it would definitely pay the user to replace his old valve with a new one.

A Definite Case

At the same time, it frequently happens that a valve survives three or four years of service with characteristics well up to standard. The question now arises, should the listener pension off his old valve and substitute a more modern valve, thus taking advantage of the improvements in valve design which have been brought about since his original valve was made?

The answer to this question, again, depends on several factors—the extent of the improvements, the position for which the valve is required in the receiver, and the design of the receiver itself.

At the outset it may be stated that, in the great majority of cases, a modern output valve may be substituted for one of older date with every confidence that improved volume and quality will be secured. This will be amply clear from a consideration of the following table, which gives in parallel columns the characteristics of a valve taken at random, in this instance one of the original Mullard

One of our enthusiasts in Holland at home with his vision apparatus and his book of reference," the "Television" Magazine.

PM4 power valves, together with the PM4 as manufactured to-day:

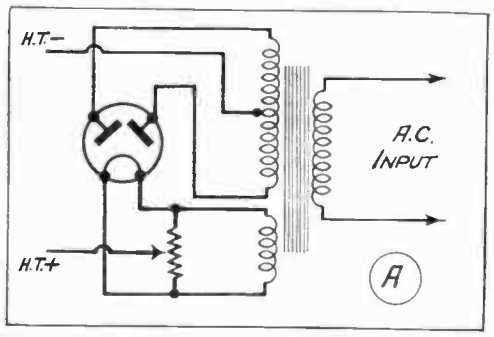
	Original PM4	*Present-day PM4*
Filament Voltage . .	3·7 volts	4·0 volts
Filament Current . .	0·1 amp.	0·1 amp.
Maximum Anode Voltage	100 volts	150 volts
Impedance	7,000 ohms	4,000 ohms.
Amplification Factor .	7·0	8·0
Mutual Conductance .	1·0 mA/volt	2·0 mA/volts
Grid Bias for Maximum Anode Voltage . .	7½ volts	9½ volts

Possible Trouble

It will be observed that the more modern valve has greatly improved characteristics, and this applies to all makes. The decrease in impedance will ensure more efficient working, and in practice it will be

found that, for equal signal input, the up-to-date valve will give greatly increased volume, combined with vastly improved reproduction.

In a few instances it may be necessary to look to the output circuit of the receiver in order to ensure that impedances are correctly matched, but generally the substitution can be effected without altering the set in any way.

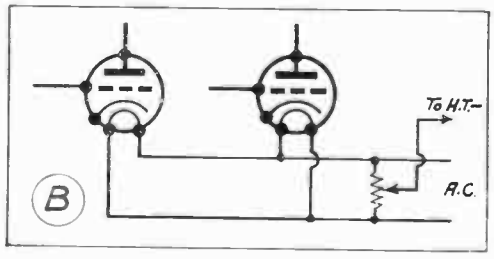


One way to cure A.C. mains hum which emanates from the mains transformer.

It is when we come to the earlier stage valves—the detector and first low-frequency valves—that some trouble may be encountered when substituting new and efficient valves in an old receiver. Most modern valves have both lower impedances and higher amplification factors than their prototypes of a few years ago, and when used in the early stages of an obsolescent receiver, these more efficient valves sometimes tend to give rise to a condition of instability.

Careful attention to decoupling and some reduction in anode voltage frequently puts matters right, but, of course, if the set is hopelessly antiquated it should really be remodelled or rebuilt.

One other point calls for special mention. Really old valves should never be used in a new and up-to-date receiver. Modern receivers are always designed with a view to utilising the most recent types of valves, and an attempt to save a few shillings by



A suggested use with indirectly heated valves.

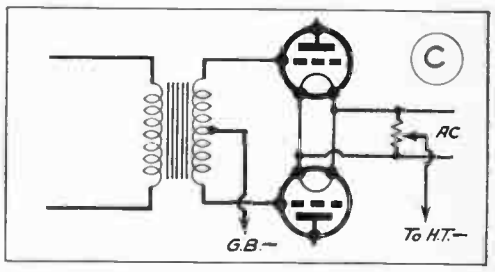
retaining out-of-date valves defeats its own object, and all the skill and good design put into the new set is wasted.

Hum in A.C. Mains-operated Receivers

It is surprising how many times one comes across A.C. mains-operated receivers, especially home-constructed ones, in which the quality of reproduction is marred by the presence of a residual hum. One of the most effective methods I have found for overcoming this is to incorporate what is known as a "Hum-Dinger" marketed by Claude Lyons, Ltd. Essentially this is a resistance strip provided with a movable centre contact which swings over the central portion of the winding, the adjustment being made with a screwdriver.

Many eliminators have a low-voltage winding for the direct application of raw A.C. to the filament of a power valve. The component mentioned provides a method for obtaining the necessary electrical centre of this filament supply winding, and in this way cancels out the last traces of A.C. hum which may be present in the amplifier output stage. It is best to place the resistance as near to the valve terminals as is possible, and not actually across the transformer terminals. To a lesser degree the same course can be adopted when indirectly heated cathode valves are being used, and, furthermore, such a device is by no means limited to final-stage application.

The resistance is adjusted for hum-elimination when no signals are being received, but with the receiver or eliminator in operation. The tuning circuits are brought into resonance, but at a wavelength on which no station is transmitting at that moment. This permits the degree of A.C. hum to be noted. The resistance control knob is slowly turned to left or right until the A.C. hum is "tuned out."



Rendering a push-pull circuit dead quiet.

The "Hum-Dinger" total resistance, whilst not critical, should be selected for the best results. The usual standard value in A.C. valve circuits is a total resistance of 30 ohms, but other values from 6 to 200 ohms are available.

Main Uses

To assist readers, the three main uses to which this component may be placed are indicated in the diagrams *A*, *B*, and *C*.

In double-wave rectifying valve circuits the mains transformer sometimes has its centre winding electrically out of balance. This is a common source for the introduction of objectionable A.C. hum into the filter circuit. If a suitable "Hum-Dinger" be connected across the filament winding (see *A*) this hum can invariably be balanced out with ease. The centre-tap terminal of the transformer winding is, of course, left blank.

Where indirectly heated cathode valves are employed, the filament leads should be bridged, as near as possible to the valves, by the resistance, the centre tap of which is taken to H.T. negative (see *B*). The variable position of the centre contact should then be adjusted until any A.C. hum present is "tuned out."

Where push-pull output valves are heated by raw A.C., as is common practice nowadays, it is found frequently that although hum and harmonics in the valves are greatly minimised by this system of coupling, if there is dissimilarity in the matching of the valves, hum is still present to a certain degree. Connecting the resistance across the filament supply and tuning to the silent point will invariably render the output circuit dead quiet (see *C*).

Soldering with an Electric Iron

For some time past I have been on the look out for a really good electric soldering iron. The task of soldering, especially with reference to making reliable connections in a wireless receiver, is one which too often is neglected by the home-constructor. He finds that the performance of the set he has built is poor, and this, in many cases, is attributable to imperfect soldered joints. This sort of thing is not likely to happen if one is in the habit of using an electric soldering iron, but it must be reliable.

The one that I have been trying out recently is manufactured by Ward and Goldstone, Ltd., and is classed as their standard radio model, and retailed at the remarkably low figure of 12*s*. 6*d*. The iron has a bit diameter of $\frac{3}{4}$ in. and consumes 90 watts, the total weight being 13 oz. Every iron is supplied complete with six feet of substantial flexible cord and an adapter; and, if desired, alternative shaped bits for special conditions can be procured.

I was delighted with the way this product functioned and, in order to make it a little more "flexible," I took off the bayonet-socket adapter normally supplied and replaced it with a "Goltone" combined wall-plug adapter with retaining cord. In this way it could be used in a standard bayonet socket or a two-pin wall socket, whichever happened to be handy at the time.

Another item which I obtained from the same firm and which, incidentally, was a British-made tool, was the Atlanta screwdriver. This little gadget has a well-tempered blade and the handle remains stationary in the palm of the hand, the turning of the screw being effected by the finger and thumb on a knurled ring. If desired this screwdriver can be supplied complete with three box spanners to fit 2, 4, and 6 B.A. nuts. When it is necessary to screw down nuts in an awkward position in wireless sets, these box spanners, used in conjunction with the screwdriver, make the task a simple one.

A Live Society

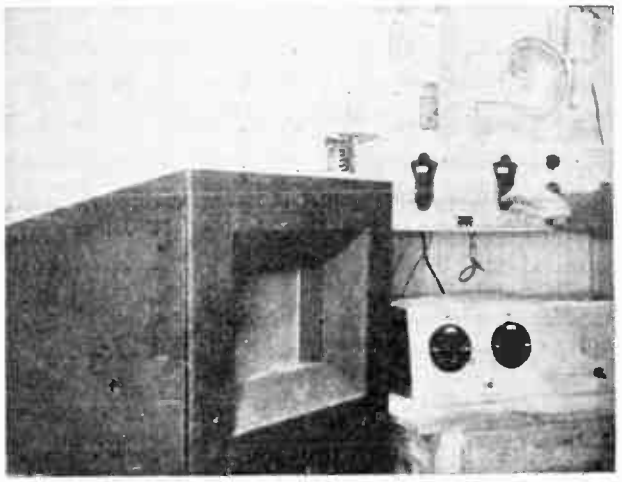
The Golders Green and Hendon Radio Scientific Society is certainly a very live affair. I was privileged to be a guest at their annual dinner a few days ago, and found quite a number of prominent radio personalities included in the gathering. Their lecture syllabus for the remainder of the session is very commendable, and, whereas so many societies have ceased to exist, this one in North-west London makes its presence felt.

If anyone in that district is interested, I advise him to write to the Honorary Secretary, Mr. W. A. Hudson, of 22 The Parade, N.W.11, when he will be pleased to furnish complete details of membership, etc.

Screen-grid Valve Leakage Capacity

Some remarkable figures are to hand concerning the grid-anode leakage capacity of Osram valves of the screen-grid type. The valves in question are the MS4 and MS4B, six of each kind of which have recently been under test at the N.P.L.

In a recently issued report, the officials of the laboratory testify that they have measured the capacity between the control grid and the anode (the leakage capacity) for the series of valves referred



Mr. Hewel's mirror-drum television receiver referred to on another page.

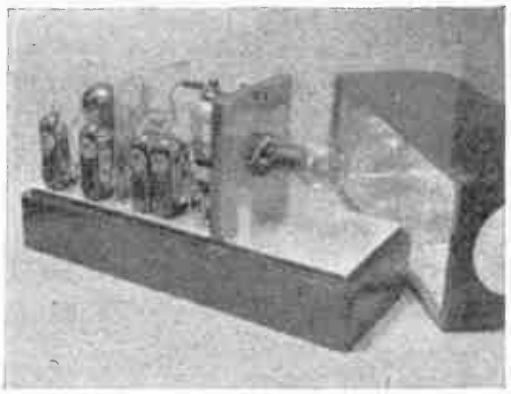
to at a frequency of 210 kilocycles per second. The results in the case of the M.S.4 were:

Valve	No. 1.	Leakage	capacity	in	m.mfd.	0·0026
,,	,, 2.	,,	,,	,,	,,	0·0023
,,	,, 3.	,,	,,	,,	,,	0·0029
,,	,, 4.	,,	,,	,,	,,	0·0023
,,	,, 5.	,,	,,	,,	,,	0·0025
,,	,, 6.	,,	,,	,,	,,	0·0026

In respect to the MS4B valves the results were:

Valve	No. 1.	Leakage	capacity	in	m.mfd.	0·0026
,,	,, 2.	,,	,,	,,	,,	0·0022
,,	,, 3.	,,	,,	,,	,,	0·0021
,,	,, 4.	,,	,,	,,	,,	0·0032
,,	,, 5.	,,	,,	,,	,,	0·0027
,,	,, 6.	,,	,,	,,	,,	0·0025

It is particularly interesting to note that the capacity of the MS4B, in spite of its high mutual conductance (i.e. 3·2 mA/volt) is as low as that of the MS4 type. The slight increase in the capacity of the MS4 over the previously published figure of 0·0019 m.mfd. is due, I am informed by the makers, to the system of electrode bonding now employed in its construction with the object of reducing microphonicity.



Two Enthusiasts Make Progress

By *E. J. and J. W. Holmes*

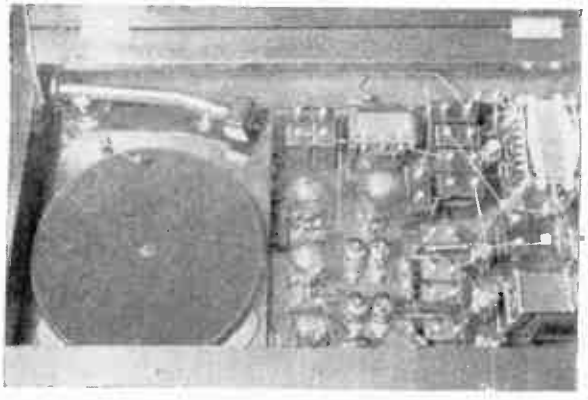
IT is now just over two years since we became interested in television, and details of our first vision apparatus appeared in the April 1930 issue of this magazine. For the benefit of new readers we will give a rough outline of our original gear.

The disc was constructed from thin cardboard, and driven by an old sewing-machine motor, the speed being regulated by a series resistance. The neon, a Philips 110-volt spiral type, was in the plate circuit of a small power valve functioning in the output stage of a straightforward R.C. coupled 0-v-3 set.

High tension was derived from an eliminator working off 150-volt D.C. mains, and after smoothing left only 130 volts at our disposal. With this simple apparatus we obtained quite good images. and on visiting the Baird studio we had no difficulty in recognising members of the staff whom we had seen on the air.

Improvement—The First Step

The first step towards improvement was more high tension in the form of thirteen 10-volt accumulator units, and with these in series with the eliminator the voltage was raised to 260. A PX4 was then used in the output stage, and a Baird neon took the place of the Philips; also a more powerful motor

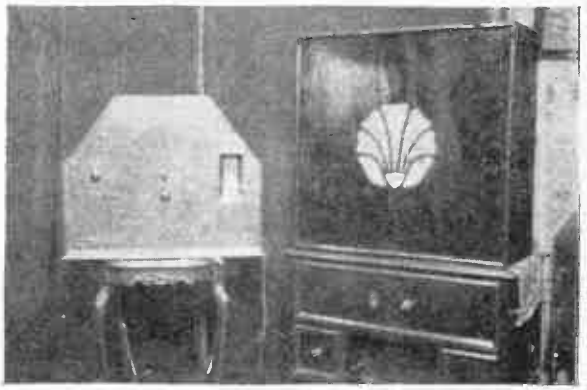


The complete power amplifier is housed in a "table cabinet" which also includes the gramophone.

was procured. This combination gave better all-round results with a much brighter image.

Owing to the most inconvenient times of transmissions, we were only able to look-in about once a fortnight, and decided that in order to carry out more frequent experiments it would be necessary to have some form of transmitting gear of our own; and a simple shadow-graph transmitter was accordingly rigged up.

The transmitting and receiving discs, 20-hole, were coupled by means of a rod about four feet long. The illuminant, an ordinary 200-watt lamp, was housed in an enlarging lantern, which projected the images (indian ink drawings on glass) on to the transmitting disc, behind which a condenser lens



In this illustration we see the very prepossessing home-made vision apparatus on the left, while on the right is the loud speaker, and below that the "table cabinet."

focused the light on to a Tungsram Nava "E" vacuum photo-electric cell. The cell was coupled to a four-valve R.C. amplifier. the output being fed to the last two stages of the vision set.

Transmitter Difficulties

At first we could obtain no results, the chief troubles being:

(1) Hum pick-up from the mains.
(2) Instability in the form of motor boating.
(3) Interference from the motor.

The hum was overcome by completely screening the four-valve amplifier, and thorough decoupling in every anode circuit cured the motor boating. Motor interference gave us the greatest trouble; the usual methods of cutting it down having little or no effect. This was eventually subdued by arranging a piece of springy wire to touch the motor shaft, and earthing

same. We then obtained good images of letters and other simple subjects.

These results were so encouraging that we decided to try using 30-hole discs. The amount of light passing through the disc was greatly diminished, and to make up for this deficiency we increased the number of stages in our amplifiers. Just as we were obtaining good results we were informed that our electricity supply was to be changed to 230 volts A.C. within the next six months. We decided to suspend our experiments for some time, and to prepare for the new voltage.

