Practical Wireless

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PRACTICAL, WIRELESS
August, 1941

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SP. 351 250-0-250 v. 60 ma. 4 v. 1-2 a. 2-3 a. 10/-
SP. 354A 300-0-300 v. 50 ma. 4 v. 1-2 a. 2-3 a. 5/-
SP. 355 300-0-300 v. 50 ma. 4 v. 1-2 a. 2-3 a. 10/-
SP. 356 300-0-300 v. 50 ma. 4 v. 1-2 a. 2-3 a. 10/-
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Boost Drivers, all C.T.

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THE UNIVERSAL AVOMINOR

ELECTRICAL MEASURING INSTRUMENT

<table>
<thead>
<tr>
<th>A.C.</th>
<th>D.C.</th>
</tr>
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<tr>
<td>Models</td>
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<td>RESISTANCE</td>
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THE D.C. AVOMINOR

ELECTRICAL MEASURING INSTRUMENT

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<th>Current milliamps</th>
<th>Voltage</th>
<th>Resistance megohms</th>
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<tr>
<td>0-60</td>
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<td>0-15</td>
<td>0-1,200,000</td>
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<tr>
<td>0-300</td>
<td>0-20</td>
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<td>0-600</td>
<td>0-300</td>
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</tr>
</tbody>
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Sole Proprietors and Manufacturers:


Write for full description pamphlets and current prices

The Universal AvoMinor

The D.C. AvoMinor

August, 1941

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Radioolocation

Aerial Warfare Revolutionised

The new science of radio location bids fair to revolutionise modern warfare. The last war was responsible for the development of wireless telephony, a secret which was very carefully kept until after the war. It was warfare, therefore, which developed this form of communication, and radio telephone networks have been considered of extreme importance. As a matter of fact, the last war claimed one of the main advantages of radiolocation. The German Navy, it is now well known, was responsible for the invention of the aeroplane, and we have been able to use aeroplanes for warfare purposes in connection with radio direction. Experiments over the past six years have now been brought to fruition, and we can henceforth believe that a science has been developed for war purposes, for commercial communications, and for life-saving at sea, can now be applied to life-saving generally. The aeroplane conveys that which was dependent upon a military point of view upon a science which was ancillary to its perfection. Many thousands of wireless operators are now in connection with radio location, and we have been approached by the Air Ministry to issue an appeal to our readers with technical knowledge, and who are anxious to get into touch with them. If readers willing to join the Service in this capacity will get in touch with us, we shall be glad to put them forward in the proper quarter. Envelopes should be marked in the top left-hand corner "Radio-location." All applications will be treated confidentially. Members of the British Long Distance Telephone Club are particularly invited to join. There are splendid opportunities in this new branch of the Services.

Wireless Examinations

Many hundreds of our readers have already placed their technical knowledge of wireless at the disposal of the country, but those who have not joined, and who may not have the necessary requirements for radio location may enlist as wireless mechanics, and pass a grade III trade test. This will provide them with an opportunity for being trained in theory as well as practical work. The course lasts from two to three months, and the trainee can then pass the grade II test. Upon passing this he may sit for an entrance examination for the Military College of Science, where he is taught advanced theory, workshop practice, and the practical side of radio servicing.

Books For the Services

Those intending to enter the Services should study the books we have specially produced for them, and which have been purchased in tens of thousands by those already in the Services. "The Radio Training Manual" is a valuable first course, and a study of it will enable the beginner to pass the initial test. The second book to study is the "Practical Wireless Service Manual," which deals with fault-tracing and remedy. Follow this with a study of "Newnes' Short-Wave Manual." The "Practical Wireless Encyclopaedia" is a reference book with the contents alphabetically arranged so that the pages virtually index themselves. It contains nearly every available radio fact and figure. The "Radio Engineers' Vest-pocket Book" is especially printed on thin but tough paper, to reduce its bulk so that it may be conveniently carried in the vest or uniform pocket, contains valuable tables, mathematical formulae, and calculations used in connection with radio.

Further Practical Books

A HANDY catalogue of our technical books is available free to readers addressing a postcard to the Publisher, Book Department, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.


Colourful Listening

"Let's turn down the lights and have some music" is not an infrequent demand on the part of those who know their records, and like to make up a programme every now and again for an evening's entertainment. Those who choose their listening and appreciate orchestral items will also often turn to music accompanied by suitable room illumination. All of which goes to suggest that to most of us there is a definite tie-up between the lights and sound.

The theatrical producer knows all about this, and lights his stage in sympathy with the music. Moreover, he goes further than the principle of "Soft Lights, Sweet Music"; he does not rely only on intensity of lighting to match the intensity of sound, but brings his artistic talents to bear by varying the colour and the intensity of the stage lighting.

Combining Colour and Sound

In the combining of colour and sound sense, one may have his own ideas of what should go together; should it be, dim, deep blue accompany low, melodious tones, or a dark, restful green? How would you react, chromatically, to a Beethoven crescendo? Do you fancy a brilliant orange or a flaming red as an appropriate associated visual sensation? If you are not sure, why not try the experiment of providing lighting effects as a background to your listening.

Many technical readers would be surprised at the preparation and activity which goes on when a "lino-wire" gramophone enthusiast gives a record recital; and it would not be long before you thence would become imbued with similar enthusiasm for the technical details, if not for the musical side of recitals. What technical details can there be associated with the playing of a few records in a private house, may well be the uninitiated reader's query. Well, by way of an answer, here is the description of the arrangements for a recital at an enthusiast's house, at which the writer attended.

Stage Effects

The first feature that attracted one's attention was the small stage in an alcove of the room—an ordinary-sized room—which was dressed with curtains lit by footlights. Rows of chairs faced the stage, but at the back of the last row was one chair on its own. At each side of this chair was an upturned wooden box on which was mounted a variety of switches and other electrical controls. A multiple cable emanated from these boxes and was led round the edge of the room to eventually disappear beneath the stage. The electrical equipment of the stage comprised three footlights, each coloured to one of the primary shades, while three more were fixed on the stage and hidden from view by short curtains.

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Something New for the Owners of Quality, High-power Amplifiers to Experiment With

An automatic record-changing mechanism, the final piece of electrical equipment was the spotlight situated at the top front of the stage hidden from view of the audience. This light had in front of it a large disc in which were mounted small gelatine discs of various colours so that the colour of the spotlight could be varied over a wide range. The disc was mounted on the shaft of a small motor with a ratchet device which allowed the disc to be rotated step by step and to come to rest when one of the gelatine discs was directly opposite the lens of the spotlight. All these devices were, of course, connected to the cable which went to the controller's chair at the back of the room and it will be appreciated that some very interesting effects could be obtained.

It remained to the personal taste of the "manager" as to what lighting accompanied any particular type of music, but the general rule was to have dark blue for soft low passages and as the music brightened up, through greens and yellow for crescendos, until the climax was reached with brilliant lights of orange and red.

Pictorial Background

Some records, or programmes of records, were terminated by a finale in which the stage was blacked out except for the spotlight, which had been focused to project on to the back cloth which was revealed at the appropriate moment by drawing open the two curtains covering it. The back cloth could carry some impression or a picture, such as the Retreat from Moscow, which was used as a climax for ending a record of the 1812 Overture.

A recital run on these lines is a novel experience for any audience who have never previously attended such an unusual function, but, as in most things of this nature, the producer has had far more enjoyment in preparing and rehearsing his effects many times before the show is given.

From the entertainment point of view, as far as the writer was concerned, the recital he attended at this particular enthusiastic's house was intensely interesting, and the association of colour with music certainly added to the thorou­gh enjoyment of the music, as well as the entertainment.

One thing, however, perhaps because of his technical interest in the show, detracted from a full enjoyment of the entertainment, and that was consciousness of the "manager" at the back of the room manipulating the lights of orange and red, as the utmost care, there were at times irritating little clicks and noises which were a prelude to some change in the lighting, but in the circumstances we had to be tolerant.

The advent of television, however, took the writer's attention off this scheme for some years, but the closing down of the television service and the more frequent evening programmes, brought fresh interest to the entertainment possibilities of records and record recitals with coloured accompaniments.

In America the idea has been commercialised in a very ingenious way by means of a radingaphone on which is mounted a large sphere or globe of opal glass. Within the globe are various coloured lamps representing the primary colours, and the resultant colour and the intensity of the lights are automatically controlled by the reproduction from a special amplifier which is connected to the normal power pack. With the lighting in the room extinguished the colours from the lights in the globe will vary from dim to brilliant according to whether the music is soft or loud.

A glass globe is not, in the writer's picture, covered by two curtains which could be opened and closed in a similar manner.

Fig. 1.—Circuit for valve-controlled coloured lamps.

Fig. 2.—Circuit for directly-controlled 6 v. lamps.
opinion, an ideal object to have as the centre of attraction, and there are great possibilities for extending the scheme by operating the lighting on a small scale, as has been described. The lighting being automatically controlled there will only remain the control of the curtains, and press-buttons could be used for this purpose to eliminate all the manual labour.

Automatic Effects
For the technically-minded, a description of how automatic effects are produced will be of interest.

The arrangement is commercialised by the

Patterson - R.C.A. amplifier, and the circuits covered by the Patent 2,131,934 which was described recently in an American journal.

In Fig. 1, it will be seen that the audio signal provides current to heat the filaments of three directly-heated power valves. In the American amplifier, type 71-A power valves are employed, and the nearest to them in the English range of valves is the PX4. Comparisons of the characteristic values of the valves are as follows:

<table>
<thead>
<tr>
<th>Type</th>
<th>Fil. Volts</th>
<th>Current (A)</th>
<th>Anode volts</th>
<th>Load (ohms)</th>
<th>Amplification factor</th>
<th>Output (watts)</th>
<th>(Characteristics at 200 v. on anode.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>71-A</td>
<td>5 v.</td>
<td>4 v.</td>
<td>200</td>
<td>40 m.</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>PX4</td>
<td>180</td>
<td>200</td>
<td>4.800</td>
<td>2,500</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

It will be appreciated that the signal as applied to the loadspeaker of the receiver reproducing the programme must be amplified to produce the necessary wattage to heat the filament of the power valve, and suitable circuits are provided for this purpose in the American equipment in the matching transformer, shown in Fig. 1.