New Apparatus

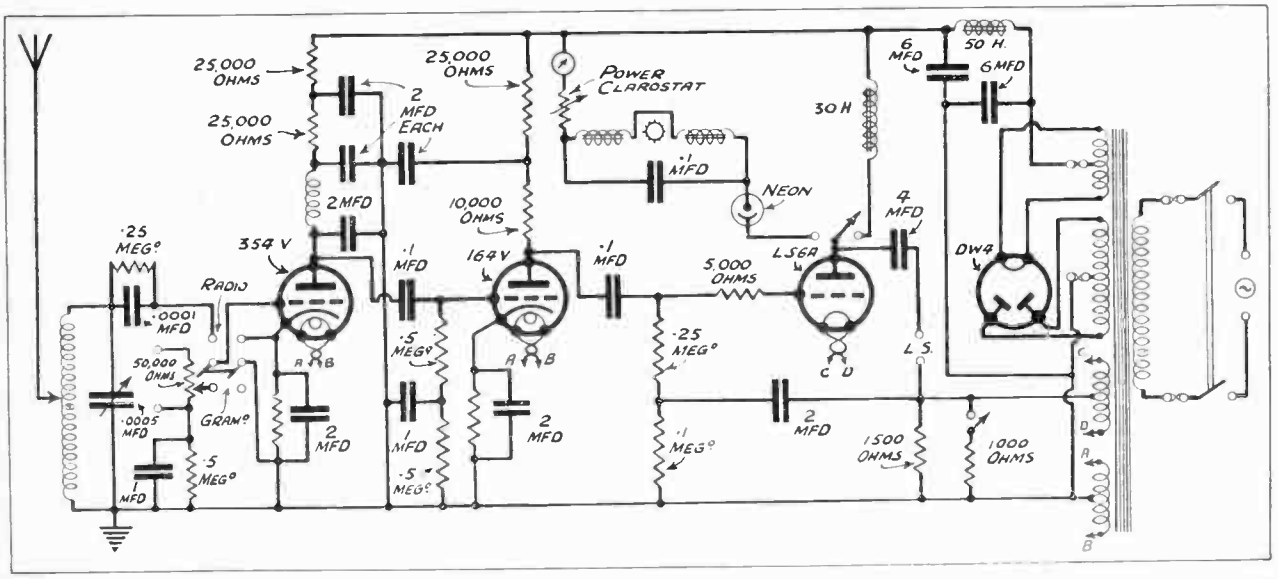
First we constructed an all-mains three-valve R.C. coupled power amplifier, with an LS6A in the output stage. Choke output is used with a moving-coil loud speaker, and as the coil is matched to the impedance of the valve, no output transformer is necessary. For vision a switch is arranged in the anode circuit of the LS6A, which cuts the choke out of circuit and switches in the neon; also a 1,000-ohm resistance is switched in parallel with the 1,500-ohm bias resistance, to ensure that the valve has the correct bias when passing 35 milliamperes.

This amplifier was completed before the change over to A.C., and in the meantime we obtained a Baird motor with synchroniser and disc. While waiting for the change over we decided to try and receive the television transmissions from Königswusterhausen. A disc was constructed, the standard German ratio being used, and a stage of screened-grid H.F. amplification was added to the receiver. The results obtained were very good indeed, the words PAUSE and ENDE coming over exceptionally well.

We have now been working on A.C. for two months, but during this time we have only been able to look-in at the Baird transmissions on two occasions. To correctly load the power-grid detector it was necessary to add a stage of H.F. amplification. The images were exceptionally good, detail was excellent, and the half-tones were particularly well rendered.

More Shadow-graph Experiments

Owing to the still inconvenient times of transmissions we have reverted to our shadow-graph experiments, and have made considerable progress in this direction. The whole gear has been reconstructed, the transmitter and receiver being in separate rooms. The cell is coupled to a two-stage R.C. amplifier, the first valves being of the screened-grid type. The whole is arranged as one unit; each stage is well screened, the cell being placed in a separate compartment with a collecting lens at one end.



Messrs. E. J. and J. W. Holmes carried out a large number of experiments before deciding on their final vision wireless receiver circuit. The complete scheme is shown in the diagram above.

This unit is connected to an R.C. coupled amplifier designed to compensate for the loss of high and low frequencies, the signal then being fed to the power amplifier and vision apparatus in another room. We are now using 30-hole discs, and obtain good images of negatives, lantern slides, etc., the picture being held steady by the Baird synchroniser. Also when using 20-hole discs we have been able to transmit simple objects by means of reflected light. This is as far as we have reached up to the present, and would mention that although all the H.T., except the cell battery, is derived from the mains, very little hum is experienced.

In conclusion, we would like to take this opportunity of expressing our appreciation of the many helpful articles which have appeared from time to time in TELEVISION.

Whenever a demonstration of television is announced to take place in this country long queues form up, for the interest in this science is increasing by leaps and bounds.

Television's New Outlook

By *T. Thorne Baker*

THE news that some definite form of regular television broadcasting is now contemplated will make English amateurs feel that the reward for British pioneering has come at last. Mr. Baird's apparatus is capable of giving entertaining pictures, as his many successful demonstrations have shown; but it is probable that amateurs who have not studied television in the United States, and have not therefore had the opportunity to grasp the enormous *geographical* superiority of that country, have felt during the past year or two that the laurels have been slipping away from our own country.

Demonstrations

This is not so, but, looking a little below the surface in America, one finds advertisements of correspondence courses in television engineering in the technical papers—practical courses of specialised engineering too. A new type of engineer ready to step in the moment television is established is already in training and coming into existence!

At a number of shops in New York you can walk in and have a look for a few minutes at the television screen. Broadcasting seems to be always going on. There are fashion pictures, topicals, views of performing artists, and so on—not by any means perfect, but sufficiently clear to make fascinating entertainment.

Future broadcasting is being envisaged in America on a scale which promises the amateur the most ample scope for his new hobby, and meantime many new avenues of considerable commercial importance are being followed up.

Progress Here

The tremendous television interest of the huge army of amateurs makes progress far easier and far more swift in that country. But all real progress must be built up on fundamental knowledge, and basic work is being done here as the columns of this magazine show quite conclusively.

What really convinces one of the stability of the television position is the business-like and practical arrangements being worked out for studio broadcasting and the televising of topical events. Experience in the making of kinematographic pictures has taught us that a great deal depends on the way pictures are made, lighted, edited, and projected. Exactly the same thing holds good in television, and with good studio management what we can see *with existing apparatus* might be and will be greatly improved.

Importance of Studio Technique

Having figured in past years amongst the cautious pessimists who warned amateurs against undue optimism regarding television, I should like to emphasise to-day the immense importance of studio technique and what it can do for the improvement of existing television. It can, in fact, accomplish so much that all physical calculations on the basis of the number of lines or areas to the square unit of surface can be entirely upset, and the eye can be made to see modelling and definition that by theory are impossible!

It is very important that due emphasis be laid on this point. While amateurs continue to build up the television *set* and increase its potentialities, let studio experts with the experience of modern picture making concentrate on improving the transmission.

Television, like "the pictures," and like wireless broadcasting in fact, is one of those peculiar mixtures of art and science, of stage management and academic engineering, that demand a true versatility of mind and generous blending of talent if we are to make quick progress.

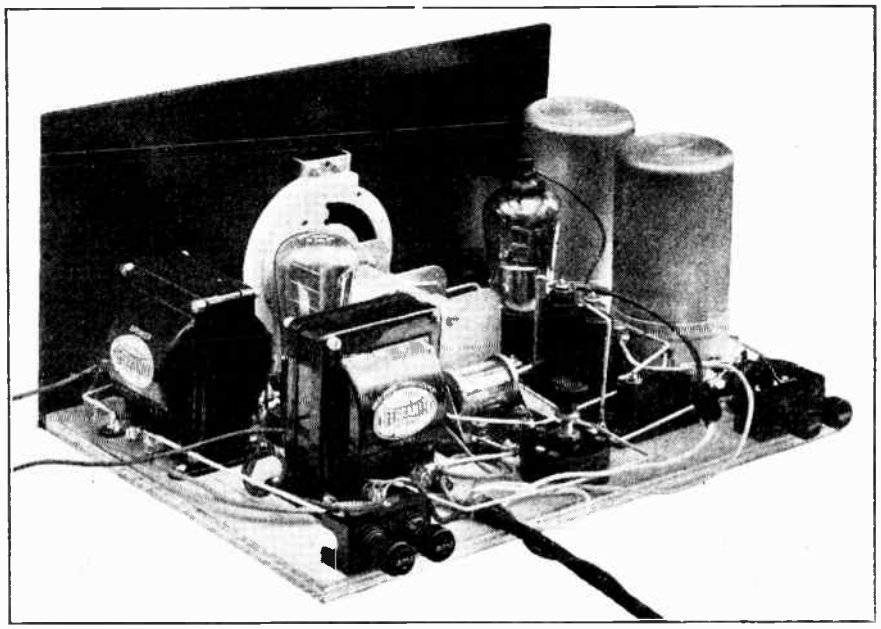
The "Crystal" Three

By *William J. Richardson*

SOME time ago I carried out a series of interesting experiments to find out what in my opinion constituted the best type of detector in a wireless set used for receiving television signals. The results of that work were recorded in the July, August, and September 1930 issues of this journal. Since that date I have had repeated requests for details of a simple set employing these principles which could be used within a range of about twenty miles from the Brookman's Park Station; and in response to these I have pleasure in presenting the "Crystal" Three.

Using a Crystal

I have tried to make economy the keynote all through with this design, but I have not allowed economy to outweigh performance. If readers will refer to the original three articles quoted, they will see for themselves how experiments were conducted and a final conclusion arrived at to the effect that a crystal detector gave the best images. In these days of modern valves it seems rather old-fashioned to resurrect the humble crystal of our earlier exploits; but facts speak louder than words, and, apart from the three-electrode valve worked as a diode, this form of rectification lends itself admirably (and in my opinion indisputably) to television reception.



Looking at the back of the "Crystal" Three, showing the valves in place and the wiring completed ready for a reception test.

Naturally if one intends to use a crystal in lieu of a valve, there is obviously no amplification to be obtained in this detector position. On the other hand, by its use that notorious agent for distortion —reaction—cannot be included, and, furthermore, the cost of the completed set is reduced somewhat; an important point in these days of looking after the pennies owing to other calls on the exchequer. A wireless receiver is as good as its detector stage will permit it to be, and no one will deny that the crystal detector is capable of giving almost the nearest approach to distortionless reproduction.

Undistorted Output

Obviously it is not necessary to go over again the various details discussed in the 1930 issues specified, but I learn that the H.F. and detector unit described in issue No. 31 was very popular with readers when joined to a good L.F. amplifier. Several experimenters, however, have asked for a complete set based on these lines; especially one that could be worked on relatively low H.T. voltages, and, if possible, use two-volt valves with a pentode output.

Bearing in mind the fairly high undistorted output needed to work vision apparatus efficiently — the Baird "Televisor" is rated to require 1,500 milliwatts — this seemed rather a tall order, but my tests with the "Crystal" Three show that it really does all that is claimed for it.

Before we go any further, let us examine the circuit diagram of Fig. 1, for it has one or two interesting features. First of all the pair of coils, L_2 and L_3, are suitable for both the medium and long wavebands. They are screened and also gang switched. Furthermore, the two tuning condensers, C_2 and C_3, are ganged so that simplification in the controls is obtained by this means.

Gang Maintenance

To meet the problems of selectivity, and furthermore to overcome the oft-found defect of medium-

wave broadcasts breaking through on the lower end of the long-wave scale, a special slab coil, L_1, has been included. This procedure is definitely recommended by the coil makers, the Watmel Wireless Co., Ltd. The method of connection is shown in Fig. 1, the aerial end of the slab coil, L_1, passing to the medium-wave tap (terminal No. 6) on L_2, via a ·0001 mfd. fixed condenser, C_1. Another advantage claimed for this scheme is the better maintenance of "ganging" throughout the whole of the tunable range, and my own conclusions, as a result of tests with the set, bear out the makers' claims.

Our tuning circuit, L_2 C_2, is now coupled to the screened-grid high-frequency valve, V_1, in the normal manner. A decoupling resistance of 600 ohms (R_1) and associated condenser of ·1 mfd. (C_3) has been included, while the anode of this valve is choke fed to the tuned circuit, L_3 C_5, via C_4, a ·001 mfd. coupling condenser.

Rectification

Directly across this circuit we have our crystal detector *C.D.* in series with a semi-variable condenser, C_6, having a maximum capacity of ·001 mfd. The rectified signal pulses across C_6 are now passed to the primary of the step-up transformer, T_1, the secondary of which is joined in the usual fashion to the pentode valve, V_2.

If the neon lamp had been included directly in the plate circuit of this output valve, the voltage required would be of the order of 300 to 350 volts. To keep down this value, therefore, an output transformer (1 to 1 ratio) has been employed in the manner shown, the secondary winding at one end passing direct to the vision apparatus (neon and synchronising coils, if the latter are incorporated) and thence to H.T.+, while the other end is joined to H.T.—.

In this way the steady direct current can pass through the neon lamp and cause it to glow at its correct brilliancy, while the output signal pulses are made to modulate this and thus produce the resultant image in the orthodox manner.

Components Required

So much then for the theoretical considerations. Let us now turn to something of a practical character, viz. making and using the "Crystal" Three.

For your guidance a list of the components used in the original set is given below, and I do not recommend substitutes. There is really no space to spare, and the items were chosen with a view to both price and performance.

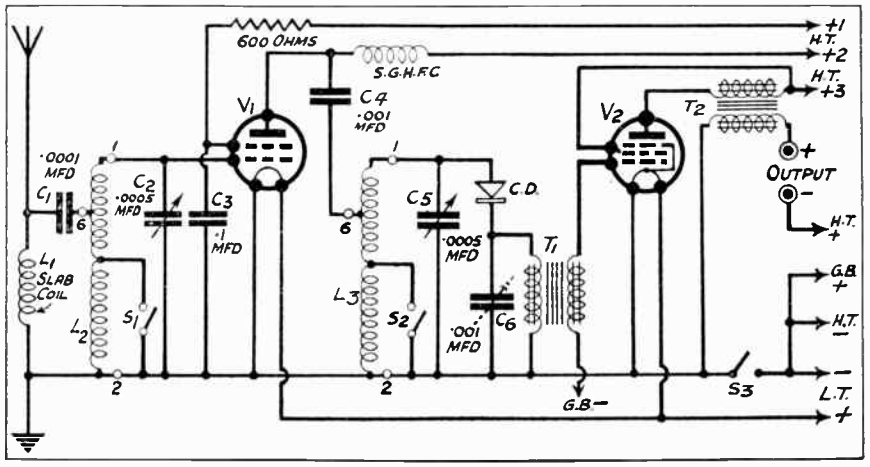


Fig. 1.—Complete details of the theoretical circuit drawn up by Mr. William J. Richardson in the design of the "Crystal" Three.

One ebonite panel, 14 in. by 7 in. by ¼ in. (Trelleborg Ebonite Works, Ltd.).

One "Uniknob" two-gang condenser (Wingrove & Rogers, Ltd.).

Two gang-switched coils (screened), types S.A.2 and S.S.4 (Watmel Wireless Co., Ltd.).

One screened-grid H.F. choke (L. McMichael, Ltd.).

One crystal detector, complete with good crystal (Ward & Goldstone, Ltd.).

The designer of this receiver shows a preference for using a crystal detector in lieu of a valve. Above we see a large carborundum crystal and a standard permanent type.

One A.F.5 low-frequency transformer (Ferranti, Ltd.).

One OPM1 output transformer (Ferranti, Ltd.).

Two five-pin valveholders (Whiteley Electrical Radio Co., Ltd.).

One semi-variable condenser, ·001 mfd. max. (London Electric Wire Co., Ltd.).

One ·1 mfd. type BB fixed condenser (Dubilier Condenser Co. (1925), Ltd.).

One ·001 mfd. type 620 mica condenser (Dubilier Condenser Co. (1925), Ltd.).

One ·0001 mfd. disc condenser (Formo Co.).

One 600-ohm wire-wound resistance link (A. F. Bulgin & Co., Ltd.).

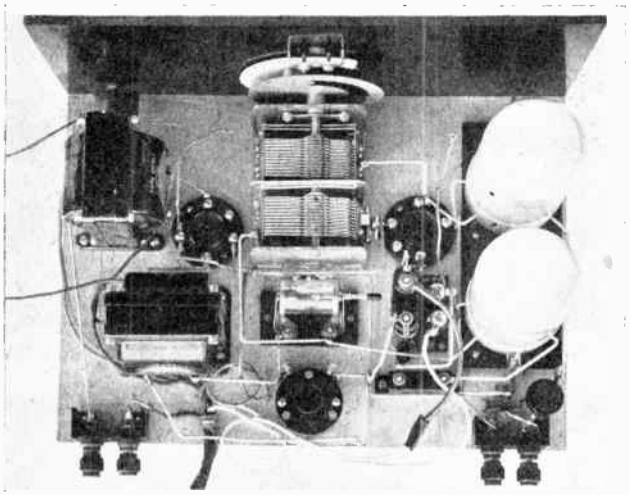
One rotary on/off switch (A. F. Bulgin & Co., Ltd.).