Circuit Details
The amplifier circuit is precluded from Fig. 1, for the sake of simplicity, and a 10-watt power valve will serve in most cases. The required-source of filament current which may have to be operated at maximum filament current will, in the case of PX4's, be 12 watts, so that there is no risk of overheating the filaments of the three valves from the output of a 10-watt amplifier.

The H.T. for the three "control" valves, as we may call them, is provided by a transformer giving 220 v. A.C. so that a simple 1 to 1 ratio transformer is required for connection to normal A.C. mains supplies.

In the anode circuit of each valve is a 110 v. 15 w. lamp which will be fully illuminated when its valve is giving maximum filament current, and 2 and 3 are the resistances for the power valves V1, V2 and V3 which are acting as diodes with their grids connected to their anodes. The values of the resistances used for the 71-A American valves were about 2,000 ohms, but this may be the subject of experiment to obtain the desired smoothness of control from the coloured lamps. The valves do not amplify, but merely control the current flowing through the lamps by means of the temperature of the filament. The temperature depends upon the amount of current flowing through the filament, and it will be observed that each valve has certain components in its filament circuit.

V2 and V3 links to inductance which will prevent any high frequency current flowing through the filament of the valve, and will allow only the low frequency or bass notes to cause the valve to function, and its red light to glow.

V2 has a combination of a small L.F. choke with a condenser in series with it. This combination allows only the middle register of the audio frequencies to actuate the valve, and cause the green light to glow. Finally, V3 is the high frequency or treble control for the blue light, as only a comparatively low frequency current can flow through the condenser which is in its filament circuit.

Audio-frequency Analyser
The whole arrangement is thus an audio-frequency analyser which sorts out the various tones in the reproduction and brings out the high and low frequencies according to the tonal characteristics of the music.

In the Patent referred to, the inventor states that for the chokes small solenoids having about 1,000 turns on 26 cotton-covered wire are used with a sliding core of laminated iron, with a condenser of 4 mfd. for the green light, and the condenser of 2 mfd. for the blue lamp, which may be tried for first experiments.

The inductance of the choke for the red lamp is less than the inductance of the choke in the green lamp circuit. In one type of equipment covered by the Patent, a similar arrangement of power valves controls the brilliance of plain, uncoloured lamps to give a direct view through transparent glass columns arranged behind coloured lamps. Thus, as the volume of reproduction increases so does the current passed by the valve, and there is an increase in the brilliance of the columns of lights which work up to a climax as the crescendos develop.

Using 6-volt Pilot Lamps
For early experiments in this interesting sphere of chromatic reproduction, or where, due to war-time conditions, it is not possible to obtain a number of large power valves for experiments with the circuits just described, similar effects may be obtained from 6 v. pilot lamps. The 6 v. type of scale lamp used in present-day receivers generally requires a current of only .3 amp., thus requiring a wattage of 1.8 to light it. Three of these lamps will thus require approximately 5.0 w. of output from the receiver to light one column.

In most cases quite a useful light could be obtained from one of these lamps connected across the speaker coil of a low resistance moving-coil reproducer. Instead of a large stage built round a radio gramophone or electrical reproducer, a smaller stage could be arranged around a loudspeaker on a table, to speak clearly and surely camouflaged as desired.

The arrangement is more economical in material, and yet provides all the enjoyment of production which may be obtained from the full-size stage, which costs about 10 or 12,000. By employing a bunch of three 2 v. lamps in series for each colour, instead of one 6 v. bulb, quite good effects can be obtained. In addition, the arrangement is sensitive to the frequency changes in the music, and the power valve circuit is much better because the delay action of the thick filament has little effect, and all flickering due to small changes of tone value, and gives a more general over-all average of rise and fall in sympathy with the reproduction.

Simple Stage Layout
Fig. 3 gives the layout of a simple stage, whether full size, or a smaller model stage, to be experimented with. In this case, the movable curtains may be controlled by small tuning motors actuating wires on pulleys such as are used for the ordinary type of tuning scale drives. This type of motor may also be used to operate a vari-coloured disc in front of a miniature spotlight.

It is quite likely that the war will carry on through next winter, and the above description of what may be done in the way of colour blended with music may well be of interest to many radio experimenters who are looking for something new to try out, until their more normal activities are regained.

If you have access to large quartz lamps, you may be tried out to obtain a different control and chromatic balance—while various combinations of colours—more than three if desired—may be experimented with.

If a non-technical record enthusiast can link up with a radio experimenter both will derive great enjoyment from well-planned home circuits on theatre lines, with due credit on the programmes to the "Musical Director" and "Stage Manager."

In Memory of Sir Walford Davies
A tribute to the memory of Sir Walford Davies, the B.B.C. is inaugurating a radio to house a bed in Charing Cross Hospital.

Placed as it is in the centre of London, near the Temple Church and Savoy Hill, where Sir Walford Davies worked for many years, this special radio is associated with the B.B.C. since the early days of broadcasting and already contains beds endowed in memory of the "Fyfe Report." H. H. L. (B.B.C. Director, and Mr. J. C. Stobart (the B.B.C.'s first Education Director), and a cot endowed by the B.B.C. Children's Hour. It also contains four Sir Henry Wood Jubilee beds for musicians.

The cost of endowing a bed in perpetuity is £1,000, and listeners who have enjoyed Sir Walford Davies' broadcasts will gladly contribute towards the fund. If sufficient money is received, more than one bed will be endowed.

In memory of Sir Walford Davies, in March last, took from listeners one of the most vivid of broadcasting personalities. Since 1924, millions had heard his talk on secular and church music, and it is fitting that enthusiastic listeners will gladly share in the tribute to his memory. Contributions should be addressed to Sir Adrian Boult, B.B.C., London, W.1, and envelopes should be marked "Sir Walford Davies" in the top left-hand corner.
Radiolocation

A Brief Account of the Wireless Means of Locating the Presence and Position of an Approaching Enemy Aircraft

At a conference held recently at the Air Ministry, Air Chief Marshal Sir Philip Joubert revealed that one of the "mysterious" devices which is countering the night bomber is radiolocation. Although its development began years before the present war, it has remained a secret until now; in fact, it largely contributed towards the success of the R.A.F. during the Battle of Britain last September.

Radiolocation is not a new departure in radio science but the application of existing knowledge. The urgent need of the R.A.F. to have early knowledge of impending air attack resulted in the conversion of a laboratory experiment into a vital weapon of war. One man, Mr. R. A. Watson Watt, visualised the great possibilities of the new device. He is now scientific adviser on tele-communications at the Ministry of Aircraft Production, and in 1935 he headed a team of brilliant scientists who worked with him on the problem from the start. They got together a team of clever young men and worked for months in absolute secrecy until they were able to show that radiolocation was a proved reality. Experiments went on continuously for four years.

As war became imminent their efforts were intensified, and so urgent did the need for radiolocation become that they made themselves the first series of radiolocators to give warning of the approach of German aircraft.

How It Works

Briefly, this is how the radiolocator works: Wireless waves, which are unaffected by darkness or fog, are constantly radiated to act as a scouting medium far beyond the limits of our shores. If a solid object such as a ship or aircraft is encountered it sends back a reflection. Day and night distant outposts of the air force are "manned" by wireless electronic watchmen, ready to flash tidings of the enemy's approach with the speed of light.

This system makes it largely unnecessary to maintain standing patrols of fighters, saving the country immense expenditure on petrol, engines, wear and tear on aircraft, and also has relieved the tremendous strain on personnel which otherwise would have been unavoidable.

Trained Personnel Wanted

Under the impetus of war the system has developed rapidly, and the experiment that started six years ago is now a huge organisation constantly growing. The scientists are making improvements, and the manufacturers are keeping pace, but there is a shortage of trained personnel to service the growing number of locators. The three Services have been combed for suitable men and women.

Dealing with the call for men to operate the device, Sir Philip said it was a marvelous opportunity for young men to "get in on the ground floor" of one of the most remarkable developments of modern times.

Technical Civilian Corps

It has been announced by Sir Archibald Sinclair, Air Minister, that a new technical civilian corps is being formed to operate and maintain the radiolocators. Skilled men from overseas will be enrolled for work here in the repair and maintenance departments of the Navy, Army and Air Force, in a non-combatant capacity. Schoolgirls and boys are to be trained for the radiolocator organisation. They must be good at physics and mathematics, and have reached the school certificate standard.

In an R.A.F. operations room, where radiolocator messages are plotted on large table maps.
LAST month we explained, in fairly
general terms, how the three principal
systems of valve detection operate.
The systems are: leaky grid (sometimes
called, cumulative grid), anode bend, and
diode; there is also power grid, but this
is merely a modified method of using the
leaky-grid system.

To put the matter in its simplest form
we could state that leaky grid is most
suitable for use in a small, "straight"
receiver, in which sensitivity is of first
importance; that anode bend is seldom
used in receivers nowadays, although it is
useful for valve voltmeters; and that
diode detection is best in a large receiver
where there is a good deal of amplification
prior to the detector—or second-detector—
stage.

It must be appreciated that although the
diode is capable of dealing with consider-
ably larger signal inputs than are either of
the other methods, and although it can
give a much higher output, it is
comparatively insensitive. Additionally,
since it causes current, the current being
drawn through the preceding tuning circuit,
it provides a fairly heavy damping effect.
In a superhet, where the frequency applied
to the second detector is lower than the
signal frequency, this damping is not of a
serious nature.

Sensitivity of Leaky Grid
The leaky-grid detector is by far the most
sensitive, chiefly due to the fact that it
provides useful amplification as well as
acting as a detector or de-modulator. It
operates on the straight portion of the
anode current-grid volts characteristic,
and this explains the good amplification
which it gives. Admittedly, this type of
detector draws grid current, so damping
the tuned circuit. But the current is not
as high as would normally be drawn by a
diode, the damping caused by this grid current can be more than
counterbalanced by the use of reaction; as
many readers will remember, the effect
of reaction on the grid tuning circuit is
that of negative resistance, so that it
compensates for losses in this circuit.

Handling Capacity and Distortion
The only important disadvantage of
leaky-grid detection is that the detector is
fairly easily overloaded. That is why it
is not suitable for use after a number of
H.F. or L.F. stages. As we saw last
month, if the grid voltage (provided by the
signal) swings to the left of the bottom
bend in the characteristic curve, distortion
takes place due to a combination of
grid-leak and anode-bend detection, which
causes "flattening" of the anode-current
curve.

This can be overcome by increasing the
anode voltage, and modifying the values of
grid leak and condenser, so that the
characteristic curve is moved farther to
the left, or negative side. That is precisely
what is done in power-grid detection. It
should be made clear in passing that the
altered values of grid-circuit components
does not affect the position of the character-
istic, but merely alters what might be
described as the time factor of that circuit.

Anode Bend
And now we can look at anode bend
from a more practical angle. On first
thoughts it would seem to offer an
advantage in that it does not damp the
tuning circuit, because no grid current is
allowed to flow. But since reaction cannot
be used very satisfactorily with anode bend
(due to the comparatively high-capacity
anode by-pass condenser) the actual
damping—assuming the leaky grid with
that the standing anode current is zero, and
that it does not damp the tuned circuit.
Since the standing anode current may
be reduced to zero, any change in current
due to the application of an H.F. voltage
to the grid can be measured on a small
milliammeter with a small full-scale
detection. Fig. 1 shows a typical valve-
voltmeter circuit where a potentiometer is
used to control the bias voltage; in
practice it may be sufficient to use simply
a tapped G.B. battery unless a high degree of
sensitivity was required such that the
valve were biased back just to cut-off
and not beyond that point.

Bear in mind that automatic bias could
not be used, because under no signal
conditions there would not be any anode
current to give the required voltage drop
across a resistor in series with the negative
B.T. lead.

Component Values for Leaky Grid
Now we can consider the circuit require-
ments for different types of detector. Fig. 2 shows a grid-leak detector with
reaction, and the component values in-
dicated are those suitable for an all-wave
receiver. If the set were required for
short-wave reception only, it would generally
be better to reduce the capacity of the
grid condenser to .001 mfd., and to increase
the value of the leak to about 5 megohms.
It will be seen that the leak is returned
to L.T., which is most unusual; with some
valves the negative L.T. connection is to
be preferred. For a "hot-stuff" short-
wave set it is still better to join it to
the slider of a potentiometer (25 to 100 ohms)
connected across the L.T. leads.

Since we obtain a fair amount of ampli-
fication from the valve the most suitable
type is one with a high amplification factor
and fairly high mutual conductance. For
battery valves, a mutual conductance in
the region of 1.5 m.A./volt generally indi-
cates a good leaky-grid detector, whilst
for mains valves the corresponding figure
is about 3.5 m.A./volt. Detector valves
have a medium value of impedance—about
18,000 ohms for battery types and 12,000

Fig. 1.—An anode-bend detector used as a valve volt-
mete. If used in a receiver, an anode load would be
required and the anode by-pass condenser should
have a lower value—n.t. more than .002 mfd.

Fig. 2.—A grid-leak detector with reaction, showing average values of
components.
omni for main types. These figures are, of course, approximate and appreciably different in different designs. It will generally be found, however, that valve manufacturers make one type of valve which will specialise in being a leaky-grid detector. In addition to having a high amplification factor, fairly high mutual conductance and medium impedance, the electrodes should be rigidly constructed and supported so that vibration, which causes microphonic noises, is eliminated as far as possible.

Load Resistance

The anode-load resistance should normally be three or four times the internal resistance of the valve, provided that with such a resistance it is possible to apply a sufficiently high voltage to the anode. As a rough approximation, a voltage of 60 for a battery valve and 100 for a mains valve can be considered as satisfactory.

Regular readers will remember that we have often recommended the use of screen-grid or pentode valves as leaky-grid detectors. These have the advantage that very good reaction control is made possible by supplying the screening grid through a potentiometer. The principal objection to these valves is that it is impossible to provide a sufficiently high anode voltage and a compromise has to be made. The method of operation as a leaky-grid detector can be considered fundamentally the same as that of a triode.

Valves for Anode Bend

For an anode-bend detector, it seems fairly obvious that we require a valve with a pronounced bend toward the bottom of the curve. It is found that the best type is one with a high amplification factor and high internal resistance. As there is little call for anode-bend detectors at the present time it may not always be possible to choose an ideal triode, and there may be a definite advantage in using a screen-grid or pentode type. The circuit given in Fig. 1 applies in its general form to a receiver detector, although it would require an anode load of high resistance (or impedance if resistors were used). Here again there is some difficulty in providing a sufficiently high load without cutting down the applied anode voltage very drastically, and a compromise has generally to be made.

The Diode-Second Detector

There are so many arrangements of diode detector that it is scarcely possible to give even a typical circuit, although the fundamental circuit shown in Fig. 3 indicates the main points. A single diode is shown, and a portion of the rectified voltage is tapped off, smoothed through a resistance-condenser system and applied to preceding variable-mu valves as automatic-volume-control bias. As we have pointed out, a large output is possible if there is sufficient input, and, therefore, an ample D.C. voltage can be developed for biasing purposes. The 6.3 megohm resistance, shunted by a .0001-mf. condenser, acts as the main load for the diode, while the .1 megohm resistor and a second .0001-mf. condenser have been introduced to give a sufficient low-frequency voltage to be applied to the following L.F. valve. In other words, the potentiometer load resistor also acts as an L.F. volume control.

This simple A.V.C. arrangement is not entirely satisfactory in practice due to the fact that a negative bias is applied to the preceding variable-mu valves whenever the weakest signal is tuned in. It is therefore desirable to introduce a fixed opposing voltage so that A.V.C. bias is applied only after the required signal level has been reached. We cannot go fully into that matter here, since it is rather outside the scope of the present article. It has been dealt with in previous articles on A.V.C. Neither is this the place to discuss the many practical methods of using double-diode-triode valves for such purposes as quiet, amplified and delayed A.V.C.

Reception of C.W.

Before leaving the subject it is worth while pointing out that a diode is not normally the most suitable form of detector or second detector for use when C.W. reception is required since it is required that purpose it is hard to beat the leaky-grid type, either with reaction or with a separate heterodyne oscillator. A separate oscillator could be used along with a diode, but since only "phones" are normally used for C.W. a small detector input is sufficient and therefore the grid-leak detector is the most practicable. For receiving communications "receiver", however, which is required for telephony and C.W., and for both speaker and "phones" use, the diode may be preferred, along with a separate heterodyne oscillator.

Broadcasts to Schools

DURING the first year of the war the School Broadcasting Programme was planned from term to term. For the school year 1940-41 the B.B.C. returned to the practical of planning on a yearly basis and the Annual Programme was issued. Despite air raids and the intensification of war-time conditions throughout the country since then, the School Broadcasting Service has been maintained without interruption. For 1941-42—the third "educational year" of the war—the programme is again planned on a yearly basis.

The News Commentary for Schools, which is broadcast daily from Mondays to Fridays, gives background information to the war—the programme is again planned on a yearly basis.

The News Commentary for Schools, which is broadcast daily from Mondays to Fridays, gives background information to the war—the programme is again planned on a yearly basis.

Series on Science and Industry

The School Broadcasting Programme for the year 1941-42 is now available and teachers may obtain copies on application to the Secretary, Central School Broadcasting, Bedford College for Women, Regent's Park, London, N.W.1.
The Brains Trust

Readers by this time are aware of my unchangeable and unchanging views on crooners and jazz. Now I have another complaint to make, regarding the B.B.C. programmes, and it concerns that fantastic item known as the Brains Trust. Among others, Joad and Huxley contribute to what I consider an entirely peevish and brainy radio feature. I do not know who selected this title, but I do suggest that it is just a trifle vainglorious, with just a soupçon of braggadocio, for I admit that the B.B.C. programmes, to which I have heard to date consist chiefly of their answers to specific questions of which they have now previous intimation. Their answers are spontaneous. Now, in the ordinary way, one would expect a learned belief that they would find with the highfalutin title of the Brains Trust would contain at least something indicative of brains or him some question which was answered in a manner which left no room for opinion or doubt.

The questions and the answers which I have heard on the lidious, the answers particularly being mere expressions of opinion; with many of them I entirely disagree, and in any case I could find many other answers equally valid. However, I do not question their capability of the world’s heritage of knowledge, of facts discovered and set on record by brainsy people, such as Euclid and Archimedes.

What are Brains?

Of course, I realise that this raises the whole question of what are brains? It is not the prerogative of the academican, for poor people without the advantage of university education have produced by far the bulk of our scientific inventions, our aeroplanes, our locomotives, our transport system, our watches and clocks, our wireless receivers, glass, pottery, weaving, etc.

It has exhibited a mental retentivity in absorbing a large part of the world’s heritage of knowledge, of facts discovered and set on record by brainsy people, such as Euclid and Archimedes.

By Thermion

Wrong or Right?

If the B.B.C. wishes to run a real brains trust it should propound questions capable of positive answers. There are always questions which cannot be answered, or the answers leave the useful loophole that those supplying the answer can never be found wrong—not right for that matter. Any schoolboy can ask tomfool questions, such as Why is water wet? and each can supply the tomfool answer. The B.B.C. should not, therefore, elevate these trivial matters to the brainy level, nor seek, to give them a brainy cachet by inviting professors to answer them. Alternatively, such professors should be given questions which would give them a chance of exhibiting their brains, as distinct from using their ability to make amusing guesses. Professors, as a general rule, are not brainy. They have exhibited a mental retentivity in absorbing a large part of the world’s heritage of knowledge, of facts discovered and set on record by brainsy people, such as Euclid and Archimedes.

Why has war consistently become more terrible? Why does a ball roll down hill instead of remaining stationary? Why do listeners like crooners and jazz? Why do women wear carnival hats in the street? Why should not a woman disport herself in her nightdress, and not object to doing so in her bathing costume? Why does the cock crow when the hen delivers the goods? Why do gentlemen prefer blondes, or do they prefer blondes? These are a few of the questions which I require the Brains Trust so-called to answer. So, Messrs. Huxley, Haldane, Campbell, Joad and Co., would you kindly note my address, and let me have an answer to the questions not later than the 28th of this month, please? Thank you so much.

Talking-paper

I noticed recently that a method for the reproduction of sound on paper, invented a few years ago by a Russian scientist named Skvortsov and perfected after his death by a group of his colleagues, has been put to industrial use by the foundation of the first phonograph factory in Moscow. Opened in December last, the factory is expected in the near future to replace 300 million feet of “talking-paper” (so named by its inventor). This year the factory is expected to produce 300 million feet of “talking-paper.”

“Talking-paper” can be played on an ordinary radio receiving set which has been adapted for this purpose by a group of Russian engineers. Paper thus promises, in the near future, to replace such relatively expensive materials as graphite and celluloid for sound recording. A phonograph roll can be sold at one-fifth or one-sixth the price of a corresponding number of phonograph records.