Four type B terminals (aerial, earth, output +, output —) (Belling & Lee, Ltd.).

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

Three midget plugs, H.T.+, G.B.+, and G.B.— (Belling & Lee, Ltd.).

One six-way battery cord (Belling & Lee, Ltd.).



A good plan view of the completed receiver which can be compared with the wiring diagram of Fig. 3.

One Mazda SG215 valve (The Edison Swan Electric Co., Ltd.).

One Mazda Pen220A valve (The Edison Swan Electric Co., Ltd.).

One baseboard, 14 in. by 10 in. by $\frac{3}{8}$ in., quantity of Lewcos Glazite wire, sundry wood screws, and short length of Lewcos single flex.

Drilling the Panel

First of all start drilling operations on the panel. The dimensions shown in Fig. 2 will help you to mark out the holes carefully, and when this is done attach the panel to the baseboard with four wood screws and fit the Polar gang condenser in position on the baseboard.

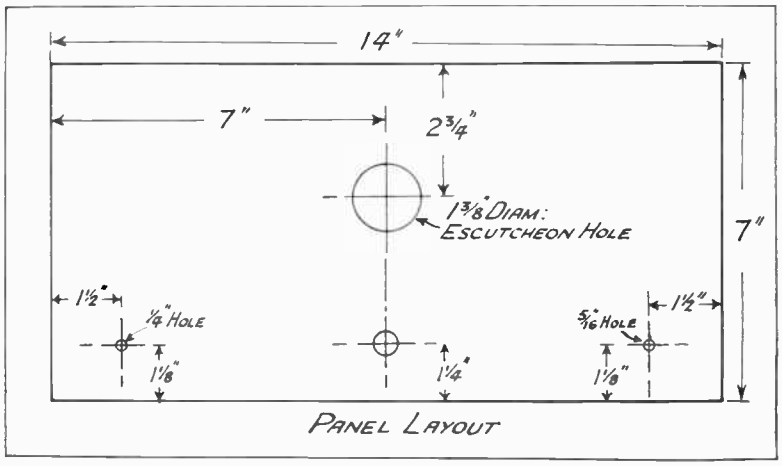
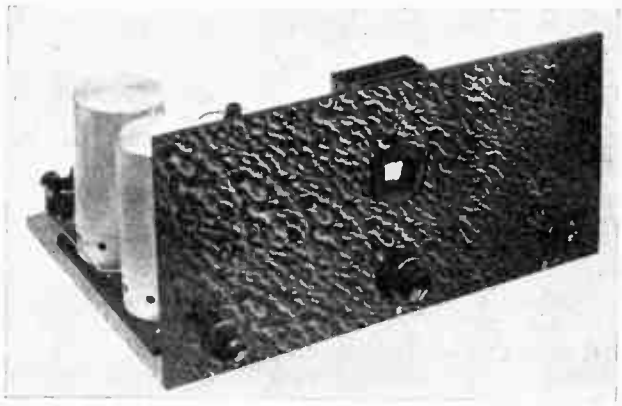


Fig. 2.—Mark out the panel prior to drilling operations according to the dimensions given in this diagram.

Fix the escutcheon by means of the small brass bracket (this being fitted behind the panel). Do not tighten the nuts more than is sufficient to hold the escutcheon. Remove the knobs from drive and place the condenser in position (taking care that it is square to the panel), and bring the scale up to the escutcheon, leaving $\frac{1}{32}$ in. to $\frac{1}{16}$ in. clearance between them. Screw the condenser down in place. After slightly loosening the nuts, the escutcheon may be moved, if necessary, to its correct height and set straight. Retighten the nuts, but *do not use undue pressure*. Fit the slow-motion drive knob, allowing about $\frac{1}{32}$ in. clearance between it and the panel; lastly fit the trimmer knob.

If desired a lamp-holder may be fitted, being fixed under one of the escutcheon nuts and bent to a suitable angle.

An air-spaced tuning trimmer is attached to the front section of the condenser to compensate for aerial capacity, etc. The rear section has a mica dielectric minimum trimmer, by means of which



The finished receiver is very neat in appearance and can be housed in a cabinet if the constructor so desires.

stray capacities and coil irregularities may be balanced.

Component Positioning

Next comes the pair of coils on their metal base, and a reference to Fig. 3 will show you exactly where they are positioned. The rod to which is attached the switch knob passes right through the panel on the left (facing front), and, having measured the distance of the coil base from the back of the panel, screw down in place on the baseboard. The remainder of the components can now be arranged in the manner indicated in Fig. 3 and the illustrations.

Now comes the wiring, a task which presents no difficulties if you follow the back of panel and baseboard diagram, Fig 3, using the photographs to give you a perspective idea of the wiring runs. I have a partiality for No. 16 Glazite for work of this character, as this wire is quite rigid. All the

(*Continued on page 29*)

"Television's" Fourth Birthday

SINCE the celebration of our last birthday, there has been an advance along the television front. It is no longer necessary to *plead* for the cause of the science, which has definitely established itself in the public consciousness. The same, however, does not apply to the magazine, which still, to a large extent, hides its light beneath a bushel.

There have been rumours extant to the effect that our journal has ceased publication. Now this, at all costs, must be denied, for not only is TELEVISION in the land of the living, but it continues to find a wide sale throughout the world.

The Amateur's Own Organ

TELEVISION may still be considered the organ of the amateur, as it is for this body of workers that it primarily caters. Perhaps a criticism will be launched stating that its pages contain too many articles of a technical and constructional flavour. This may be combated, however, by the retort that for those who are anxious to learn about the science, the sources from which they may obtain information are limited.

Broadly speaking, it is only a handful of people who have the opportunity to study television in the laboratory or possess time or means to devote to research in this direction. The enthusiast situated many miles from the nucleus of experiments in London, and with other demands on his time, is dependent on what details he can obtain from writings devoted to the science.

This need is supplied by one journal alone in Great Britain—the TELEVISION Magazine. The amateur constructor asks for help to enable him to turn his first failures into success. It is his aim to discover how to build satisfactory apparatus, to have his faults explained away and helpful suggestions substituted.

Authoritative Articles

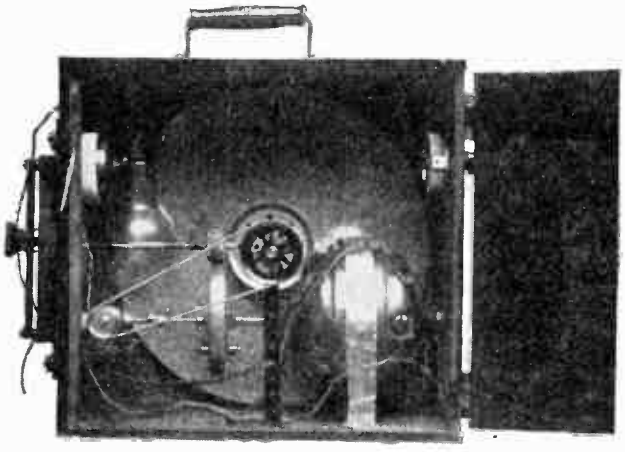
It is to this cause that the magazine is, firstly and foremost, devoted, though this in no way prohibits articles of a lighter nature, and details of demonstrations and advances which should be of interest to all thinking men and women alike. Whereas many exaggerated reports appear in the public press, TELEVISION speaks the bare, unvarnished truth. It offers articles by well-known authorities on the subject, who do not spend their time in groaning over limitations, but realise fully the infinite possibilities which daily draw nearer to becoming facts.

All new inventions face the same gruelling battle against scepticism and, very often, ignorant criticism, and in the same way any magazine devoted to the exploitation of a fresh wonder has to fight against somewhat unequal odds. It is up to the interested television public to see that it has fair play.

From letters that reach us we realise that we have many staunch supporters throughout England, and also abroad, who are doing their utmost to propagate news of the advances made in the universally acclaimed system of Mr. Baird. The reaction of the recently interested person is inevitable. He desires to become a regular recipient of the TELEVISION Magazine. Occasionally some difficulty is encountered in obtaining the journal. The solution is obvious! Order direct from Television Press, and thus ensure the monthly receipt of a copy *immediately* upon publication. The mode of procedure is simple—send in 13*s.* 6*d.*, together with name and address and details of issues required. You may then lie back in your arm-chair and cease to worry about ways and means.

A Word of Thanks

A word of thanks is here imperative to all those splendid amateurs who have contributed so vastly



A typical example of home-constructed vision apparatus built up by our enthusiastic readers. The work involved offers ample scope for ingenuity.

to the success of "their" magazine. Without their reports it would be impossible to assess the extent of the enthusiasm existent, and, in giving details of their own work, they have undoubtedly inspired many hundreds of the less keen and ambitious to try their hand at the reception of television. Long may they continue the good work!

It is not a vain prophecy to venture to state that before another birthday is celebrated by this magazine, many further improvements will have taken place, and that the entire standing of television and its mouthpiece will have changed. No longer will we be forced to swallow the contempt of the near-sighted. Television will be all the rage, and, as a consequence, the TELEVISION Magazine will be found in every home.

R. M.

A Trammel for Piercing Scanning Discs

By *R. W. Martin*

WHAT television experimenter with a friend looking over his shoulder has not heard him say, "Why are there lines all over the image?" and this after he has spent several hours making the disc.

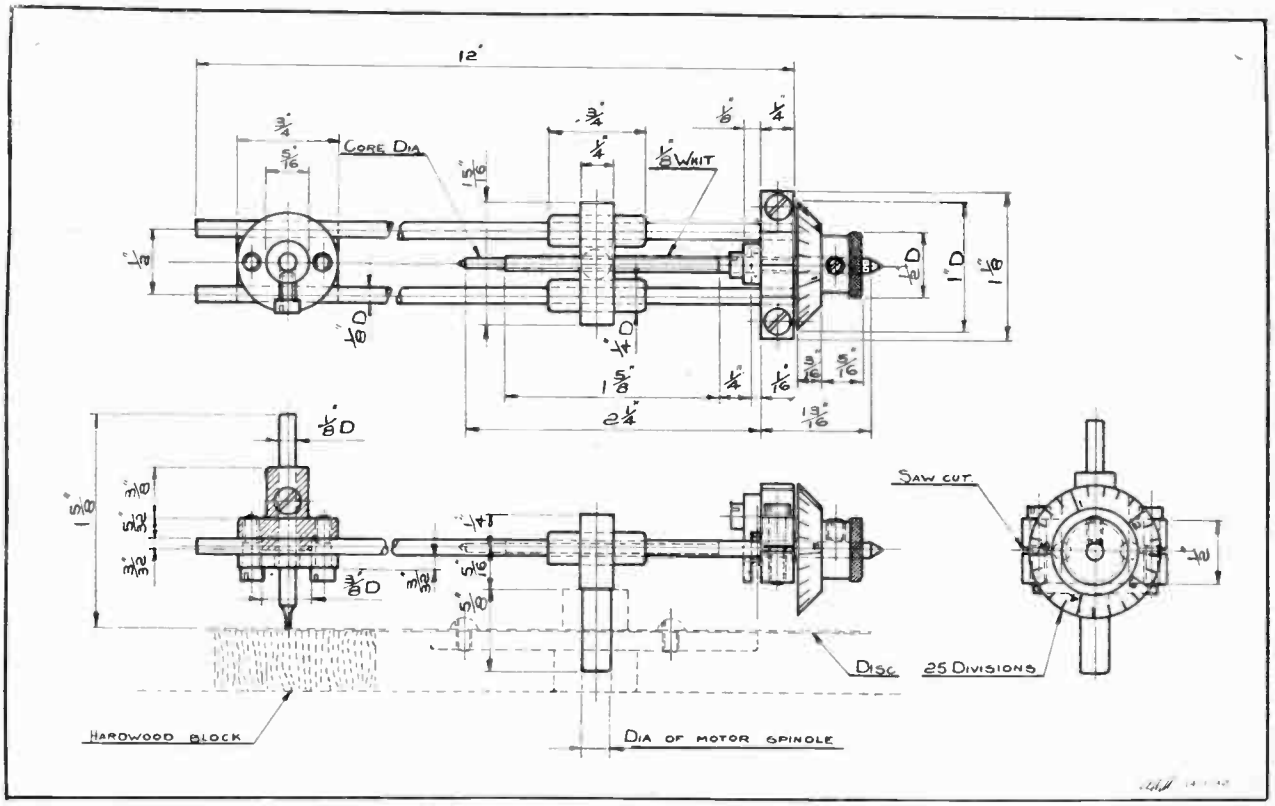
The tool illustrated was designed and made by the writer to obtain radial accuracy in piercing scanning discs and, although looking somewhat elaborate at first sight, has proved well worth the time and trouble spent on its construction. Any amateur possessing a 2-in. centre light plain lathe and a little patience can make the tool, and the only special tools needed are an $\frac{1}{8}$-in. Whitworth die and tap and an $\frac{1}{8}$-in. dia. reamer or home-made "D" bit.

The First Operation

First file up the centre piece and end piece carrying the dial and screw, from $\frac{1}{4}$-in. brass plate. Clean one side of each piece and sweat together. Mark out the positions of the three holes and centre punch. Set up on the face plate of the lathe and drill the two outside holes $\frac{1}{8}$-in. dia., and the centre one drill and tap $\frac{1}{8}$-in. Whitworth.

Unsweat the two pieces and open out the two outer holes in the centre piece to $\frac{1}{4}$-in. dia.; make two brass brushes to fit these holes and ream $\frac{1}{8}$-in. dia. Now hold the assembly on the face plate with two pieces of parallel packing under the bushes, and turn the centre peg to the same diameter as your motor spindle. If it is over $\frac{1}{4}$-in. dia., reduce the diameter of the peg to, say, $\frac{7}{32}$-in. dia., and fit a sleeve.

Open out the centre hole in the end piece to $\frac{1}{8}$-in. dia., drill and tap the two holes to take the $\frac{1}{8}$-in. Whitworth screws that grip the guide rods. Saw through from the outside into each of the outer holes to allow them to close in when the screws are tightened.



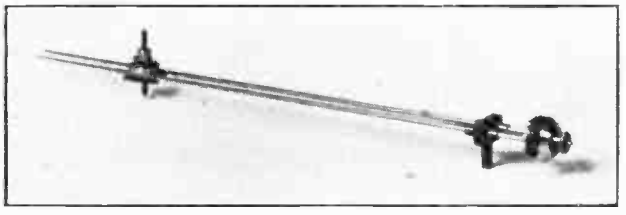
The complete working drawings of the trammel designed by Mr. R. W. Martin.

Making the Screw

Next make the screw from $\frac{3}{16}$-in. dia. steel, turning down the end to the core diameter of the $\frac{1}{8}$-in. Whitworth thread to lead the die on truly. Adjust the die to cut large at first, and if the thread is too tight in the centre piece adjust the die again and take another cut until you get a good fit without any slackness. Turn the dial from a piece of brass or aluminium, dividing the circumference into twenty-five and marking every fifth division in a clockwise direction. Drill and tap a hole for the grub screw.

Make the punch holder from steel and turn a shoulder $\frac{3}{8}$-in. dia. and $\frac{3}{32}$-in. deep for the guide rods to register against. Now tap three holes for screws, one in the side to grip the punch, and two in the flange for securing the punch holder to the guide rods.

The two guide rods and the punch should be made from $\frac{1}{8}$-in. dia. silver steel, the latter being



We have examined the finished trammel and find it well designed and capable of performing its function in an efficient manner

turned down and filed square and parallel for $\frac{3}{32}$-in., and then hardened, tempered, and touched up with an oilstone. The size of the square can be found by dividing 2,100 into the circumference on which the outermost hole of the disc is to be placed.

Marking out the Disc

Mark a line on the end piece to read the dial against, and assemble the tool after seeing that the guide rods are reasonably straight and there are no burrs on the ends. When marking your disc bore a hole in the centre of the piece of aluminium, a good fit to the boss, and secure with three screws. With a scriber in place of the punch, scribe a circle as large as possible and divide into thirty as accurately as your patience will allow, afterwards scribing radial lines from each point 2 in. long from the outside of the disc.

Replace the scriber by the punch, and set it square and projecting sufficiently to bring the guide rods parallel with the disc when the point is touching it. Pierce the outermost hole first, striking the punch once with a light hammer and supporting the disc under the punch on a block of hardwood (end grain).

Turn the dial clockwise through a number of divisions equal to the size of the punch in thousandths of an inch for each succeeding hole, not forgetting to move the block of wood. The result should be a disc equal, at least in radial spacing, to the best.