Talking-paper has “a number of advantages over the common sound record. For example, it can be reproduced in the form of a roll of “talking-paper” can be played thousands of times without the quality of the sound deteriorating, whereas an ordinary phonograph record can be used only 100 times. Moreover, should the tape be accidentally torn, it can easily be repaired by gluing.

Skvortsov’s method is very simple: the sound waves, inscribed by the usual methods on a film, are printed and duplicated on ordinary paper. To reproduce the sound, a ray of light is thrown on to a photo-element in a light stream of varying intensity. The photo-element transforms the light waves into electrical waves, which in turn are transformed into sound waves by means of a wireless amplifier.

A New Vest-pocket Book

Wires and Wire Gauges

3/6 or 9/6 or by post from George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.
The next link in a P. A. installation is to the microphone and mixer unit, the components described in the last article will depend upon the output of the equipment. In a small installation having only some 30 to 30 watts output a single amplifier unit comprising one or two low-gain, high quality L.F. stages feeding into a couple of valves of the KT66 type in push-pull would suffice, but in order to survey all the equipment of a modern P. A. installation we will review the design of a large rack with a total output of some 400 to 500 watts. The input of such an installation can be effectively loaded, the signal from the microphone and mixer unit must be considerably amplified, and this is carried out by a pre-amplifier stage situated on the same rack as the output unit.

Driver Amplifiers

The driver amplifier increases the signal voltages to a value large enough to "swing" the grids of the large output valves which are employed in big installations. For this reason the amplifiers are sometimes referred to as "military" and the P. A. engineers as "swingers." A typical driver amplifier would comprise a medium impedance input valve of the MHL type which would be resistance-coupled to the push-pull input transformer feeding two power valves of the PX4 or PX25 class.

The output transformer of this driver unit would be the push-pull input transformer of the final stage comprising the 250 w. or 500 w. valves. For rapid fault finding and also for general maintenance tests the driver amplifier is usually provided with its own filament transformer which could be quickly switched into the anode circuit of each of the valves by means of a rotary switch or plug and three sockets so that the anode currents can be quickly measured.

To obviate high potentials on the test leads it is convenient to keep the meter out of the H.T. circuit where it might introduce unwanted coupling effects, the meter is connected in the cathode or return circuits where, of course, it is as effective but only subject to low voltages.

The driver amplifier will contain its own mains transformer and H.T. supply when so breakdown occurs which is intended and may be easily withdrawn from its place in the rack to be replaced by a spare amplifier if desired.

Audible Monitoring

It is often arranged to have a pair of test sockets which are wired up across the input to the amplifier so that headphones can be plugged in for audible monitoring of the incoming programme. This is desirable when fading from one source of input to another so as to be able to turn the volume control down to zero on the amplifier while the change is being made. When the required programme has been selected and brought up to the required level by the mixing or selection units, the master volume control on the driver amplifier is rotated to a predetermined position found by experience which provides the desired volume level from the loudspeakers.

Of course, the inclusion of a test socket in the driver amplifier is also very useful for quickly ascertaining where a fault lies when the volume control is turned down to zero on the amplifier while the change is being made.

Transformers

In large installations, even when specially designed for a particular job and not made up from a number of standard units fitted to a rack, many separate mains transformers will be used to supply the various stages of the amplifiers. It would not be an economical proposition to build one large transformer with dozens of various windings for E.H.T., H.T., G.B., L.T. etc. By making each function of the amplifier dependent on its own transformer, wiring is simplified, replacement is easier and less expensive in the event of a breakdown and the first cost is smaller.

Instead of a bulky transformer with exceptionally high quality of insulation throughout, only one or two smaller components for the output valves need be built to such a high specification, the other transformers conforming to more usual standards.

In amplifiers employing very large output valves the grid bias potential is generally supplied by a separate supply comprising its own mains transformer and rectifying valve and diode voltages for large valves is often anything from 1,000 v. to 3,000 v., and the grid potentials are correspondingly high, and it will be appreciated that should the bias supply fail, severe damage may occur to the output valves and their associated components. It is therefore arranged that should the bias circuit become inoperative a relay comes into action and cuts off the H.T. supply to the output valves.

Bias Potentials

In order to obtain balanced operation of the output valves the bias potentials are applied to the grid circuit of each valve via a potentiometer, which may be adjusted until each valve is supplying the same anode current.

Apart from lack of bias a positive potential applied to the grids would be disastrous, as would any stage of the amplifiers. This is desirable when stages of the amplifiers.

Bias will contain its own supply to the input to the whole rack would perhaps also provide its own transformer, wiring and rectifier valves. These would be controlled by the G.B. supply is if, however, the G.B. fail, the current through the relay windings will cease and the contact will fly open through the action of its spring and all the H.T. supply.

Incidentally, this arrangement also automatically safeguards the amplifier in the event of the mains supply falling, as the relay would open and would not close again until the G.B. circuit and the other circuits of the output stage had been put into operation again after the breakdown.

The H.T. supply for high voltage circuits is generally derived from mercury vapour rectifier valves. These gaseous rectifiers operate with quite a bright blue glow due to the ionisation of the gas molecules and require a very high vacuum where large currents are to be drawn from them. If the H.T. voltage is applied to the anode of the valve at the same time as the filament a short circuit results and the filament will heat up first before the H.T. potential is applied to the anode, then the special coating of the filament will emit due to its high temperature and the filament will be destroyed in some 250 m. may be safely taken from the valve.

Delay Valve

With potentials of some 1,000 v. and 2,000 v. at 100 mA. and more, as would be required for a large 200 w. or 400 w.
amplifier, the H.T. must be switched on only after the filaments of the rectifiers have come up to the required temperature, to obtain the layer output and the procedure is automatically attended to by what is termed a delay valve. This device is connected directly to the plate, or heater, and has the appearance of an ordinary valve, but the internal assembly is as shown in Fig. 1.

First there is the filament F₁, which is heated by a current passing through it. When a length of metal is heated it will expand, but all metals do not expand at the same rate for the same amount of heat applied to them. Fabricators have two small strips of dissimilar metals clamped tightly together and then heated, they will buckle when they are tried to expand and thus we obtain a movement when a change in temperature between T₁ and the mains supply.

Now, when a H.T. and L.T. for the delay valve is broken, so that the valve circuit is obtained as shown in Fig. 2 the contacts are open so that there is no connection between T₁ and the mains supply. It will be seen that one side of the filament circuit for this valve is via V₁, which is the control that determines the period of the delay action as already described. The other side of the filament circuit is via the contacts 2 and 3 of the relay switch which are shown in their closed position.

Smoothing Circuits
When the mains supply switch is closed, the filaments of V₁ and D.V. go into operation. V₁ and its associated smoothing circuits C₁, C₂, C₃, C.K. and R provide the required G.B. voltage and the bi-metal strip in D.V. starts to heat up. After the delay period the strip buckles and the contacts within the valve short across to each other. Current then flows from the positive side of the G.B. circuit through the relay to the negative side of the circuit: the relay is so energised and pulled up the contacts 2, 6, and 7. Contact 2 thus leaves contact 3 and breaks the filament circuit to D.V., but the contact goes cold and its contacts open, the relay is connected to the positive side of the G.B. circuit by another route. Thus the relay remains energised with its contacts in the closed position.

At the same time as the above action has been taking place, contact 5 closes on to contact 4 and contact 7 open so to contact 6, so putting the mains on to the primary of T₁. It will be apparent from the above why it is necessary to employ separate transformers for many of the supply circuits to the various parts of large amplifiers, so that individual control may be obtained, if desired, quite apart from the technical reasons related to constructional articles given earlier in this series.

Apart from the protection afforded to the mercury-vapour rectifiers by the action of the delay valve, all the other components in the H.T. supply circuits are safeguarded against the application of an abnormally high H.T. voltage. This would occur during the warming up of the output valves during which time they would be drawing their full amount of current, so that with little or no load on the supply, the voltage would rise to a dangerous value.

The arrangement just described of a delay action for mercury-vapour rectifiers is not the only circuit that may be used, but it explains the general features of most arrangements.

H.T. Supply Transformer
It will be noted that the H.T. supply transformer is an entirely separate component and has no L.T. or other secondary windings. The L.T. supply for the filaments of the mercury-vapour rectifiers is obtained by another separate transformer, thus giving independent control.

Reverting to our consideration of the delay valve, the delay period depends, of course, upon the heating of the metal strip, and this depends in turn upon the temperature generated by the filament. Therefore by means of a variable filament resistance we can control the delay time by adjusting the current flowing through the filament and thus have either a fast or slow action.

If the voltage across the filament is made low it takes longer, time for the filament to heat up to the point where it goes cold and buckles so that a long delayed action is obtained. For the control of mercury-vapour rectifiers a period of about 45 seconds is generally allowed for the filament of the valve to reach its maximum efficiency, and after this time the delay switch will come into operation so that it will be applied to the anodes of the rectifier valves.

Bridge Circuit
Often four of these valves will be used arranged in a bridge circuit to supply a voltage of some 2,000 volts. It is so arranged that directly the H.T. contactor switch is pulled over the heating current flows to the relay circuit, the filament circuit of the delay valve is broken, so that should ever the mains supply to the amplifier be cut off the delay action will automatically come into operation again when the mains supply is reconnected, thus making the whole procedure automatic.

D.C. for operating the relay and delay valve circuit is obtained from the grid-bias supply and Fig. 2 is a typical circuit which will enable the above description to be more easily followed.

In this circuit, T₁ is the H.T. supply transformer connected to the arrangement of mercury-vapour rectifiers. It will be seen that the primary of this transformer is not connected directly to the mains supply, but goes first to the relay and contactor switch contacts 4 and 6. The mains supply is taken to contacts 5 and 7 of this switch, but as shown in Fig. 2 the contacts are open so that there is no connection between T₁ and the mains supply.

T₂ is a separate transformer supplying L.T. for the filaments of the mercury-vapour rectifiers and is permanently connected to the mains supply within the amplifier.

Finally, there is T₃, which provides H.T. and L.T. for V₁. This may be a normal 350-0.35 rectifier valve providing the necessary potentials to potentiometers (not shown) in the grid circuits of the output valves. An extra winding on this transformer provides L.T. for the filament of the delay valve, D.V.