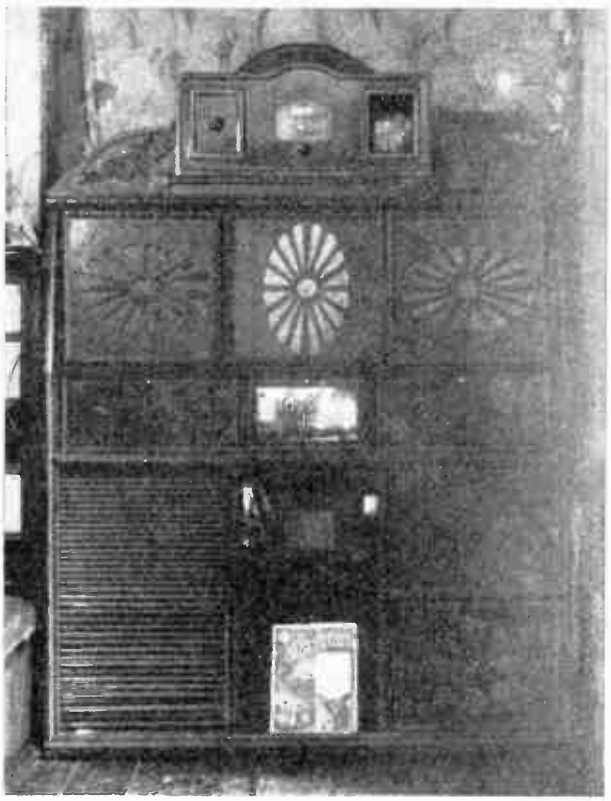
Another Stage in the Tele-Radio Receiver

DESIGNED AND DESCRIBED BY

H. J. Barton Chapple,

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

I WISH to take this opportunity of thanking the many readers who have written to me in connection with the Tele-Radio Receiver design which I started some little time ago. Many helpful suggestions have been forthcoming in this way, and



An amateur version of an "all-in" set for the purpose of receiving the dual vision and sound transmissions.

it is gratifying to know that there is abounding such a keen interest in the reception of television signals with the idea of getting the very best possible results, in many cases without consideration of cost.

A Warning

In addition, an apology is due to those readers who, having followed the work so far, found a blank period of two months before these articles have been continued. According to some of the letters, potential constructors have gone so far as to preconceive what my intentions were likely to be on this design, and have purchased certain components with a view to incorporating them. Such enthusiasm, while in every way commendable, may in the long run not be economical, for obviously in a design of this character several experiments have to be made before it is possible to decide *finally* on the correct components and the correct circuit.

I have given a great deal of very careful thought to this intricate question of a *de luxe* wireless receiver for the reception of television signals, and, as far as possible, it is hoped to make use of the most up-to-date developments which have taken place in connection with new components and new valves. For example, the variable-mu valves will be included, for undoubtedly they have many important advantages.

Advantages of Variable-Mu Valves

Under normal circumstances there is no H.F. distortion or cross modulation. This is an important factor when it comes to the reception of a television image, where it is necessary to fulfil in every way the expression "distortionless" to a degree more so than is necessary generally for aural reception. Then, again, with these valves one has the advantage of an excellent volume control with a particularly wide variation, a very necessary item in a receiver of this character which, it is hoped, will be employed many miles from the source of the transmitting signals.

Although situated in the London area myself, I am endeavouring to bear in mind the requirements of those who are not so favourably situated so far as proximity to the Brookman's Park transmitters

is concerned. The requirements of lookers-in in the Midlands and the North are much more stringent than those in the South, while, in addition, thought has to be given to Continental television transmissions, which are now beginning to make their appearance with fair regularity.

A Thought on Tuning

Turning once more to the advantages of the variable-mu valves, this new development reduces background noises to a minimum, results in a simplification of the decoupling equipment, and one is able to bring about increased stability with multi stages.

There are one or two other aspects which require very careful thought, and these are the type of tuning to employ and the best method of rectification. In the case of the former, while appreciating the obvious advantages to be gained by using band-pass tuning, I found that a definite limit was set on the frequency band which could be passed. We all know that for television purposes the greater the frequency spread that can be made to pass through the receiver, the better will be the image ultimately watched and, although the nominal sideband allowed by convention is 9 kilocycles, one can reasonably hope that there are certain frequencies beyond this 9 kilocycles which are propagated into the ether, and if these can be captured then it is all to the good.

Final Selection

My final decision, therefore, was made in the direction of three straightforward tuned circuits, such as are indicated in the accompanying diagram, Fig. 1. The type of coil that I visualise is the new Colvern "K." Adequate barriers between anode and grid circuits can no longer be produced by simple vertical screens or by the use of large metal boxes. In their place separate screened coils, valves, and condensers have been pressed into service in all but the most modest of sets. By this means electrostatic and magnetic fields are kept within their defined limits and unwanted couplings are reduced to a minimum.

In the coils I have shown in the diagram it will be noticed that a two-way switch transfers the lead from the aerial or anode-feed condenser to a point nearer the earth end of the coil as the wave-change switch goes over to the long-wave position. In this way it is hoped to remove the difficulty so often met with when self-oscillation occurs on the long wavelengths, though stability is maintained on the medium waveband. In addition, of course, an added degree of selectivity is obtained on these long waves.

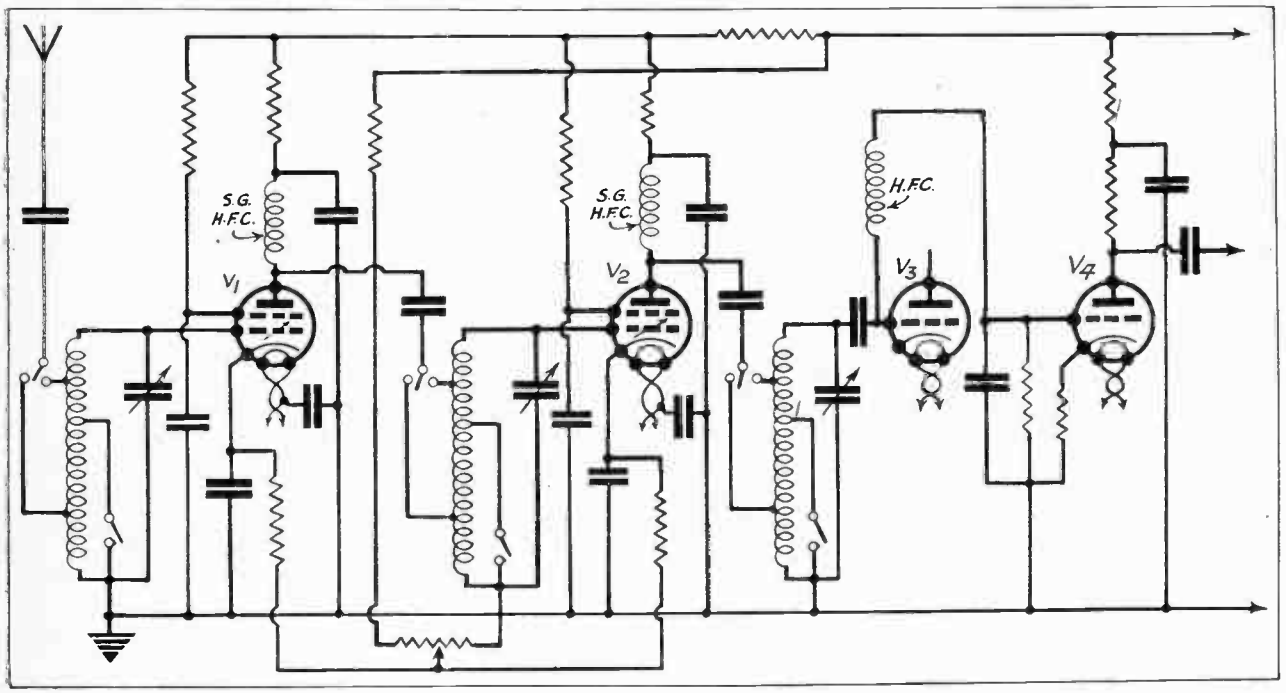


Fig. 1.—Mr. Barton Chapple's suggested scheme for the high-frequency and detector stages of the Tele-Radio Receiver. Volume control is secured through the medium of variable-mu valves, while a diode valve is to be employed to rectify the signals before they pass to the low-frequency amplifier.

Dual Purpose

It may be wondered why any provision should be made for long waves in a set which is to be used for the reception of television signals, since the bulk of these transmissions, that is, apart from Königswusterhausen, are on the medium waveband. My reason for following this policy is really one of economy. With the present length of time per week devoted to television transmissions, there are many hours in which the set would normally be out of

commission. I am therefore visualising the use of this set for the reception of sound transmissions during the periods when television signals are not on the air, and since the long waves provide some very good aural transmissions it is wise to allow for their reception.

De-coupling

So high is the efficiency of modern valves and component parts, that unless due care be exercised in preventing energy transference back from the output to the input of the valve stage, the receiver will suffer from uncontrollable oscillation, or perhaps, which is worse, from incipient oscillation with its quality-destroying properties.

There are three types of unwanted coupling, namely magnetic, capacitative, and resistive. The

Another amateur version of a dual vision and sound wireless receiver built into a cabinet complete with loud speaker and vision apparatus.

first two can be held in check by adequate screening such as is intended to be used in the Tele-Radio Receiver, while the third, which results from the passage of oscillating currents through a component which is common to two or more circuits, can be avoided by providing a low-impedance by-pass for the unwanted oscillations to pass to the cathode. This side issue will, as far as possible, be carefully watched in the design.

Choke Feeding

A reference to Fig. 1 will show the bare essentials of the scheme I have in mind. The volume control with the two screened-grid H.F. stages is secured by a variation of grid bias, and this is effected primarily through the medium of a single potentiometer. Choke-fed tuned-grid coupling has been chosen, as my previous experiments have proved quite readily that this form gives first-class results. The component values are not included at this stage of the description, but will be forthcoming as soon as more opportunity has been given for prolonged tests on the set itself.

A Diode Rectifier

The next important item is the rectifying stage. Readers will see that my final choice is the use of a diode on the lines of what has come to be known now as the "Kirkifier." This has been dealt with very fully in a recent issue of the *Wireless World* (February 3rd, 1932), and interested readers, who desire to know more of the actual working of this stage of the apparatus, are referred to Mr. Kirk's original articles on this question.

Whereas in the original schemes it was necessary to use a battery for polarising the grid, the same effect can be obtained by automatic bias. Special care must be given to the choice of the valve for this stage, as well as to the H.F. choke used in this position. There must be negligible self-capacity and negligible capacity to earth, but I will have more to say on this in the next instalment of the series.

On the L.F. Side

Readers will see that in the diagram I have not continued beyond the first valve of the L.F. stage, namely V4. It is my intention at the moment to include three stages of R.C. coupling before passing finally to the vision apparatus. Furthermore, having proved that the efficiency of synchronising is so much better when a separate valve is used to handle the synchronising signal, I intend to make provision for this arrangement.

Since the receiver in question will be a complete mains drive, there will be no difficulty in obtaining the required voltage and current to bring these particular ideas to fruition, and it is hoped that by the time the next issue is out, there will be very complete details to be handed on, so that the constructor can make an actual start with the work.

Voice Your Own Opinion

In any case I wish to extend an invitation to any interested readers to write to me c/o this magazine, and voice their opinions as to the decisions I have made so far as the circuit diagram is concerned. The low-frequency stages have not been included in Fig. 1, and, furthermore, the arrangement of the mains eliminator supply are omitted. This section is relatively straightforward, however, and will be given with next month's schematic diagram.

I fully appreciate that there are several extremely good alternatives to the circuit I have proposed, but I am basing my comments on the fruits of a very large experience in television reception coupled with data I have compiled from tests of about twenty

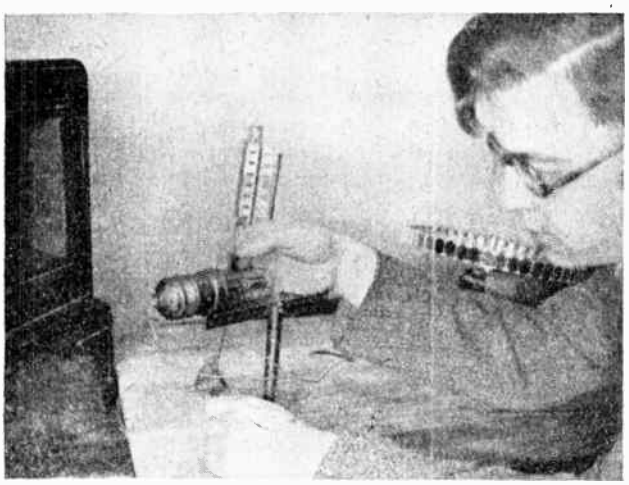
(*Continued on page 26*)

Amateur Television Work in Berlin

By *Dr. A. Gradenwitz*

AT a recent meeting of the German Television Society, Mr. Horst Hewel, with whose work in receiving the Baird television transmissions from London readers of this journal are familiar, demonstrated a new wireless set developed by himself specially for television work, in connection with vision apparatus likewise of his own construction.

The "Telesuper," as this set is termed, is a super-



Mr. Horst Hewel making positional adjustments to the "point" neon lamp which he uses in connection with his home-constructed vision apparatus.

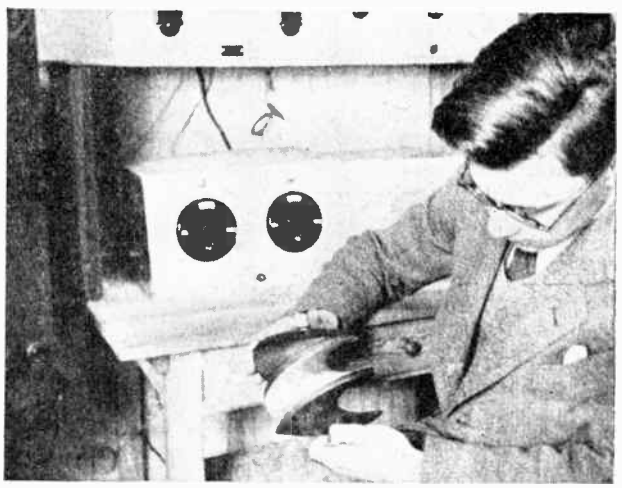
het. receiver for television on short or ultra-short waves. Its main constructive features are as follows:

A single-grid valve is used as frequency transformer in connection with a separate oscillator valve, the intermediate frequency being about 1,200 kilocycles. This is amplified aperiodically by two multiple valves; H.F. power rectification is by means of a pentode and diode; a glow lamp being in the output anode circuit.

Simple in Design

This receiving set was demonstrated in connection with a 48-line mirror-drum machine, using a "point" lamp, the size of images being 18 by 24 cm. Television transmissions from Doeberitz (on 144 metres) were received quite satisfactorily, though the set had only just been completed, without sufficient time for a thorough adjustment.

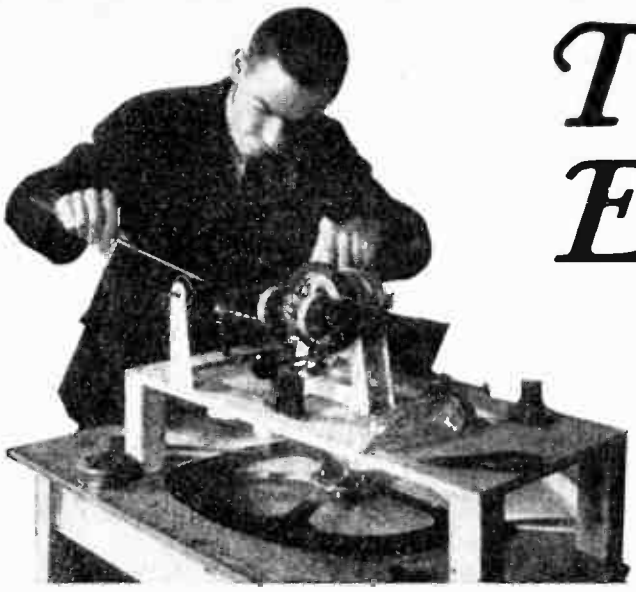
When calling on Mr. Hewel at his private laboratory a few days ago, I found him at work with a 60-line helical mirror system for ultra-short-wave television, the transmitter of the *Reichspostzentralamt* (General Post Office Research Department) being received on 6·75 metres, the station power being about 300 watts.



Examining the 60-line helical mirror drum employed in connection with Mr. Hewel's ultra-short-wave television experiments.

The waveband allowed to pass by the "Telesuper" at present is about 100,000 cycles, a modulation frequency of 50,000 cycles being reduced only 30 per cent. Moreover, it is claimed that this waveband can be further widened.

The receiving set is very simple in design and, while being highly sensitive, enables ultra-short waves to be used under very stable service conditions.



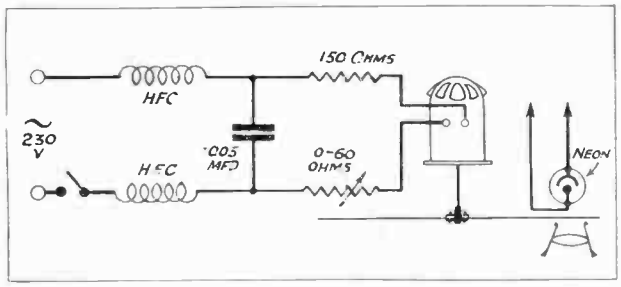
The Enthusiast Sees it Through

IT is interesting to note that we number among our most ardent enthusiasts members of the younger generation, who not only experiment during holiday time, but give lectures to their fellow schoolmates during term time. In many cases a shortage of ready cash makes these experiments a slightly laborious business, but, nothing daunted, they continue with their efforts in a most laudable manner.

As television, in a perfected state, is to be the heritage of these younger people, it is encouraging to know that they are willing to help in hastening it forward, so that the older enthusiasts may benefit by their discoveries.

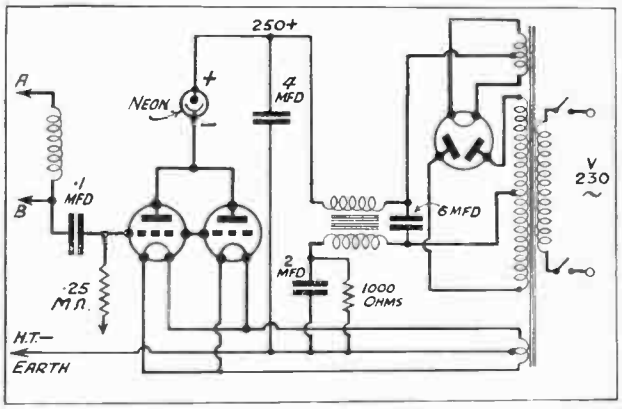
Help from Fellow Enthusiasts

We have received a very interesting letter from one of our younger enthusiasts, Mr. H. K. Milward, of "Highclere," St. Lawrence Road, Chepstow, who acknowledges that it was owing to the reports submitted by his fellow enthusiasts in the columns of this series that he first started experimenting with television. He now gives us some details of his work, hoping, no doubt, in his turn to help others in a like manner. From details he gives us below, Mr. Milward is evidently both keen and clever, and we heartily congratulate him on what he is doing for the cause. He writes:



The scheme adopted for driving the motor—one which normally does duty in the home vacuum cleaner.

"I started taking TELEVISION in February 1930, and it was owing to the encouraging letters therein that I started my own experiments.



Both the mains transformer and smoothing choke were made up by Mr. Milward, and work satisfactorily in conjunction with the amplifier.

"I should like you to know that I can only work in the holidays, as I am still going to school and, like others, am very short of pocket money.

"I got my apparatus going first in August 1931, and my results were not very encouraging, as the only things I could see were vague shadows, and it was only a few weeks ago that I found it was the disc that was the trouble. Many of the holes were nearly a degree out of position, thus distorting the picture almost out of recognition.

"I have not yet been able to finish my new disc, so I can give you no fresh results. However, I am quite sure that the extra trouble will be rewarded with good results.

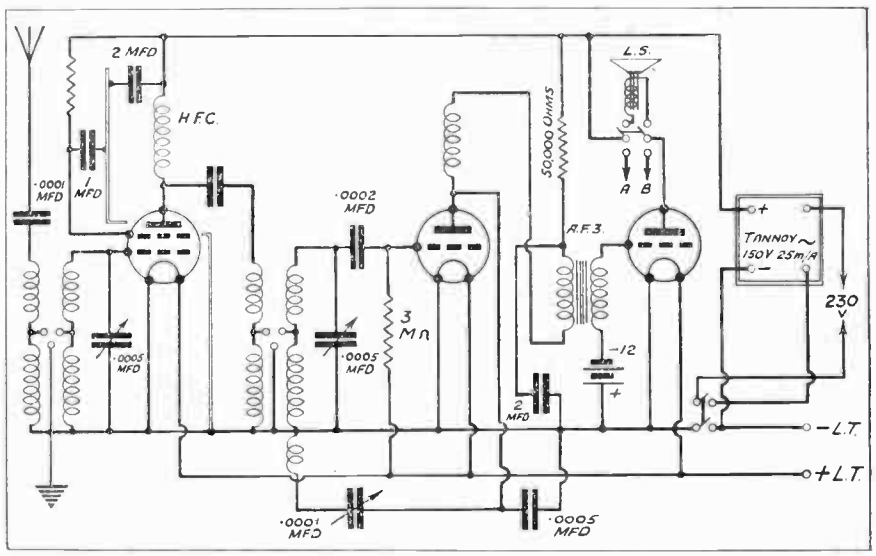
"My apparatus consists of the usual type of thing. My motor is one which I have to take from the vacuum cleaner every time I want to get a transmission. I am using an ordinary beehive neon with the resistance removed.

"The diagrams of the receiving set and amplifier are shown on the accompanying sheet. The set itself is an *Amateur Wireless* design, which was put together for family use about three years ago (before I knew much about wireless and television).

"The amplifier was made about two months ago, and it may interest you to know that the mains transformer and smoothing choke were constructed by myself. It will supply about 270 volts at 50 m/A. The rectifier is a Tungsram PV495, passing 50 m/A at 300 volts. The two super-power valves are Lissen PX240 and Mullard P240.

"The total current consumed is about 30 m/A, and the neon is very bright with this current. Altogether, everything works very well (except my old disc).

"Thanking you very much for the help your magazine has given me and wishing it every success."



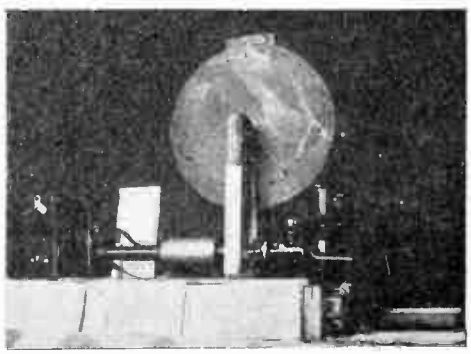
A straightforward receiver design, about three years old, is used by Mr. Milward, in Chepstow, to bring in the vision signals broadcast from Brookman's Park.

Television Results from Sweden

This month we are again able to publish some details of the results obtained by one of our early enthusiasts, Mr. Adolf Herrlin, of Fil. Mag., Ahus, Sweden. It is very reassuring to feel that all over the world we can draw upon the experiences of television experimenters for the benefit of our readers, and we are sure that they will be interested to read of the work of this latest correspondent, who says:

"From the pictures I enclose you will see that my television apparatus includes a scanning disc (Danish 24-holes system) and neon lamp, the speed being regulated as on the previous occasion I wrote to you. The results, however, were not very good, this probably being due to incorrect motor speed.

"I then tried a low-voltage, home-constructed motor (6 volts, 7 amperes), and a honeycomb transformer was also made up. Using this low voltage, the radio receiver was not disturbed by interference from the motor. After this a more powerful 120-volt motor, shown in illustration, was employed, and the results showed great improvement. A scanning disc with three separate spirals (for the English, German, and Danish systems) was made.



This original apparatus of Mr. Herrlin was driven and synchronised by hand.

"In spite of the fact that every precaution was taken, the motor interference destroyed long-wave reception and, therefore, the Königswusterhausen transmissions were not receivable. Reception of the Berlin transmissions in Ahus in daylight are also poor, while the transmissions from

Köbenhavn, on a wavelength of 160 metres, show strong fading. The only really good results I received were from the midnight transmissions sent out from London. I saw many recognisable pictures, but after a few seconds synchronisation was lost, and it was perhaps a couple of minutes before I could bring the picture back into synchronism. I had intended making synchronising gear, but now that the midnight transmissions from England have been discontinued, this hardly seems worth while.

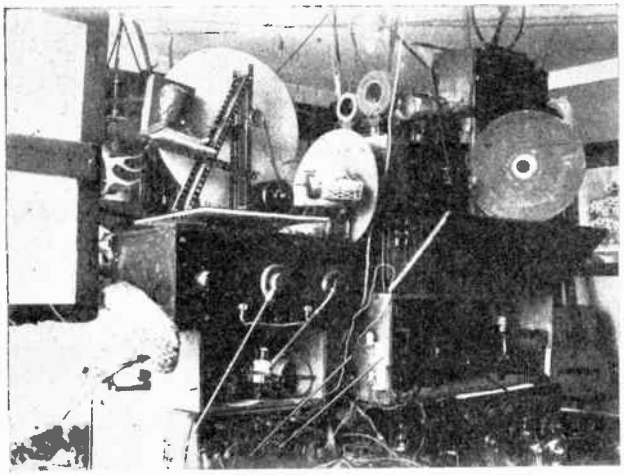
"I will now give you a few details concerning my television apparatus. The scanning disc is made of pasteboard with quadratic holes in the usual formation. The lamp is the usual glow lamp, neon type, costing about two shillings. The receiver has a detector and two stages of low frequency. On the last of these can be applied a high negative grid voltage regulated by a potentiometer. The neon lamp is shunted directly in the plate circuit."

Transatlantic Television

One of our most ardent enthusiasts, Mr. J. Foster Cooper, of Toll Bar, Barton Road, Cambridge, has written to us again in connection with the efforts he is making to establish transatlantic television reception.

We feel sure that readers will be intrigued with the information he has been able to impart, and we would suggest that others should endeavour to receive the station which he appears to have logged. He says:

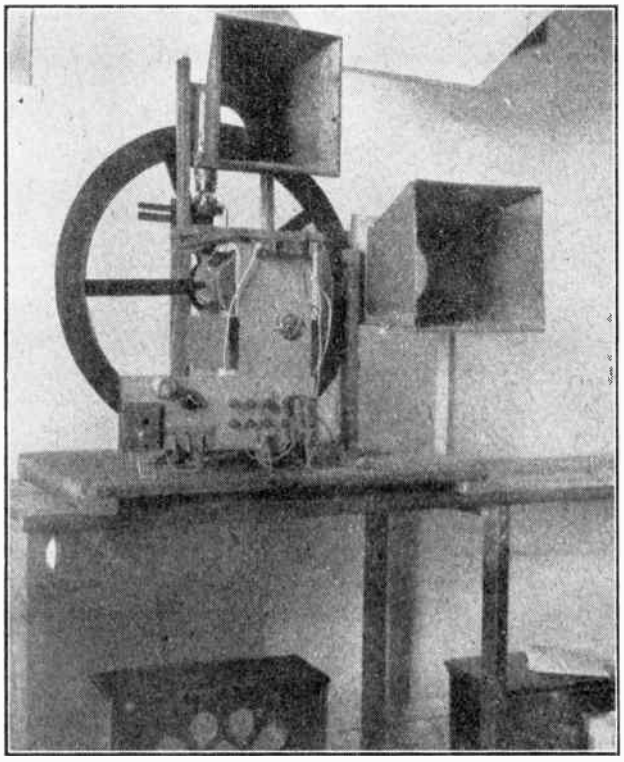
"Since I last wrote to you, I have been searching carefully for television signals on all wavelengths between 15 metres and 2,000 metres. Unfortunately, most of the American transmissions seem to be on the 150-metre band, which is by far the worst for transatlantic reception. I discovered signals, however, round about 300 metres, and wrote you a letter to that effect. Since then I have calibrated my set carefully, and calculated the wavelength as 309 metres.



We are obliged to Mr. Herrlin for this picture of his radio room. No one will deny that he is a keen enthusiast, judging from the apparatus he employs for his hobby.

"I then discovered in a very comprehensive list of American transmitters, published in last month's *Radio Digest*, that WCFL Chicago broadcasts television on 309·1 metres. A picture of the equipment used, appeared in *Amateur Wireless* a few weeks ago. I have written to the station in question, and will let you know what they say.

"The signals were heard at about 2 a.m. on a 4-valve set, at about R5 on 'phones, and were of a rather higher pitch than Baird ones. I think that possibly some of your readers may like to search for this station, which might, under good conditions, provide an image.



A front view of Mr. Foster Cooper's vision apparatus. By means of one switch he can bring either neon into circuit or alternatively pass the signals through a loud speaker for tuning purposes.

"I enclose two photographs of my rebuilt vision apparatus. It has two viewing tunnels, for vertical and horizontal scanning. Both the neon stands and the tunnels are completely adjustable. The switches on the panel in front enable me to turn on either neon or to switch over the loud speaker used for sound on to the vision wavelength for tuning the latter by ear.

"I have fitted Baird synchronisers, which give marked improvement, but I am still troubled with fluctuating 90-cycle mains. I have been operating this apparatus with a Marconi 4-valve all-mains set, using a PX4 output."

A Reader since No. 1

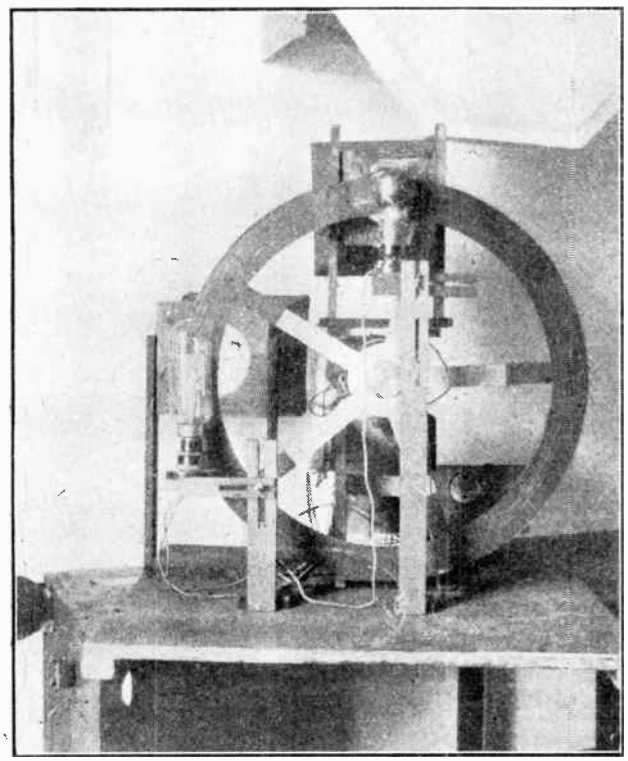
We are naturally delighted to hear from our

readers, especially when they can boast that they have been staunch supporters since No. 1.

Mr. J. Aldam, of 110 Charlemont Road, East Ham, falls within this category, and we not only appreciate the fact that he eagerly looks forward to each issue, but takes a pride in feeling that we have helped him in his work on television.

That he intends to go still further with this work is explained in his letter, during the course of which he says:

"I have been a reader of your magazine since the first issue, and look forward eagerly each month for the next number. I have never written before,

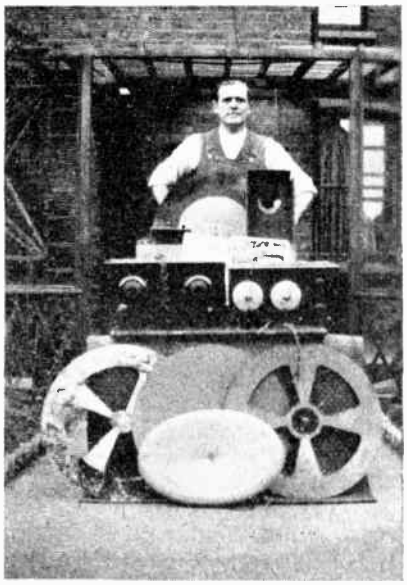


Looking at the back of Mr. Foster Cooper's vision apparatus. Both vertical and horizontal scanning may be employed, the separate neons for this purpose being clearly visible.

since I have not had the best of results on my vision apparatus. My first trouble was a fan motor with a wrong voltage, which I found would have been too dear to run; so I procured another, and this had to be run in series with two variable resistances in order to get the correct speed.

"I next found that the discs which I had constructed were faulty, so I made the jig (described in TELEVISION) and another disc, and this time had greater success. I next burnt out a resistance, but, having had that repaired, found that synchronisation was my trouble. I have now overcome this difficulty by using tape on the motor spindle, and am able to hold the picture fairly steady. I am using a beehive neon, frosted with emery powder, and with the resistance removed.

"Early in my experiments I tried using a motor lamp glass filled with water for a viewing lens, a piece being puttied on the back, but this gave bad results, so I bought a pair of Baird lenses and a



A reader since No. 1, Mr. J. Aldam is justly proud of the work he has carried out in connection with television reception.