Sometimes a condenser is charged through a resistance across a neon lamp, which arrangement is rather like a time base. When a certain voltage is reached across the condenser, the neon lamp "fires" and the rush of current through the lamp from the condenser is made to actuate the relay controlling the H.T. circuit.

In other methods, a clockwork mechanism is set in motion when the mains supply is first connected, and the mechanism operates the H.T. switch after a predetermined lapse of time.

Full-wave Rectifiers
For amplifiers requiring H.T. voltages up to about 500v., ordinary full-wave rectifiers may be employed, and these require no special switching arrangements as do the mercury-vapour type of half-wave rectifiers.

Where an installation calls for a certain amount of power not very much in excess of a small standard amplifier, two of these smaller units, each feeding a number of valves, will often be less expensive than going to a higher power single unit amplifier with its more complicated safeguarding devices. This point, however, comes more under the heading of planning installations, which will be the subject of articles later in this series.

(Continued in col. 3, next page)
SHORT-WAVE listening appears to have become popular since the war began, because people find it an additional entertainment to listen to the opinions and programmes of other nations. The shortage of voltages, war conditions, and the high cost of equipment have all been factors in the increase of short-wave stations, when and where they can be heard, etc., seems to be causing many listeners much disappointment, and on many occasions recently have been asked by many people what stations a person should be able to receive on an all-wave receiver. In view of this obvious public interest in short-wave listening these days, I spent about twelve hours on a recent Saturday, from 13.00 to 01.00 (new B.S.T.), listening on the short-wave broadcast bands, and made a note of all short-wave stations. It was considered could be heard on any average all-wave receiver used in this country. The following are the stations received, and almost any short-wave listener should be able to receive them, unless the receiver is in a bad area, or reception conditions very bad. It should perhaps be mentioned that remarks concerning stations in Argentina, Italy, and the other occupied countries have not been mentioned in this list for obvious reasons, but lack of such information is hardly likely to worry the ordinary listener, as the main "tripe" broadcast from these stations these days is usually not worth listening to, unless perhaps for a laugh now and again.

49-49-metre Band

Until after 21.00 in the evening very little was heard on these bands except for an R4/5 signal in the afternoon from VQ7LO, Nairobi (Kenya Colony), on 49.31 m., and WRUL, Pittsburgh, on 49.67 m., WPIT, Pittsburgh (U.S.A.), on 49.86 m., and CHNY, Halifax (Nova Scotia), on 49.94 m., and CRCX, Toronto (Canada), on 49.26 m., both at R4/5.

41-metre Band

During the whole period of listening there was nothing of any note worth recording on this band, except for good signals from two Daventry stations, GSW (41.49 m.), and GBS (42.46 m.), both received at R7.

31-metre Band

This band proved more interesting, and in the early part of the listening period, VLQ, Sydney (Australia), on 31.20 m., was heard at R6, and VUD8, Delhi (India), on 31.28 m., and REC, Ladi (Finland), on 31.58 m., and TAP, Ankara (Turkey), on 31.70 m., were both received strongly at R7/8. Later in the evening WGEO, Schechelyd (31.48 m.), and WBO3, Millis (31.35 m.), both in the United States, were heard at R4/5.

25-metre Band

This band was the best and most interesting of all and, in the writer's opinion, many interesting hours of listening can be spent on this band alone. All signals mentioned were heard between 18.00 and 22.00, commencing with RNE, Moscow (U.S.S.R.), on 25 m., at R6/7; SSB, Motala (Sweden), 25.63 m., R7; VLQ9, Sydney (Australia), 25.77 m., R5/6; VLQ7, Sydney (Australia), 25.35 m., R4/5; Rabat (Morocco), 25.15 m., R6/7; WCBX, Wayne (U.S.A.), 25.36 m. R4/5; WRUL (U.S.A.), 25.45 m., R6/7. A weak signal from JZJ, Tokyo (Japan), on 25.42 m. (R3/4), and an interesting English news broadcast from Radio Brazzaville (Fr. Eq. Africa), at R6 near 21.30, completed the broadcast on this band. As a matter of interest, the latter station announces itself as the Free French Radio Station in Free French Africa, and the wavelength is 25.06 m.

19-metre Band

The first station to be heard on this band was Moscow (U.S.S.R.), on 19.76 m., at R7 around 19.30, and then the next signals any interest were received around 18.00 when the following three stations in the U.S.A. were heard, WPIT, Pittsburgh (19.72 m.), R5/6; WRUL, Boston, (19.87 m.), R5/6; WCBX, Wayne (19.65 m.), R4/5. Later about 20.30 a further U.S.A. station was received quite well on 19.55 m., it was WRUL, Boston, at R5/6.

The 16- and 13-metre bands introduced a very little to listen to, the only signal worth mentioning was from WNB1, Boundbrook, (U.S.A.), in the afternoon on 16.87 m., at R4/5.

In addition to the stations in the usual short-wave broadcast bands, the following six were also received outside the broadcast bands, SUX, Cairo (Egypt), 38.14 m., R6; Moscow (U.S.S.R.), 39.76 m., R7; PMA, Bandong (Java), 15.48 m., R5/6; HOQ, Radio Nations (Switzerland), 44.94 m., R15 m., R5/7; WCBX, Wayne (19.65 m.), R4/5. About 20.30 a further U.S.A. station was received quite well on 19.55 m., it was WRUL, Boston, at R5/6.

French Evening Programmes

Many people in this country who have been listening to the evening programmes broadcast to France on short-waves have been unable, for the last week or so, to receive these programmes at the accustomed times. The French news bulletin, hitherto broadcast at 8.15 p.m., has now been advanced to 9.15 p.m., and the French Half-hour programme has been advanced from 8.30 p.m. to 9.30 p.m. DBST. In addition to the transmissions on the medium wavelength, the programmes may be heard on the following short-wave bands:

<table>
<thead>
<tr>
<th>Call Sign</th>
<th>Programme</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>GSA</td>
<td>Evening</td>
<td>French</td>
</tr>
<tr>
<td>GSW</td>
<td>Evening</td>
<td>French</td>
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<td>GRX</td>
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<tr>
<td>GSN</td>
<td>Evening</td>
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</tbody>
</table>

Solution to Problem No. 421

If the pentagrid valve was oscillating, a definite increase in H.T. current consumption may be registered by short-circuiting the oscillator reaction winding, or by short-circuiting the grid leak of the oscillator section of the valve. No correct solution was received for Problem No. 429.
Practical Hints

An Efficient Aerial Lead-in Tube

All that is needed for this lead-in is an old porcelain inkwell, a piece of glass tubing, a brass rod and four nuts. First, I bored a hole in the bottom of the inkwell big enough for the rod to go through, and screwed one of the nuts on to the rod until it was about 1 in. from the end. Then I slid the inkwell on the rod and screwed on the other nut. Care must be taken when tightening this nut, or the porcelain will crack if too much pressure is exerted. Then I slid the glass tubing over the rod, which in my case was 9 in. long, and screwed a nut on the other end to keep the glass tubing steady.—D. MALE (Wellington).

A Dial-lighting Arrangement

In a receiver of the communications type, or any other employing a separate switch for controlling the H.T. supply, a single dial-light may be used to indicate whether H.T. and mains, or merely mains, are switched on. All that this necessitates is to connect the bulb in series with the mains lead. Now, with a set which consumes about 75 watts, on switching on the mains, the valve heaters only will be in circuit, and about 30-40 watts will be used. This means that between 120 and 170 mA will flow through the bulb, which, being an ordinary flashlight bulb, will only light at about half brilliance. When the H.T. is switched on, the full mains load is taken, and, in the example mentioned, some 300 mA will light the bulb to full brilliance. Thus, it is seen by the brilliance of the bulb when the H.T. is on. For sets consuming a larger wattage, a low voltage, higher current bulb must be used. The bulb also makes a good mains fuse in this position, and gives an idea of the consumption of the set.—G. W. CAGG (Oakham).

A Simple Pick-up

The accompanying sketch shows a simple pick-up I have made from odds and ends requisitioned from the scrap box. To the diaphragm of an old earpiece I soldered the part A, which was taken from a disused sound-box. The clip B, made with a piece of thin strip brass, is bent round the earpiece body, and clamped with a small bolt and nut, as indicated. The piece of wood-dowel, which fits into the end of the pick-up arm, is attached to the back of the earpiece by a long bolt and nut, as shown. When completed, I found this simple unit gave fairly good reproduction on both speech and music.—E. BITTON (Barrow-on-Humber).

A Novel Soldering Device

From a piece of copper tubing, about 3 in. diam. and 6 in. length was cut, one end being pinched tight over the bored ends of a length of single flex. The pipe was set in a wooden handle, and the wire brought out in the manner of an ordinary electric soldering iron. A carbon rod was taken from a torch battery and pointed one end, then pressed into the free end of the tubing, as indicated in the sketch.

To use the soldering bit, 4 or 6 volts is taken from a transformer, or accumulator, the wire connected to the positive, and a lead is taken from negative and clipped, by means of a crocodile clip, to the article to be soldered.

The speed and ease with which a set can be wired with this device is remarkable, the heat being instantaneous, and located in the point of the carbon bit.—R. G. GEY (Truro).

Corner Insulator for Aerial Lead-in

At one time, much attention was paid to the aerial lead-in and its insulation, and while this should be equally important to-day, if consistent results are to be expected, it is frequently overlooked. This is due to the high standard of performance possible by receivers themselves, and the aerial is often quickly erected with little thought for its insulation. The lead-in very often passing round a corner of a building with only the covering of the wire itself as insulation. Where this latter method has of necessity been adopted, it will be found that the simply constructed corner insulator shown in the accompanying sketch will prove very effective.

This insulator takes only a few minutes to construct, and merely consists of three glass test tube size about 3 in. by 1 in., bound together in the form of a rough triangle by insulating tape, as shown. The finished insulator is inserted under the aerial or lead-in wire, the tension of the wire itself keeping the insulator in position. Provided that the glass tubes are of a thick type, when arranged as indicated they will stand up to a surprising strain without fracture, but if it is thought preferable, wooden rods, completely filling each tube, might be used in place of the corks.—R. L. GRAPES (Chelmsford).
Connecting

Methods of Connecting Built-in and Extension Speakers to the A.M. Set

Connecting Built-in Speakers

Optimum Load
With the average triode, or pair of triodes, in push-pull, output is not normally affected to any serious extent if the matching is correct, to say, 70 per cent. at 500 cycles, but close matching is desirable when using some types of pentode and tetrode if maximum efficiency is to be ensured. In passing, it may be pointed out that the optimum load to be considered in the case of two valves in push-pull is twice that of either of the valves. Thus, if two valves each having an optimum load of 2,500 ohms were connected in push-pull, the ratio of the output transformer would have to be found by taking the overall optimum load as 4,000 ohms.