Baird neon, and am glad to say that since then I have had very fair results.

"I am constructing synchronising gear as described in the constructional feature of the January 1932 issue, and am going to build myself a 'Gradiovisor' as soon as I am satisfied. I am forwarding you a photo showing my vision apparatus and wireless receivers for sound and vision. I have now cut out the sound on account of expense, so hurry up that vision and sound receiver of Mr. Barton Chapple's.

"With best wishes for your journal and the queries column. Hoping you can find room in the magazine for these notes and photograph, so that I may interest a few friends with television."

NOVEL RADIO EFFECTS IN A LONDON PLAY

In his latest production, *The Last Coupon*, at the Garrick Theatre, London, Ernest King appears to have spared no pains to ensure realism and last-minute modernity. For instance, the action in the biggest scene, which takes place in a Park Lane drawing-room, hinges largely on the dramatic effect of a running commentary on a boxing match relayed from the Albert Hall.

The "relay" is, of course, produced "off stage," complete with the appropriate noises, and the assistance of the Mullard Wireless Service Company has been enlisted in this connection. The commentary is passed through their public address amplifiers before being led to a modern wireless receiver and loud speaker on the stage, and the effect is most realistic.

Television on an Express Train

A Novel Experiment

A FEW days ago a very novel experiment was carried out by a party of radio and television experts who received, on a moving train, the normal television transmission broadcast through the Brookman's Park B.B.C. station, by means of the Baird process. On this occasion no special apparatus was employed, a standard McMichael 4-valve portable receiver, similar to that used by H.M. the King, being coupled to a Baird "Televisor."

High Speeds

The vision signals, broadcast on a wavelength of 356 metres, were tuned-in and the images observed by those looking-in. The train touched speeds up to 70 miles per hour between Sandy and Huntingdon, but the artists performing at the Baird Studios in Long Acre could still be seen by the train party.

This is the first time that television broadcast by wireless has been received on a rapidly-moving railway train; no experiments of this nature having been tried elsewhere in the world.

Seated in a saloon car of a L.N.E.R. express train, a party of radio and television experts were able to receive the normal Baird television transmissions broadcast from Brookman's Park and watch the artists performing in a "Televisor."

A Film Record Taken

As was only natural under such extreme conditions as these, a certain amount of interference was noticed, but this in no way detracted from the interesting experience enjoyed by all who participated. The Pathé film company took a wonderful film of the whole experiment, and no doubt some readers have already seen this record at their local cinemas.

The tests were made in order to ascertain whether it would be possible to receive radio vision on express trains in addition to radio sound programmes. The L.N.E.R. have already equipped one of their regular express trains with a wireless set, and sterilised headphones, which are hired out at a nominal fee.

H. J. B. C.

Another Stage in the Tele-Radio Receiver

(*Concluded from page* 20)

commercial wireless receivers in receiving the television signals.

Whereas the ear often can be satisfied with a relatively inefficient circuit, the eye demands greater stringency. This is said with a full appreciation of the fact that "praotice" necessitates some modifications to "theory." So many sets fail when receiving television signals owing to their inability to pass through the very low frequencies, and this has to be guarded against if the best is to be aimed at.

However, I am anxious to please the majority of the readers in this work I have taken on, so do not fail to let me know *early* your own impressions and requirements, and as far as possible I shall be pleased to incorporate them in the final model of the Tele-Radio Receiver.

Workshop Hint

By *Thomas W. Collier*

A GOOD deal has been written from time to time in this magazine on the subject of making scanning discs for television receiving apparatus. I will not therefore repeat what has already been done in the way of detailed instructions, but, on the other hand, offer a few helpful suggestions to constructors who have probably made fairly good discs or to those enthusiasts who desire to "have a shot" at disc making.

Common Disc Faults

A perfect disc will reproduce scenes on the "field" or scanning area exactly as they are seen at the transmitting end. There will be no vertical

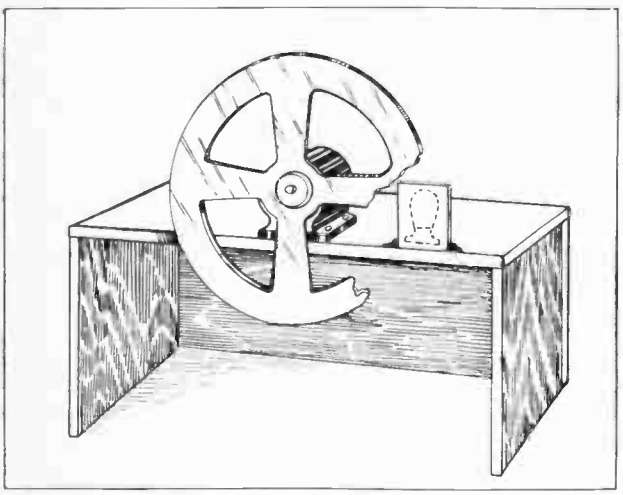


Fig. 1.—Testing discs by the use of a ground-glass screen secured by plasticine, the neon lamp being replaced by an ordinary filament lamp.

lines, and horizontal objects will not possess a broken or stepped appearance. It will be obvious therefore that as much depends on the mechanical perfection of the scanning disc as on any other factor. Even so it is not beyond the average constructor's ability to make good discs while indifferent ones can be corrected without a great deal of trouble.

The commonest faults with discs are:

(*a*) White and black lines due to incorrect spacing.

(*b*) "Steps" due to faulty angulation.

Spacing errors are easier to correct than angular; one reason being that the latter can only be corrected while a picture is being actually received. A diffused screen is required to check over

the field to determine the extent of the spacing errors. An arrangement as shown in Fig. 1 will do quite well for this purpose, the neon lamp being replaced by an ordinary metal filament lamp. Ground glass will do for the screen, and can be secured in position by plasticine. This material, by the way, will be found useful in a number of places for securing temporarily such items as lenses, neons, mirrors, etc.

White and Black Lines

White lines appear because two adjacent holes are overlapping; while black lines are due to adjacent holes being too far apart, dust clogged holes, or

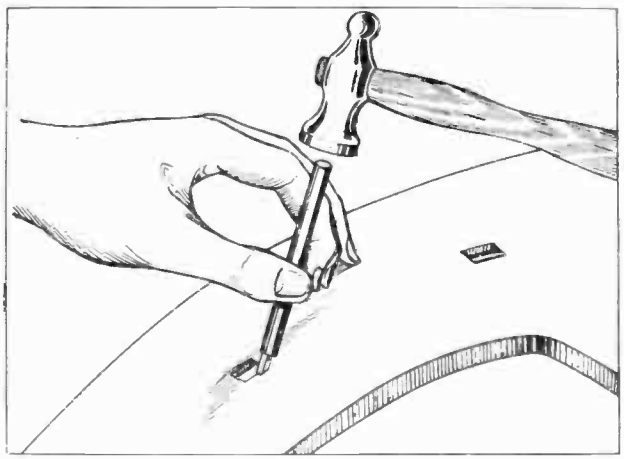


Fig. 2.—Correcting white lines on a disc by "closing" the hole with a light tap on a punch.

maybe a burr pushed up during the punching operation. A fairly stiff brush may be used to remove dust, and fine blue-back emery paper will remove any light burrs.

If, after burring and brushing, the black lines are

still visible their positions on the field should be noted and, with a fine 3-square file (jeweller's needle file, price about 2½*d*.), file the inner and outer sides of the respective holes between which the black line is visible. Check the disc at each separate operation, that is to say, check after filing the inner side before proceeding with the outer side of the next hole.

You will find it quite a simple matter to remove all the black lines in this manner. If you have any difficulty in counting the holes correctly while running, deal with the disc in sections. A good plan for this is to stick stamp-paper over the tenth and twentieth holes (not in them).

A Useful Tip

White lines are not so objectionable as black, in fact thin ones will not be noticeable when the neon is modulating; but if you wish to remove white lines, this is the best method. Check over and find the adjacent holes between which the white lines appear;

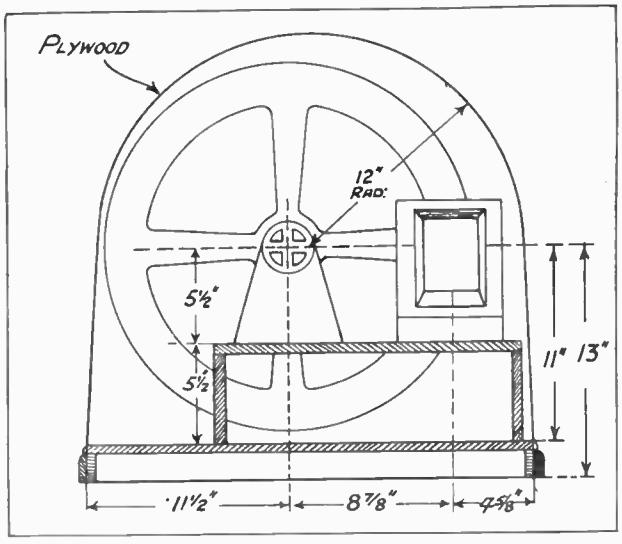


Fig. 3.—The general scheme of component lay-out, ex cabinet front.

remove the disc from the motor, and close the hole slightly by spreading the metal (see Fig. 2). This operation should be done with great care, especially if you have used thin aluminium sheet for making your disc. Angular errors should be corrected in much the same way, except that the extending or closing will be done from the top and bottom of the holes. With patience, a perfect disc may be made.

If you consider a square-hole disc too difficult or too much trouble, try one with round holes. Use a drill slightly larger than the square punch, say 10 per cent.; this will cause a slight overlap, but it will be uniform and hardly noticeable. Now indent the disc at the points where holes are to be drilled.

This can be done with the scriber, taking care to hold it "spot on" the dividing lines, and being quite sure that it is truly vertical when the indent is made. This will give the drill a true guide. Any burrs thrown up after drilling should be removed by lightly countersinking the hole with the tip of a larger sized drill. The drill should be held with the fingers, and great care taken to ensure that the drill does not open out the smaller hole.

Making Cabinets

Many constructors have described their television receivers in these pages, and a great number of

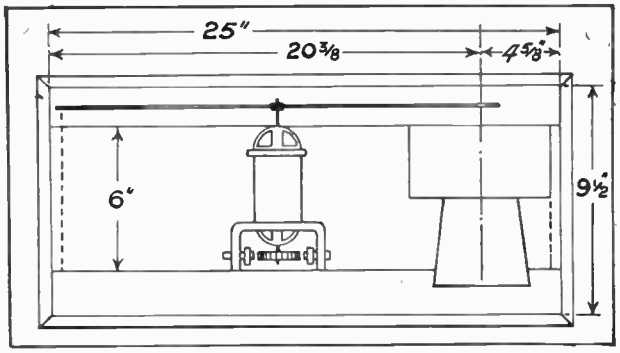


Fig. 4.—A plan of the baseboard lay-out supported on the plinth.

photographs of apparatus have been featured; but it has occurred to me that very few have really gone much further than a square box as a suitable home for their apparatus. Figs. 3 and 4 illustrate a new departure in cabinets to house receiving apparatus. It is quite easy to construct, and is made up chiefly of plywood. The plinth is fixed to the baseboard; the front is made in two sections, the top being hinged to the lower section which is the control panel. An elongated slot allows the framing gear spindle to protrude sufficiently to fix the operating knob and allow the top section to open. If the slot is not desired, a clearance hole for the spindle should be drilled, but in this case the front would have to be screwed in position.

The motor support, having ample room for additional fixed resistances or condensers, is built up from the base. The front panel could be fret cut to break the "plainness" if desired and cloth material backed, as is the case with so many loud-speaker cabinets at the present moment. The arched top and sloping sides are bent in plywood. This should not be very difficult, owing to the large radius. If, however, any difficulty is found owing to the thickness of the ply, it can be shaped by steaming before bending.

The neon is fitted outside the back panel, and should be encased in a suitable cover (the one illustrated in last month's issue will do quite well); while the viewing tunnel is supported on wooden packing strips from the baseboard.

The "Crystal" Three

(Concluded from page 14)

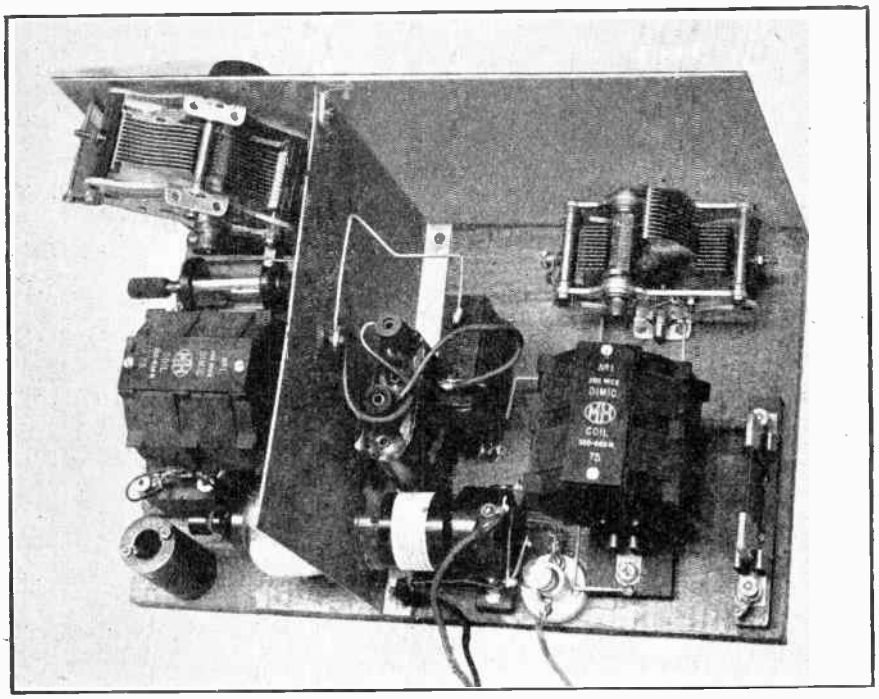
junctions are soldered, and for this I had the assistance of the "Goltone" electric soldering iron. The work when carried out in this manner is quicker and cleaner, and I can wholeheartedly recommend others to follow the same policy.

Although there are four H.T. positive connections, I have specified and used a six-way battery cord which only allows for three. The remaining one, H.T. +, is joined to one of the output terminals (see Fig. 1) for the circuit including the neon, and the reason for this will be explained later. Tuck away any spare lengths of the individual leads of this battery cord where connections are made on the set itself, for nothing looks worse than straggly wires; and don't forget to cleat down the cord to the baseboard with an insulated staple to hold it in place.

Valves

Check over each wire to make sure no mistakes have crept in and then prepare for a test. Since it is desirable to have the largest possible output with a set of this character I have chosen two Mazda valves, the SG215 and Pen220A. In the case of the former, the amplification factor is 400, with a mutual conductance of 1·1. Quite a large signal is therefore handed on to the crystal detector, which in turn then passes to the pentode valve. For a two-volt pentode this Mazda valve is rated to give an undistorted output of 1,000 milliwatts under proper working conditions, and this is excellent for our purpose of energising the neon lamp.

Insert the two valves in their holders, joining the respective flex leads to the screen-grid valve anode terminal and the screening grid terminal of the pentode valve. If you have a five-pin pentode valve, then join this lead to the valveholder terminal connected to the centre socket.



Recalling the original H.F. and detector unit designed by Mr. Richardson and described in our September 1930 issue. Interested readers should turn to this number for further information.