Extension-speaker Connections

Fig. 1 shows the usual connections for a moving-coil speaker connected in the anode circuit of an output triode. The connections would be the same, of course, for a valve of any other type. Also shown are the connections for an extension speaker. It will be seen that this is parallelled by using the primary winding of the transformer of the built-in speaker as an output choke, and feeding the extension speaker through a fixed condenser. The earth connection to the extension speaker may be made direct at a point near to the speaker.

A practical point about this circuit is that the fixed condenser should be placed as near as possible to the valve anode so that the whole of the extension lead outside the set is insulated; that is so that should the lead be broken, large variations will occur in the H.T. supply could not be short-circuited.

The transformer of the extension speaker should have a ratio similar to that of the built-in transformer, although the matching is not always critical. In any case, most speakers specially made for extension use have a transformer with a tapped primary, so that the transformer may be used by moving one lead to different terminals, by transferring a wander plug to different sockets, or by rotating a switch arm. The optimum ratio can be found by trial, but it is more easily found if some idea increases the output from the extension speaker in addition to "silencing that which is not required and improving the matching. This can best be done by breaking the speech-coil circuit by means of a switch, as shown by broken lines in Fig. 1. Care must be taken in doing this, since there are often only two or very flexible leads from the secondary winding of the transformer running direct to the speech coil. It is important that any new leads shall not interfere with the free movement of the speech coil, and that the resistance of the new leads plus the resistance of the switch contacts shall be negligible. One of the most important of the last-mentioned point will be clear when it is remembered that the total resistance in the secondary circuit may be only a few ohms, and that signal output will be lost if any voltage drop occurs across additional circuit resistance. It is therefore best to use stout flexible leads running to a good-quality switch mounted near to the speaker transformer.

One speech-coil lead should be unsoldered from the transformer secondary terminal or tag and fitted to a new terminal which shall be connected by means of a small insulated strip attached to the transformer; this is to ensure that speech-coil movement is not interfered with. The other lead is then connected from the transformer and from the new terminal.

Connecting Extension Speakers

Batteries for the Deaf

The Board of Trade recently announced the completion for the manufacture of an adequate supply of high-tension batteries to meet the needs of deaf persons who use hearing-aids. One of the disadvantages of these batteries has, however, been found necessary to curtail considerably the number of different types of these batteries, which are intended to an agreed range of standard types.

The new types have been designed to cover the requirements of all existing United Kingdom makes of hearing-aids which employ high-tension batteries, but it may be found that some instruments will need minor modification in order to accommodate them. No modifications will be required in the mechanism of any instrument. Users of hearing-aids are advised to communicate with the manufacturers of their apparatus who will inform them of the most appropriate new types of battery and of any modifications to their sets which may be necessary.

Commercial Television in U.S.A.

It is interesting to note that prominent department stores are among applicants for television stations in various parts of America. The applicants are quick to realise the potential importance of television advertising to local audiences; at the start of commercial television, most programmes will be local in nature, both in entertainment content as well as advertising value.
THE SPEAKER
Speakers and of Providing Remote Volume Control

Energised-speaker Connections

Difficulty often arises in "sort out" the connections to an energised moving-coil speaker which has only three terminals or sockets. Of these is the end of the field winding, one of the transformer primary winding, and the other a series junction between the two. This will more easily be understood from Fig. 2. The terminals will generally be marked in some manner, but if not the field winding can be recognised, due to the fact that it has a higher D.C. resistance than has the transformer winding. For example, the field winding has a resistance of 2500 ohms, while the transformer primary has a resistance of only about 200 ohms. The difference is so great that a sufficiently accurate check can be made with a millimeter and a G.B. battery, or even with a pair of "phones and a battery.

Effect of Field-coil Resistance

The resistance of the field winding will probably be found somewhere on the speaker, since it is important that this be known. If the resistance were the fairly usual figure of 2500 ohms it will be apparent that an appreciable voltage drop must occur across it, and therefore that the values would be severely under-run if allowance were not made for this in the design of the H.T. power unit. Trouble might also arise even if the voltage drop were not excessive because the field winding was of much lower resistance, say 1000 ohms. To provide the necessary wattage, to keep the field a comparatively high current would have to be passed through it; the current normally passed is the total H.T. current consumed by the receiver.

The actual wattage required depends very largely upon the particular speaker, but it should generally be at least 10 watts from a reasonably efficient operation, while three or four times this figure is often desirable. For 10 watts to be dissipated in a 1,000 ohm resistance it is necessary to pass 0.01 amperes through it (watts = volts x amperes, square ohms, or watts = volts squared divided by ohms).

Remote Volume Control

Reverting to extension speakers, which are essentially of the magnet type unless fitted with their own power unit, we can consider methods of controlling the volume. It may cause a fairly marked variation in tone, however, unless the fixed condenser indicated by broken lines is not included in circuit.

It will be noticed that a range of maximum values is shown for the volume-control meter; as a very rough guide it may be suggested that this value should be about twice the optimum load of the output stage, but it is not critical. In the second method, this variable resistor takes the place of the off-on switch shown for the built-in speaker in Fig. 1. A fairly wide range of control will be given if the maximum value of the resistor is equal to the resistance of the speaker coil, but if a wider range of variation is required a larger resistance could be used. The same general rules must be followed in fitting the control as those laid down for the switch, and the resistor used should have a definite "shorting" position at the bottom end of its range. It may also have an "off" position at the other end of its range so that the extension speaker can be switched off simply by turning the control past the maximum-volume position.

The third method shown in Fig. 3—or rather the two similar methods—is often very satisfactory, although in theory it would appear to have a rather marked effect on tone as well as volume.

Control of Tone

When remote tone control is required the simplest method is that shown in Fig. 4, where a fixed condenser and variable resistor are wired in parallel across the primary of the speaker transformer. The tone values shown are average ones, but could be modified with advantage in the case of certain circuits. In this case it is desirable that the condenser should be rather smaller, and the resistor rather larger than those used in the set itself, assuming that there is no "off" position for the built-in control. When using the external speaker the tone control in the receiver should be set to its "high" or "treble" position.

Extension Speaker with Push-pull connections

The simplest method of connecting an extension speaker to a push-pull output stage is shown in Fig. 5. In this case it will be observed that the built-in output transformer is used as an output choke. To ensure good matching, the transformer on the extension speaker should have approximately the same ratio as the overall ratio of the built-in transformer. It is desirable to include a switch—such as a speech-coil lead to the built-in transformer, as in the arrangement shown in Fig. 1. The switch is indicated by a broken line. All the other precautions—positions of feed condensers, low resistance in switch circuit and so forth—given in respect of Fig. 1 should be observed when following the connections shown in Fig. 5.
THE matter of supplying a receiver with high and low-tension current appears so elementary that it seldom receives the full attention which it deserves. This is especially the case with battery receivers, where the constructor believes that if he has a two-volt accumulator, 120-volt high-tension battery and a 9-volt grid-bias battery all is well.

In the first place let us deal with the accumulator, assuming the use of standard double-plate accumulators. If the set has four valves its total L.T. consumption will be in the region of .5 amp. per hour. And suppose that the set is used on an average of 20 hours a week; this means that it will consume at least 10 ampere-hours in one week, or 40 ampere-hours in a month. If the accumulator is charged at a service-station the most suitable capacity for the conditions set out above would be 60 ampere-hours (at the 10-hour rate). This means, in the simplest possible terms, that the accumulator would deliver 5 amp., continuously for 10 hours, or .5 amp. for 100 hours before becoming run down.

Amp.-Hour Capacity

Since the current drain is only one-tenth of that delivered on a 10-hour discharge the effective capacity would be rather high in this 60 ampere-hours, but allowing for the accumulator dropping slightly in efficiency after a good deal of use, it would be fairly safe to estimate its "life per charge" on the nominal rating. In passing, a warning should be given that in a few cases of unbranded or "cheap" accumulators the capacity given is not at the 10-hour rate—and possibly not at any other recognised rate! Also, it is not uncommon with good makes of accumulator for radio-set use to give the capacity at the 20-hour rate (which is generally more applicable) but this is generally in addition to the 10-hour figure.

Since the cost of accumulator charging—that is the price charged by service stations—does not normally vary very much with the capacity, it is obviously an economy to use accumulators with the largest practicable capacity. But there is a limit here, due to the fact that it is desirable that all plate-type accumulators should be charged at intervals not greatly in excess of one month. In consequence, there is seldom any advantage to be gained by having a battery whose capacity is much greater than that required for, say, five weeks' service. This does not apply to the accumulators having two very thick plates, and which are especially designed for use where the current drain is very small and charging is not necessary at intervals of less than seven or eight weeks

Mass-Plate Accumulators

In general, these "mass-plate" type accumulators are most suitable for receivers which do not take up to, say, .5 amp. L.T. On the other hand, they are very convenient for higher outputs, up to their rated maximum, if a trickle charger is used, the accumulator being given a refreshener charge every few days. A similar rule can be applied to ordinary plate accumulators when a trickle charger is available. That is, one of smaller capacity than mentioned above can be used, so long as a trickle charger is available. Even then, however, the discharge at the 10-hour rate should not be exceeded.

All-Dry-Battery Valves

A number of readers now use the 1.4-volt filament battery valves, the filaments of which are normally run from a dry cell forming part of the complete dry-battery unit (H.T. and L.T.). This arrangement is excellent in many respects, since the H.T. and L.T. capacities are so designed that the two sections of the battery run down at a similar rate. With a portable receiver it is practically essential to stick to the combined battery—because accommodation is not provided for any other type. But in the case of a "home" receiver, it will often be found more economical to adopt an alternative arrangement, partly because of the difficulty of obtaining the special batteries in certain districts.

One method is to use a standard type of dry H.T. battery along with a large 11-volt bell cell for L.T. supply. Where at a point slightly below the calculated required resistance value, this point could be estimated by taking the proportion between the total and required resistance values. Another alternative would be to use copper wire wound in the form of an H.F. choke, but this would be comparatively bulky.