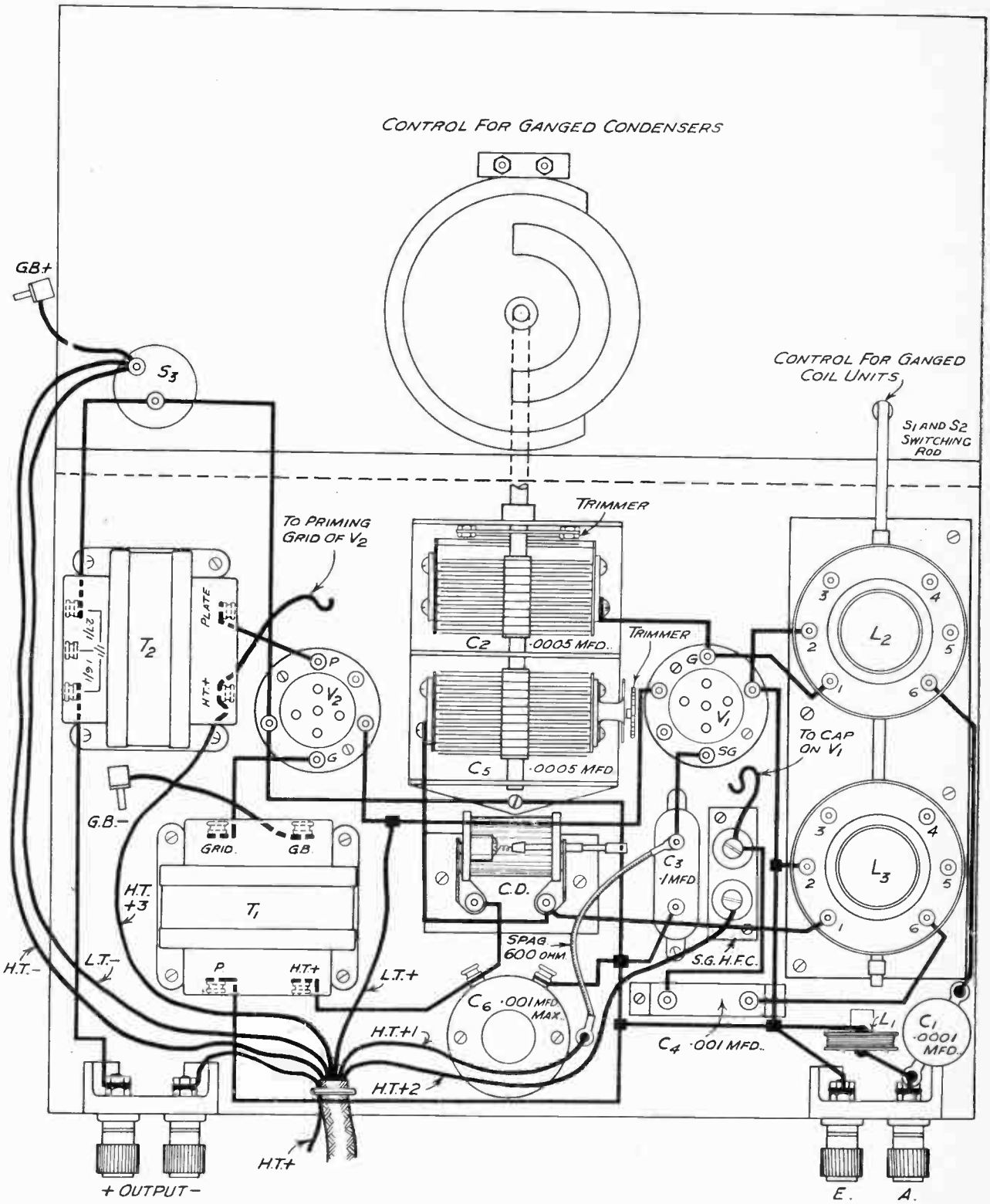


Fig. 3.—A true-to-scale reduction of the original wiring diagram for the back of panel and baseboard. Make all your own connections in the manner shown, using the photographs to enable you to visualise "wiring runs."

Recommended Voltages

The recommended H.T. voltages are as follows:
H.T. + 1—60 or 75.
H.T. + 2—120 or 150.
H.T. + 3—150.
H.T. + —200.

The total H.T. current for the first three tappings is between 20 and 25 milliamperes, and one can use either batteries or an H.T. eliminator, whichever does normal service for this purpose. Depending upon what type of neon is used in the vision apparatus, so the voltage and current of the H.T. + connection will vary. My own tests were carried out with a Baird "Televisor," and the voltage of 200, giving a current of 25 milliamperes, suited admirably.

This tapping can be run from batteries or an eliminator, and in some cases it may be desirable to split the total H.T. for the four tappings between batteries and an eliminator, for the current consumption is rather high, a factor which cannot be avoided without using high voltages.

Testing

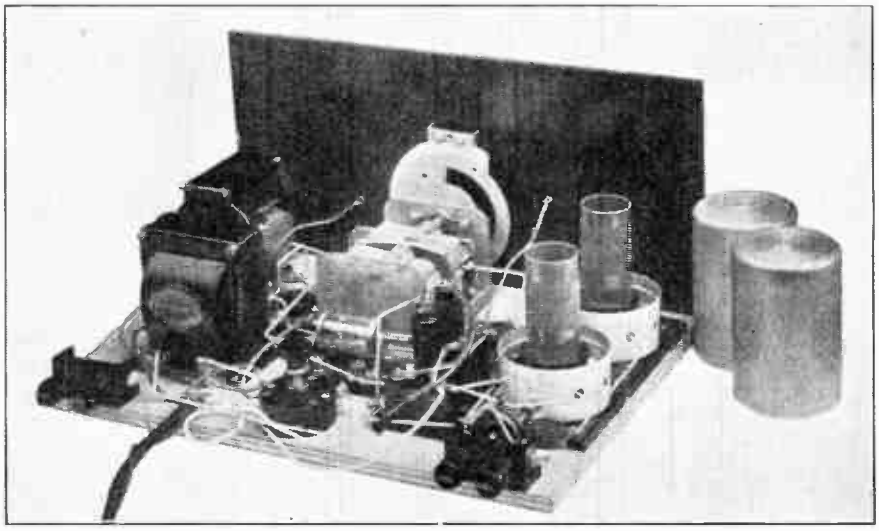
Join the aerial and earth to the terminals so marked and the vision apparatus across the pair of output terminals. Then having adjusted the grid-bias voltage to 0, switch on the set.

With the coils switched to the medium waves, tune in the Brookman's Park Regional Station (or the London National if that happens to be transmitting the vision). Do not forget to adjust the pair of trimming condensers as mentioned earlier in the article, to balance out stray irregularities. Provided your crystal detector has been carefully adjusted to give a good "contact," then you will be rewarded with clean and really first-class images.

Adjustments

When I first joined up the receiver and made a test on one of the morning transmissions put out by the Baird Company, I was able to watch exactly the performance of the artists in the studio. With the connections exactly as indicated in Fig. 3, the resultant image is a positive one, but if, by chance, your own image happens to be negative, then a reversal can be effected by changing round the crystal detector or the primary or secondary windings of the transformer. I recommend the former policy as being the best one to follow.

Naturally the constructor can try out several adjustments on his own account in order to suit his own conditions, and amongst these can be mentioned slight variations in the recommended H.T. voltages; but remember always to render your receiver inoperative by switching off via the on/off switch before making any alterations of this character. In addition, do not forget to try the effect of various capacity values of the semi-variable condenser, C_6, situated at the back of the baseboard on the centre line.



This illustration shows the coil covers removed and the wiring runs. When used in conjunction with Fig. 3 it will ensure your leads being correctly positioned.

A Final Thought

Let me stress again that it is absolutely essential to pay careful attention to the adjustment of the crystal detector. Both the quality and strength of the resultant image will be marred unless a good contact is secured, and since in this particular case a "cat's whisker" type has been incorporated, do not subject the receiver to any violent knocking, otherwise, of course, your contact will be ruined and a resetting becomes necessary.

Of course, as was stated at the beginning, this set has only a limited range, but apart from that it performs its function in an admirable manner, and constructors will be delighted with the results they obtain.

The Television Society

The Fourth Meeting, held on Wednesday, February 10th

AT the meeting of the Television Society held on Wednesday, February 10th, at University College, a Lecture on "Difficulties Encountered in the Transmission of Pictures over Telephone Circuits" was given by Mr. E. S. Ritter, M.I.E.E.

A brief synopsis of the lecture is given below:

Production of electrical energy from the light and shade of the picture to be transmitted.

Standard dimensions and speeds of rotation of

A small section of the crowds of people attracted by a demonstration of television.

the picture drum as laid down by the C.C.I.T at Berne, May 1931.

Size of the light spot in relation to the rate of rise of current.

The relation between the dimensions of the sending and receiving light spots and the definition of the received picture.

The production of a current suitable for transmission over a telephone circuit.

Two-wire and four-wire repeater circuits.

Attenuation and phase distortion; the building up of a sine wave current of various frequencies at the receiving end of a long coil-loaded circuit, with and without phase correction. Transmission time.

Carrier current and radio circuit characteristics.

Synchronisation of the sending and receiving apparatus.

Receiving systems and photographic problems.

After discussing the various types of picture transmission apparatus now in use, and the possibilities of standardisation as drawn up by the Comité Consultatif Internationale Telegraphique, which deals with international telegraph matters for the Continent of Europe, and of which Mr. Ritter is a member, the lecturer spoke of the relation of wave frequencies and time of propagation. He showed by means of oscillographs that with long lines a signal requires an appreciable time to reach its final value, and also how this time on a particular line varied with frequency when with and without phase correctors in circuit.

Synchronisation, phasing, and various faults were dealt with, and examples of pictures received over the various systems were shown, in order to demonstrate that in spite of difficulties very good results were obtained in practice. In the course of the discussion which followed, it was emphasised that the specimen prints shown had not been touched up in any way. A hearty vote of thanks was accorded by the meeting to the lecturer for his exposition of a difficult subject.

The next meeting will be the Annual General Meeting of the Society in March, and will be followed immediately on the same evening by a lecture-demonstration by Mr. Howgrave-Graham, M.I.E.E., who will display exceptional high-frequency discharges, and discuss an episode in the history of wireless. Particulars can be obtained on application to the Hon. Secs., Television Society, 4 Duke Street, Adelphi, W.C.2.

Caricature over the Ether

Gosforth Part in Feat by Television

Man sees himself drawn in London

THE rapid approach of the day when people might sit at their own fireside and watch a football match or other events taking place many miles away was indicated to-day.

Mr. Tom Payne (formerly "Uncle Tom" of the Newcastle Radio Station) sat in his home at The Laurels, Gosforth, and, by the aid of television, watched a caricature of himself being drawn by a man in London.

The transmission was from the Baird Television Studios, the signals being broadcast from the Brookman's Park Station.

Mr. Rupert Harvey, the cartoonist, whose drawings are a popular and regular weekly feature at the Baird television broadcasts.

After Eileen Murphy had been heard and seen by the little party in Mr. Payne's house in a song and dance, the announcer said that Rupert Harvey would sketch Mr. Payne.

The vision was astonishing. Every stroke of the cartoonist's crayon could be seen.

"I hope the sketch is being received by the Newcastle gentleman," said the announcer. It was, with great success, and a telegram was immediately sent to the B.B.C. informing them so.

Mr. Payne said to an *Evening Chronicle* representative who was present: "Although television is out of the sphere of the ordinary man at present, it has certainly reached that stage when wireless enthusiasts should experiment with it.

"People in the North are handicapped by virtue of the fact that the B.B.C. television broadcasts are not meant to be received in this part of the country.

"I understand that it has been officially suggested that television should be broadcast from the Northern Station. If this is done, as I hope it will be, thousands of people will take it up.

"The Baird 'Televisor' can now be obtained for eighteen guineas, and it is possible that the price will decrease considerably when television has become more general."

(Extracted from the *Evening Chronicle* (Newcastle), Wednesday, February 10th.)

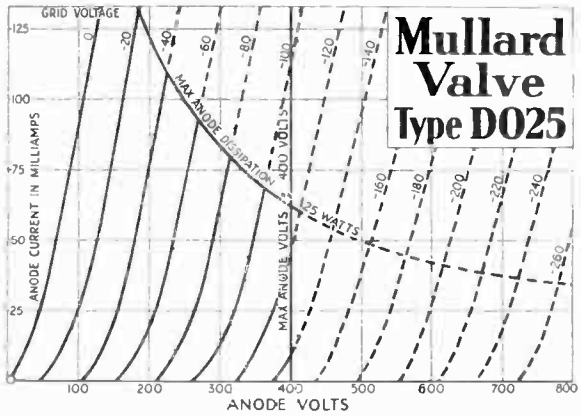
TRADE NOTES OF THE MONTH

REPORTS ON APPARATUS TESTED

Improved DO/25 Valve

DURING the past few months the Mullard Wireless Service Company have made several additions and modifications to their "D.O." series of large-output valves, which now includes five valves ranging from 10 to 75 watts dissipation.

The latest development to be announced is a modification to the DO/25. This valve now has an impedance of only 800 ohms as against 1,150 ohms in the original valve, the amplification factor remaining at 3. The mutual conductance thus rises to 3·75 milliamperes per volt compared with 2·6 in the earlier model.



A reference to these static characteristic curves will show clearly how the DO/25 valve has been improved.

At the same time, the filament consumption has been substantially reduced from 1·6 to 1·1 amperes.

The full operating data and characteristics of the DO/25 are now as follows:

Operating Conditions

Maximum Filament Voltage	6·0 volts
Filament Current	1·1 amps
Maximum Anode Voltage	400 volts

Characteristics at Anode Volts 100; Grid Volts Zero

Anode Impedance	800 ohms
Amplification Factor	3
Mutual Conductance	3·75 mA/volt

When working at the maximum anode voltage of 400 volts, a negative grid bias of approximately 112 volts should be applied, the anode current under these conditions being 63 milliamperes.

A New Wireless Receiver

We learn from Messrs. A. C. Cossor, Ltd., that they are marketing a new four-valve battery-driven receiver with enclosed loud speaker. It is known as Model 732. According to details supplied by the manufacturers, the two high-frequency stages employ Cossor 220VSG (variable-mu screen-grid) valves controlled by variable bias on both stages. The use of these valves results in a very high degree of selectivity combined with high sensitivity.

The output is so arranged, with tone correction and screen voltage, that a pentode or power valve can be plugged in without alteration. The dial is calibrated in wavelengths and fitted with special slow-motion control.

The makers state that this receiver has been tested in all parts of the country, and they are satisfied that the selectivity and station-getting power is all that can be desired, while the quality of reproduction is excellent.

At a later date it is hoped to include in our columns a test report on this set.

Cossor Variable Mu Valves

With the ever-increasing power of broadcasting stations, the difficulties of preventing cross modulation and high-frequency distortion rapidly increase. Cross modulation is the phenomenon that occurs when two signals, one of which is of relatively high amplitude, are imposed upon the grid of the other. The result is that both modulations are imposed upon the same carrier frequency, and succeeding tuned stages are powerless to separate them. It is therefore very evident that adequate selectivity must be obtained in front of the screened-grid valve unless the grid acceptance can be increased.

It is claimed that Cossor variable mu valves are so designed that the actual grid acceptance can be directly controlled out of all proportion to the loss of magnification by a variation in grid bias, thus freeing the valve from cross modulation. Wider variations of bias affect the stage gain within very wide limits, thus high-frequency distortion rapidly falls off with the increase of bias; the variable bias control acts as an absolutely independent volume control and does not militate against quality or ganging.

FORTHCOMING LECTURE

We learn that Mr. H. J. Barton Chapple will give a lecture to the Golders Green and Hendon Radio Scientific Society on Friday, March 11th. The lecture is timed to start at 8.15 p.m., and the venue is the "Ark" Restaurant, Temple Fortune, the subject for the lecture being "Television Strides Along." Visitors will be welcomed.

Stated briefly the advantages of "variable mu's" are:

(1) Cross modulation is eliminated and heterodyning minimised.

(2) Unwanted rectification and high-frequency distortion are avoided.

(3) Truly independent volume control that does not affect ganging.

(4) Volume control with enormously wide variation.

(5) Background noises reduced to a minimum.

(6) Increased stability in multi-stage receivers.

(7) In the mains type modulation hum is prevented.

(8) Remote volume control that does not affect tuning or quality is made possible.

For maximum selectivity a certain loss of stage gain is unavoidable. Consequently it is desirable to employ a reaction control, of which sufficient use should be made to overcome the loss of sensitivity due to detector damping, which will at least compensate for the loss of sensitivity in the initial stage.

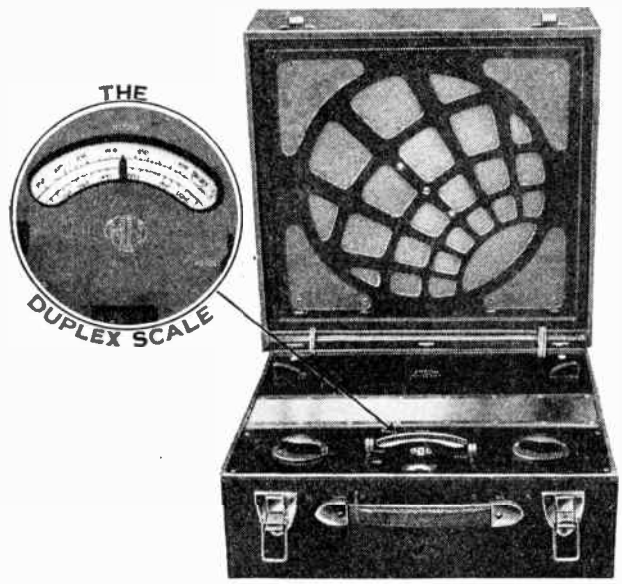
With the mains-type valve care should be taken

to avoid change of screen voltage arising from adjustment of variable bias.