H.T. Supply

The supply of high-tension current is generally even more important than the supply of filament current, because dry batteries should be used with the utmost care in...
present circumstances. In the first place, we will assume that an eliminator is not to be used. Standard-capacity dry H.T. batteries should never be discharged more than 10 milliamps, while it is very desirable to keep the discharge rate well below this figure, since, roughly, the life is inversely proportional to the square of the current. This approximation is good enough, at any rate, for discharge rates above, say, 7 mA.

Reducing H.T. Consumption

The first requirement, then, if a standard-capacity battery is to be used, is that the current consumption of the set should be reduced as far as possible. This is done by using the highest grid-bias voltage compatible with satisfactory reproduction, by reducing the setting of any variable-mu valve control as much as possible, and by cutting out L.F. stages and using phones when speaker reproduction is not necessary.

One very convenient method of providing for the last-mentioned change is to fit an open-circuiting jack in the anode circuit of the detector valve, as shown in Fig. 2. This allows the 'phones to be connected in the detector anode circuit, and when they are plugged in the L.F. to the detector valve is broken. This is practicable in all cases except when 1.4-volt valves are in use with a 2-rotl accumulator and series resistor; in that case the filament current should not be broken, since that would cut down the L.T. current and thereby reduce the voltage drop across the resistor. That, in turn, would cause the voltage applied to the other filaments to rise above the correct figure.

This difficulty could be overcome in many cases by increasing the bias applied to the output valve to twice its normal value, the change being made while the set is switched off. This would reduce the anode current of the output valve practically to zero.

Automatic Grid-bias

The use of automatic grid-bias is very helpful in ensuring that the anode current is kept at a low value, since this reduces the chance of the bias failing due to a run-down battery. At the same time, quality is not affected when the H.T. battery is partially run down, since the anode current drawn is then reduced, and so is the applied bias.

Automatic bias has previously been dealt with in this series of articles, so it is not necessary to explain it again here. The value of bias resistor is seldom critical, and it is always best to use the highest resistance possible without overloading the valve for reproduction. With home-constructed receivers it is often a good plan to use a variable resistor, mounted inside the set, and to set it to the highest satisfactory value when the set is first tested out.

Large-capacity H.T. Batteries

When the H.T. current consumption is increased, it is always better to use a "double-capacity" H.T. battery; should the current exceed 15 mA, a "super-capacity" battery is most economical if there are any reasons why an eliminator, M.C. or Q.P.P., should not be used. As mentioned when dealing with class B and Q.P.P., a special type of battery or H.T. unit is necessary when using either of these forms of amplification. The reason is that the H.T. current fluctuates widely from a very low value to 30 mA or so. Thus, a very low internal resistance is necessary.

Eliminators and other forms of H.T. supply for battery and mains receivers will be dealt with in later articles of this series.

Colonel Sir A. Stanley Angwin, D.S.O., M.C., T.D., M.I.E.E., whose name recently figured in the King's birthday honours list, was educated at the East London College (now known as Queen Mary College), and received his practical engineering training with Messrs. Yarrow and Co., Ltd., engineers and shipbuilders. He joined the Post Office Engineering Department in 1900 and shortly after was transferred to Glasgow.

When the Territorial Force was inaugurated he raised the Lowland Division Telegraph Company, which was comprised almost entirely of Post Office staff. The unit was mobilised in 1914 and formed into the 32nd Divisional Signal Company with Major Angwin as Officer-in-Command. He served through the war with the unit in Gallipoli, Egypt, Palestine and France and was awarded the M.C. and D.S.O. After the war he commanded the 44th Home Counties Divisional Signal Company until 1927, when he was appointed Deputy Chief Signal Officer, first in the Territorial Army, Eastern Command, and then in the Supplementary Reserve, Royal Corps of Signals, a post he held until 1939. He was awarded the T.D. for 20 years service in the Territorial Army.

On return to civilian life he was brought to London to join the Wireless Section of the Engineer-in-Chief's Office, which was then in a state of rapid expansion. He took a large part in the design and construction of the Leatherhead, Cairo and Rugby radio stations, and in the inauguration of the transatlantic telephone service. Under his direction the Wireless Section developed equipment for short-wave radio telephony, and built up the multiplicity of overseas radio services which has given this country a pre-eminent creation in world telephony. He has taken a large part in international work and as British delegate he attended the Madrid and Cairo Telecommunication Conferences, the Lisbon and Bucharest meetings of the Comite Consultatif International Radiotelephonique and the Lucerne and Montreux European Broadcasting Conferences.

Colonel Sir A. Stanley Angwin.

Sir Stanley is a member of the Institution of Electrical Engineers, and an Associate Member of the Institution of Civil Engineers, and has read papers on telecommunications subjects. He has been chairman of the Wireless Section of the Institution of Electrical Engineers, a member of the council, and is now a vice-president. Among many other activities he has been a member of the Government Television Committee since its commence- ment, and he takes a keen technical interest in the development of television. In 1933 he was promoted to Assistant Engineer-in-Chief and in 1935 he was advanced to the post of Deputy Engineer-in-Chief. He succeeded to the post of Engineer-in-Chief in June, 1939.

The Postmaster-General has announced the appointment of Mr. D. J. Lidbury, C.B., D.S.O., to be Assistant Director-General of the Post Office.

Mr. Lidbury has been Regional Director of the London Postal Region since April, 1939. Entering the Post Office as assistant surveyor in 1906, he was transferred to headquarters in 1912. He served in the European War from 1915 to 1920, became Director of Army Postal Services, which post he held until 1935, was mentioned in despatches, and awarded the D.S.O. As assistant secretary at headquarters from 1935 to 1938, he was also made responsible for the carrying out of the Regionalisation Scheme in the Post Office.

On the completion of that task, Mr. Lidbury became Regional Director of the London Postal Region in 1938. Early the following year he went to Buenos Aires as the chief British delegate and chairman of the first commission of the International Postal Union Congress.

In July, 1939, to November, 1940, he was seconded to the Ministry of Home Security, where he was appointed Principal Assistant Secretary. He resumed duty at the G.P.O. as Regional Director of the London Postal Region in November last.

In the New Year's honours Mr. Lidbury was awarded the M.C.

N. C. Tritton, of Brisbane, Queensland, Australia, who recently came to this country as assistant secretary of the C.B.C., has been appointed to the staff of the B.B.C.'s Overseas Division. He will be responsible for the study of the broadcast audience in the area covered by the B.B.C.'s Pacific Transmission, which includes Australia and New Zealand.

After twelve years' association with H.M.V. and Marconi, J. S. Galbreath has been appointed to the staff of the B.B.C.'s Overseas Division.

A. McVie, general manager of Kolster-Brandes, Ltd., has been appointed a director of that company.

G. H. Walton has been appointed works manager of British Insulated Cables, Ltd., on the retirement of E. A. Bayles, who continues his association with the company in a consultative capacity.

The PRACTICAL WIRELESS ENCYCLOPEDIA

By F. J. CAMPBELL

Wireless Construction, Sets, and Definitions explained and illustrated in clear language.

ROUND THE WORLD OF WIRELESS

B.B.C. European Service

A S from Sunday, June 8th, the period 9.30 to 10 p.m. G.M.T. in the late night transmission of the B.B.C.'s European service, has been allocated as follows:

9.30 p.m., G.M.T.—News and talks in Italian.
9.50 p.m., G.M.T.—News and talks in Dutch.
10.00 p.m., G.M.T.—News in English.

This cancels the news bulletin in Serbo-Croat previously broadcast from 9.45 to 10 p.m. G.M.T. The B.B.C. service is now produced by one bulletin per day, but in its place broadcasts will be given in Serbo-Croat from the Cairo station of Egyptian State Broadcasting.

Blitzed History

THE B.B.C. are broadcasting to America dramatised stories of famous London raid-damaged buildings. Westminster Abbey and Dr. Johnson's house in Gough Square have already been treated in this way. Chelsea Royal Hospital will be the subject of another broadcast.

B.B.C. Man Lost in the "Hood"

Among the list of officers lost in H.M.S. Hood is the name of Lieut. Bernard Stubbs, R.N.V.R., who was formerly B.B.C. news observer, and well known to listeners for his naval commentaries at the beginning of the war. He was 32 years old.

U.S.A. S.W. Stations and National Defence

Station WLWO, America's most powerful short-wave international station, now operating with 75,000 watts, is among the American stations that will take part in a plan to mobilise short-waves for national defence. The plan also is designed to provide international goodwill, according to James D. Shouse, vice-president in charge of broadcasting for the Crosley Corporation, which operates WLW.

Plans have been formulated for the organisation with representatives of five other international station operators at a meeting in Washington, D.C. The organisation is a voluntary one established to assist the Government in national defence through short-wave activity.

Cuban Amateur Reserve

The President of the Cuban Republic has issued a decree to the effect that all Cuban amateurs are to be formed into a voluntary emergency reserve to be known as the Auxiliary Corps of Radio Amateurs. Under the guidance of the Minister of Communications, the corps will be a valuable reserve of trained men with equipment for use in a national emergency.

U.S.A. Commentaries' Broadcast to Germany

Broadcasts originating in the U.S.A. are now being given regularly in the B.B.C.'s German programmes. Every Thursday after the 10.00 p.m. G.M.T. news, listeners in Germany hear Lieut. H. A. Conger, the well-known American journalist, reviewing current events in his country and giving the latest news of America's ever-growing activity as the "arsenal of democracy." A monthly feature is a talk by Dr. Thomas Mann, who lives in California. His talk is recorded in Hollywood, flown to New York, and thence broadcast to Britain for re-recording.

News commentaries on current affairs are also given from time to time by Professor Arthur Newell, an American who has worked for many years in the interests of Anglo-American understanding.

New Radio Loop

A New loop aerial, manufactured by RCA in the United States, is to be used to enable aural direction finding in aircraft when used with receivers which will match the adapter kits. This new loop is remotely operated by means of a flexible cable and tuning mechanism, and enables the pilot or radio operator to take bearings for "position fix" while in flight.

The outstanding feature in this new loop is that of remote control which allows the compass receiver to be placed anywhere, where in the plane; the distance from the tuning mechanism being governed by the length of the control cable, which is 125 ft. long.

Broadcasting to the West Indies

Further developments have taken place in the B.B.C.'s service to the West Indies which three months ago was "stepped up" to three weekly programmes each of twenty minutes duration. Four programmes were now broadcast weekly, during which men and women from the West Indies serving with the Forces in this country come to the microphone to broadcast personal messages to their families at home.