Messrs. A. C. Cossor, Ltd., have submitted their two latest variable mu valves, the 220 V.S.G. and the M.V.S.G., to us for test. Their rated characteristics are as follows:

Cossor 220 V.S.G.

Filament Voltage			2
Filament Current (Amp.)			·2
Impedance	110,000 ohms	at	Va.150
Mutual Conductance	1.6 mA/volt	at	Vsg.60
		at	Vg.0
Maximum Anode Voltage			150
Inter-electrode capacity of the order of ·001 m.mfd.			
Grid Bias, variable (for 1 stage)			0–9
Grid Bias, variable (for 2 stages)			0–15
Anode Current for 150 Anode Volts with 1.5 volts Grid Bias (average)			2.6 mA.
Normal Working Anode Voltage			120
Positive Voltage on Screen Grid			60–80



Showing the McMichael Duplex Four portable receiver. The pointer moves to the appropriate scale as the waveband switch is operated.

Cossor M.V.S.G.

Indirectly Heated Cathode

Heater Voltage			4
Heater Current (Amp.)			1
Maximum Anode Voltage			200
Impedance	200,000 ohms	at	Vsg.80
Mutual Conductance	2.5 mA/volt	at	Va.200
		at	Vg.1.5
Inter-electrode capacity of the order of ·001 m.mfd.			
Anode Current for Anode Volts 200, Screen Volts 80, Grid Bias —1.5			7.8 mA.
Normal working anode voltage			200
Screen Grid Voltage			80
Grid Bias			—35 to —1·5 volts

Our tests substantiated these figures within usual working limits, and furthermore we satisfied ourselves that the advantages accruing to the user by incorporating these valves in sets designed for that purpose were very material. They give a first-class volume control with a wide variation, and ganging is not perceptibly affected.

A New McMichael Portable Receiver

Messrs. L. McMichael, Ltd., have introduced a new portable receiver which, at the price of £17 17*s.*, including all equipment and royalties, is designed to bring that quality and performance which one usually associates with products of that company within the reach of all. The specification, as issued by the makers, is as follows:

Circuit.—A four-valve, employing a high-efficiency double-gang tuned circuit, indicating on the new *duplex scale.* Employing a minimum of controls with the maximum range and selectivity, and including the latest refinements in circuit design. The *automatic grid bias,* dispensing with the grid bias battery, automatically adjusts the reproducing valves to their best point under any conditions of working, thus maintaining the best possible tonal qualities throughout the life of the high-tension battery.

Scale.—The McMichael *Duplex,* calibrated in metres (patents pending) mechanically coupled to the waveband switch, giving accurate and precise indication of the actual wavelength under any conditions of setting.

Accumulator.—Two-volt jellied acid non-spillable.

H.T. Battery.—Two H.T. battery wires *only.* The battery used is a reliable and well-known make of 120 volts. The battery compartment is closed by a new snap-clip battery lid.

Finish.—The case is covered in dark furniture hide. Highly polished ebonite panels and controls, machine engraved. Nickelled panel fittings and machine mottled aluminium valve screen. Oxidised case clips and locks.

We hope in a future issue to be able to give a test report on this receiver.

Twin Baseboard Fuseholder and "Wanderfuse"

Messrs. Belling & Lee, Ltd., have sent along one of their Twin Baseboard Fuseholders and a "Wanderfuse" for review in these columns. A report will appear next month, but we should like to draw readers' attention to the fact that the price of the former has been reduced from 3*s.* 6*d.* to 2*s.* 6*d.*, while in the case of the latter the reduction has been from 1*s.* 6*d.* to 1*s.* At these prices they represent remarkable value for the small cost involved.

BOOK REVIEW

James Clerk Maxwell. A Commemoration Volume. 1831–1931. Crown 8vo, pp. viii + 146, with two portraits, 6*s*. net, published by Cambridge University Press.

This bound volume of essays by Sir J. J. Thomson, Max Planck, Albert Einstein, Sir Joseph Larmor, Sir James Jeans, William Garnett, Sir Ambrose Fleming, Sir Oliver Lodge, Sir R. T. Glazebrook, and Sir Horace Lamb, has been published to commemorate the centenary of the birth of one of our greatest scientists, James Clerk Maxwell. His influence on the development of the conception of physical reality is almost impossible to estimate.

The life and work of James Clerk Maxwell (photograph above) should be studied by everyone. It will inspire old and young alike.

To the student of radio, with its wide ramifications, Maxwell's Electro-magnetic Theory of Light, whereby he showed that electric disturbances are propagated as transverse waves of electric and magnetic force (a theory subsequently established experimentally by Hertz in Germany) is of the greatest importance.

His name will never be forgotten, but the publishers of this volume of essays are to be congratulated in presenting this work to the public. It should be read by old and young alike. By showing his methods of attack on difficult problems and furnishing intimate glimpses of his personality in an all too short life (he died in 1879), coupled with revelations of his keenness to assist others to think for themselves, the volume serves as an inspiration to everyone.

H. J. B. C.

LETTERS TO THE EDITOR

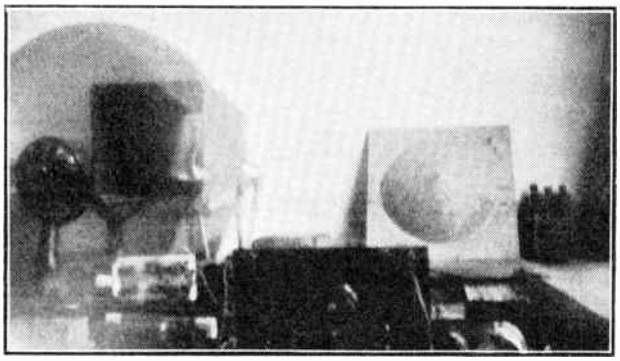
The Editor does not hold himself responsible for the opinions of his correspondents. Correspondence should be addressed to the Editor, TELEVISION, 505, Cecil Chambers, Strand, W.C.2, and must be accompanied by the writer's name and address.

A READER'S SUGGESTION

To the Editor of TELEVISION

DEAR SIR,—I am writing to make a suggestion which, I am sure, will be supported by the majority of your readers.

The television transmissions from English stations are good in quality but, as yet, few in quantity. Consequently the experimenter often desires to tune-in to foreign transmissions. But there are no journals which publish foreign television pro-



Before completely rebuilding his receiving unit Mr. J. Curle sent us this photograph of the apparatus which has done good service and has been described in our columns.

grammes, or even times of transmission. I feel that, as the premier television journal of the world, you would supply a much-felt need by publishing every month the programmes of the principal European and American television stations, and also a list of all television stations, giving picture-frequency, etc.

Yours faithfully,
J. CURLE.

"C" HOUSE,
MARLBOROUGH COLLEGE,
WILTS.
February 13th, 1932.

"TWO COMMON MISTAKES"

To the Editor of TELEVISION

DEAR SIR,—Thanks are due to Mr. Boardman (see TELEVISION for February 1932, p. 483) for calling attention to certain inaccurate expressions in technical descriptions, which undoubtedly tend to puzzle and confuse the reader. In this connection reference may be made to the List of Standard Definitions published in the *Journal of the Television Society* (Vol. I, Part I, p. 32, January 1931), which includes the following:

"*Definition* (4). *Elemental Area* is that portion of a picture which is represented by a particular value of current impulse."

"*Definition* (6). *Prime Frequency* is the number of elemental areas explored per second."

If Definition (4) is accepted then "the number of elemental areas explored per second" is infinite, since scanning along a strip is continuous, and the intensity-time graph therefore a continuous curve. In definition (6) an elemental area is evidently regarded as a fixed sub-division of a strip, while in definition (4) it is the portion of the picture instantaneously being scanned.

Definition (9) states "*Detail Frequency* is the frequency of the signal variations due to defined markings . . ."

Frequency, which is the reciprocal of periodic time, is something quite inconceivable except in association with a periodic phenomenon. The term is used here, wrongly, to denote the reciprocal of the time occupied in scanning the marking, or the *traverse-time*.

There is nothing periodic about an isolated marking. Doubtless what was in mind was the frequency-range required of the valve amplifiers. The use of wavelength would not be much better, for though one can have a single wave, it must be symmetrical; one can hardly call an irregular fluctuation a wave. With diffidence, I would suggest an expression in terms of time, instead of this pseudo-"frequency," defining *prime traverse-time* as the time in which the scanning-spot travels a distance equal to its own length (or, in other words, travels across a fixed cross-line).

The traverse-time is related to the picture constants in the following way:

Let n = number of strips.
a = width of strip.
l = length of strip.
T_p = time of scanning whole picture.
T_d = time of scanning a portion of strip, length d.

Then $\frac{T_d}{T_p} = \frac{d}{nl} = \frac{ad}{na.l} = \frac{\text{Area of rectangle } a \times d}{\text{Area of picture}}$

For a small area equal to the scanning spot $d = a$, but the area of the spot will not, of course, be a^2 unless it is square.

Mr. Boardman's suggested use of a long narrow scanning spot seems hardly feasible, since it would cause very unequal definition of markings parallel and perpendicular to the spot.

Yours faithfully,
(Miss) A. EVERETT.
(Fellow of the Television Society.)

7 RIVERSIDE,
SUNBURY-ON-THAMES,
MIDDLESEX.
February 15th, 1932.

"DOWN TO THE SEA IN SHIPS"

To the Editor of TELEVISION

DEAR SIR,—The regrettable accident to the submarine M2 has set me thinking of the use of a television camera under water. It occurs to me that a suitably constructed camera could be used for the exploration of the sea-bed even in very rough weather when diving is impossible.

In view of the present development of television, I do not see any very great difficulties to be overcome, and the advantage of such an apparatus is obvious.

Perhaps the above suggestion will be of interest to someone in a position to develop it. Thanking you for the many interesting hours spent with your valuable paper, which I have read from No. 1.

Yours faithfully,
L. CHAUVET.

38 EAST ACTON LANE,
LONDON, W.3.
January 29th, 1932.

FOR THE BEGINNER

To the Editor of TELEVISION

DEAR SIR,—The other day I was fortunate enough to pick up a copy of TELEVISION at a friend's house, and was greatly interested in its contents. This is the first time I have seen your magazine, and feel that in its present stage it is too advanced for anyone who does not as yet know the rudiments of the science. I wonder if you would be good enough to tell me of some earlier issues which would give me a representative idea of "how television really works" or, alternatively, perhaps you could recommend some elementary book which will give me the details I want.

With thanks in anticipation.

Yours faithfully,
ANDREW CHANTOR.

LONDON, N.W.3.
February 13th, 1932.

(Our correspondent is referred to a series of articles, "Televison for the Beginner," by John W. Woodford, which appeared in our journal from January to December, 1930.—ED.)

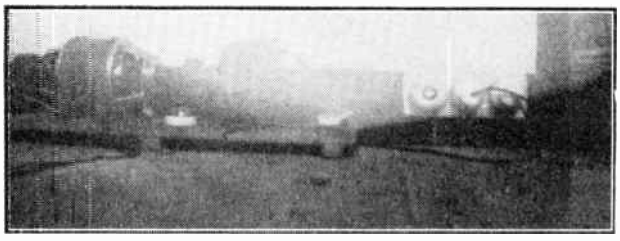
COMPLETELY REBUILDING HIS SET

To the Editor of TELEVISION

DEAR SIR,—A short time ago I wrote to you describing my results with television apparatus. You kindly asked me for some photographs of my set, and I now enclose two of the set and one of the motor and 600-volt generator which I use for my power supply.

Owing to difficulties of lighting, it is most awkward to photograph my apparatus, and these are the best I can produce.

I am completely rebuilding my receiving unit to try and obtain a perfect receiver for medium- and short-wave television reception, and will write to



The 600-volt generator used for Mr. J. Curle's power supply.

you in a few months describing any results I obtain. Wishing your paper every success.

Yours faithfully,
J. CURLE.

C HOUSE,
THE COLLEGE,
MARLBOROUGH.
February 9th, 1932.

WE ARE CONGRATULATED

To the Editor of TELEVISION

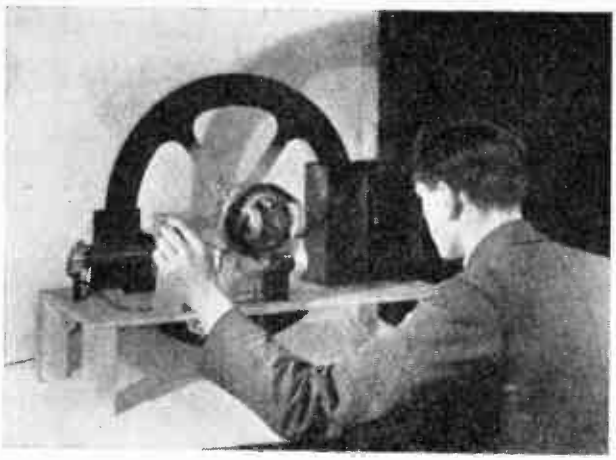
DEAR SIR,—I wish to take this opportunity of congratulating you upon having successfully completed the fourth volume of TELEVISION. I have been a reader of this magazine since its inception, and look forward to its monthly appearance with great enthusiasm. Judging from the contents, I should imagine that the readers of TELEVISION take a keener interest in its well being and the information it offers than any other journal dealing with wireless matters. I think this is due to the fact that it is, in a sense, a "family" magazine, which encourages its supporters to voice their opinions and does not fail to give due publicity to them.

May I express the hope that we shall be able to celebrate many more of TELEVISION's birthdays, and that it will continue to prosper and give its public what they want?

Yours faithfully,
DONALD BRADLEY.

39E EMPEROR'S GATE,
S.W.7.
February 16th, 1932.

Television's Query Corner



QUERY:

Since constructing my own vision apparatus and testing this out with a vision wireless receiver built up from hints which I have derived from your valuable journal, I have noticed a number of peculiar effects which I am unable to rectify owing to lack of knowledge. I am, therefore, writing to see if you can assist me in this matter. Stated briefly, the following are the defects which I have recorded:

(1) There are one or two black lines which appear in the field of the neon lamp when scanned by the disc.

(2) On occasions I notice a double image resembling a ghost somewhat.

(3) With one type of wireless receiver I used the image appeared very faint.

(4) After making certain adjustments to the set, I found that exactly the opposite effect was obtained, that is the resultant image was too contrasting and lacked detail in the manner of an over-developed photograph.

(5) Now and again I notice light splashes appear on the received picture.

Can you please make suggestions as to how I can best remedy these faults?

A. S.

REPLY:

In reply to your query, we think the following few brief notes will help you to cure the troubles.

(1) Black lines in the disc are due primarily to two reasons, namely, some dirt has got into the holes of the disc, or holes in the disc are radially off their proper lines of travel, owing to inaccurate punching. Steps should be taken to clean the disc or, in the case of inaccurate punching, the holes should be relocated in the manner described in this month's "Workshop Hints."

(2) This ghost image effect is due generally to interference from the horizontal component of the transmitting wave being reflected by the Heaviside layer and interfering with the ground or vertical component. Since this is a defect of nature, a remedy cannot be found, but there are occasions when ghost images can arise owing to reflected voltages in the radio receiver due to improperly placed impedances. This latter point calls for a careful overhauling of the set.

(3) This can arise from insufficient signal strength, or too much external light, or too much steady current through the neon lamp. To cure this, bring up your signal strength by using a more powerful L.F. amplifier, decrease the steady current passing through the neon lamp by increasing the grid bias or reducing the anode voltage or, if preferred, by placing a variable resistance in the anode circuit. If, of course, your room is too light, then obviously you must darken it.

(4) In this case your receiver is not passing through the necessary high frequencies to give image detail. This can arise from incorrect bias on the H.F. stages, a badly designed detector circuit, too sharply tuned circuits or an excess of reaction. The cures are perfectly straightforward, and it should be pointed out that whenever possible reaction should be eschewed when receiving television signals.

(5) Light splashes may arise from home-made statics due to one or more "crazy" connections in the set itself. On the other hand, there are times when the motor driving the disc causes interference, and methods for overcoming this have been described quite recently in these pages.

IMPORTANT NOTICE TO READERS

WITH the increasing interest which is being manifested in television developments and the growing numbers of amateurs who are conducting definite experiments in the science, we have had a very large number of queries sent in from readers who are seeking advice.

We have, therefore, inaugurated a query service for the benefit of these readers. Will they note that we shall be pleased to give advice on their problems, provided these are set out carefully and neatly on one side of the paper?

There will be a nominal charge of one shilling for this service, the number of queries to be answered for this sum not to exceed one. We cannot at the moment, however, undertake to supply blue prints, circuit diagrams, etc., in this service.

When space permits, we shall include one or two selected queries in our Editorial columns, so that others can reap the benefit of our advice.

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