While these personal broadcasts are primarily for West Indians serving with the Forces, opportunity may occur from time to time for other West Indians resident in this country and for people with relatives in the West Indies to send messages. Requests should be addressed to the West Indian Department, Broadcasting House, London, W.1.

Wristlet Radio

A Lieutenant in the Polish Army and Mr. I. Solar, a Dunfermline electrical engineer, have devised a wristlet broadcasting set. It is designed to help prisoners locate and send messages. It is an ordinary portable set can pick up these oscillations and thus enable rescuers equipped with a receiver to locate a trapped person. It will operate for forty-four hours continuously on a small dry battery and will cost less than five shillings when mass produced. The Home Office are to test it.

Australia's Transmitters

According to a recent report there are now a total of 129 broadcasting stations in Australia. Of this number 26 medium-wave and three short-wave transmitters are operated by the National Broadcasting Service. The others are commercial stations. The average power of the transmitters is very low, being approximately 1.6 kW.

Edinburgh Classes for Service Men

It is stated that sufficient applications have been received by the Edinburgh branch of the Scottish Radio Retailers' Association for day classes to be started in co-operation with the education authorities for the training of service men to fill the gaps in the industry caused by the demands of the Services. Some of the necessary equipment for training purposes has been given by wireless firms in the city.

Receiver Sales in Canada

During 1940 the total number of receivers sold in Canada was approximately 438,000, this being an increase of over 20 per cent, on the previous year's sales. The sales of U.S. receivers in Canada, which have been rising steadily since 1932, are likely to be adversely affected by the recently imposed taxes on sets.
ELEMENTARY MATHEMATICS FOR WIRELESS OPERATORS. By W. E. Crook. Published by Sir Isaac Pitman and Sons, Ltd. 64 pages. Price 3s. 6d. net.

As the author of this book remarks, in his preface, "you cannot understand or even study wireless without some knowledge of simple mathematics." This book covers sufficient ground on the subject to give the wireless operator all the mathematics he needs to know on his course. The book is divided into five chapters bearing the headings: Arithmetic; Algebra; Geometry and Trigonometry; Graphs; and Mechanics. The text is illustrated with numerous diagrams.

THE OBSERVER'S BOOK ON RADIO NAVIGATION. By W. J. D. Allan. Published by George Allen and Unwin, Ltd. 106 pages. Price 2s. 6d. net.

This small handbook is intended to assist the wireless operator and observer to deal with all problems as they arise, in order to ensure that rapid and smooth working which is of value to the navigator, and to this end the first part of the book is devoted to the elements of electricity. Other subjects dealt with include The Directional Loop; The Cardioid; Coastal Refraction; Night Effect; Plotting; Long Range Loop Bearings; Homing; Ground D/F Stations; and Route Markers and Approach Beacons. The book contains numerous diagrams.

THE T. AND C. RADIO COLLEGE

Now that "Radio-location" is very much in the news, it is interesting to note that The Technical and Commercial Radio College, of Reading, are introducing a special course for men wishing to qualify as wireless operators, for their courses to the T. and C. Radio College. Interested readers should write for more details.

John, of World. R.A.F. Even become proficient by availing yourself of the college's special method of tuition.

A NEW DIG-FOR-VICTORY POSTER

The Ministry of Agriculture has accepted an offer from The Smallholder, the well-known war food-growing journal, to co-operate in finding a successor to the famous Dig for Victory "foot and spade" poster. The Smallholder has arranged to do this by means of a Poster Idea Competition. The sender of the idea considered by the judging committee to be the best will be awarded a First Prize of £10. Five additional prizes each of £5 will be awarded for the next best efforts.

Entries should be addressed to: "Dig For Victory" Poster, The Smallholder, Tower House, Southampton Street, London, W.C.2, and sent in as early as possible but not later than Monday, July 21st, 1941. Name and address of sender (in block capitals) should be placed on the back of each attempt.

ON SMALL PARTS...

In countless instances quite intricate pieces of apparatus are wholly dependant on the proved reputation and reliability of their component parts.

All products from the House of Bulgin are pre-eminent for superior design and workmanship, and every article bearing our Trade Mark has to pass exacting and exhaustive tests during the course of its production.

That is why every manufacturer of national importance incorporates Bulgin components.

Let us send you


Price 9d., post free.

Always depend on

BULGIN

REGISTERED TRADE MARK

A. F. BULGIN & CO., LTD., BY-PASS RD., BARKING, ESSEX.

TEL. RIPPLEWAY 3474 (4 lines).
The New
"Westalite" Rectifier
An Improved and Compact Unit with a High Standard of Performance

The Westinghouse Copper-oxide Rectifier, first introduced to the public in 1933, is well known to radio constructors, and has found its way into most branches of the electrical industry, where it has established a reputation for reliability.

After developing the rectifier for application to the most suitable markets, the Westinghouse Research Laboratories carried out a series of experiments with a view to improving the unit, and as a result, a considerable reduction in size and cost, coupled with an improvement in efficiency, has been effected. An improved type of rectifier has now been produced which is suited for the larger power applications.

The Westalite Rectifier, as it is called, has a slightly better electrical performance than had previously been obtained, and also a considerable reduction in bulk and weight, with a consequent reduction in cost.

Constructional Details

The new rectifier consists of a steel plate in which is formed a thin layer of a special selenium compound. A thin layer of alloy serves to make contact with the selenium compound, and rectification takes place at the junction of the alloy and the compound, in so far as current readily flows in one plate and not in the other.

A range of elements of varying sizes is available which permits the smallest and most economical rectifier to be built for any particular requirement. Figs. 1 and 2 show some of the types of unit so far developed, and indicate the variety in sizes. The rectifier elements are mounted on one or more spindles, a number of elements being connected in series or parallel, according to circuit conditions. In some cases cooling fins are fitted, which enable a considerable increase in output to be obtained from a given area of rectifier element. These fins, which are sometimes made of an aluminium alloy to reduce weight, embody a boss on the centre which acts as a spacing washer, thus maintaining the fins at the most efficient pitch for cooling purposes. This method of assembly results in a considerable saving of time, as less components have to be handled, and at the same time the electrical and thermal resistances are minimised, thus increasing efficiency.

The construction of a rectifier

oxide, the same high safety factor in the rating being maintained.

The life of the Westalite Rectifier, like its copper-oxide counterpart, is of long duration, many of the latter having been in service for nearly 14 years without the need for maintenance or replacements.

General information concerning the many applications of the Westalite Rectifier is covered by separate pamphlets issued by the Westinghouse Brake and Signal Co., Ltd., Pew Hill House, Chippingham, Wilts.

Performance

The electrical performance of the Westalite Rectifier is generally better than that of the equivalent copper-oxide rectifier.

Fig. 1.—Typical Westalite plate bank rectifier.

and for its application to radio equipment reference should be had to the publication "The All-Metal Way."

"IN TOWN TO-NIGHT"

When "In Town to-night" closed down for the summer on June 21st, the programme celebrated its 250th performance.

"In Town to-night" has been produced continuously since the winter of 1933, with the exception of summer breaks each year, and over two thousand people have taken part in the programmes. Those interviewed include nationals of every country in the world and range from foreign princes, dukes and princesses to chimney sweeps and dustmen. Contact in the studio reveals that both the dukes and the dustmen are intensely interested in each other. Despite the raids of September and October last year, all the people turned up every Saturday night as they had previously done in peace-time.

The 93 per cent. of the people interviewed had never broadcast before. Every big film star who has visited this country has been included in the programmes. All the thousands of personalities have been interviewed in person with the exception of a children's party last Christmas, which was recorded.

A great feature of "In Town to-night" is that in the rehearsals producers and personalities sit down to tea together, and those of lordly line are delighted by chat across the table with navvies and cockney trademen. There was an amusing incident when two Piccadilly flower-girls were being interviewed, and one had "mike-bright" right up to the moment when she was due to broadcast. Her companion suddenly turned to her and said: "You had the meales when you were young. You get over that and you'll get over this." The nervous flower-girl then spoke perfectly.
BEETHOVEN gave his own first public concert-recital on April 2nd, 1800, and from that year till 1803, when the production of an opera was contemplated, he moved about from one address to another. Eventually he moved to Baron Pasqualli’s, where rooms on the top floor were specially reserved for him and in which he used to lock himself up for long periods, for study and contemplation. But even with this he was not contented, and he often took up quarters in the city which he was constantly changing. He hated the city in the summer and always followed the Vienna custom of spending it in the lovely countryside round about.

Many of his greatest works, certainly the _Missa in Olive_, Fidelio, and the _Eroica Symphony_, are products of solitary strolls through the country.

He then commenced work on his opus 1 of what now forms the catalogue of his printed works. It is “Three Trios, for piano, violin and violoncello.” They were published especially on Vienna on October 21st, 1785, and dedicated to Prince Karl von Lichnowsky. They were followed on March 9th, 1796, by opus 2, “Three Sonatas for clavecin or piano” (the first of the set and dedicated to Joseph “Papa” Haydn.

Three Distinct Styles

To-day, almost everyone follows the example of Ferdinand Ries in dividing Beethoven’s music into three distinct styles or periods. They overlap a bit according to the category of work being dealt with—Sonata or Symphony or Quartet, etc. So far as his piano music is concerned, the first period is said to terminate with the second Symphony and the second creation of the two, as he would only accept ten ducats for the other instead of the twenty he wrote.

The descriptions of works of this first period are generally pitiful and do not give full justice to the works themselves. They are, too, as a rule, not enough to satisfy the modern jaded critic. The work itself is the only thing that will satisfy his hunger. He is not interested inæsthetic pleasure in his music; he is interested in substance, in musical content. The modern critic demands more. He wants to know what the composer’s mind was, what he was trying to express, what he was trying to say, to what extent he succeeded in saying it. He wants to know why the music was written, and where and when and how.

The works of this period still please sophisticated audiences, and many examples were then much played. He was also fortunate to gain the confidences of many charming and wealthy patrons, with means to cater to fashion and the amusement of the ladies. He was also fortunate to gain the confidences of many charming and wealthy patrons, with means to cater to fashion and the amusement of the ladies.

He even composed a _Concerto for piano and orchestra_, in C, the quintet for piano, oboe, clarinet, bassoon and horn; six string quartets, the second pianoforte concerto, the septet, and the first symphony—1800.

First Concertos

The concertos are wholly delightful, especially the C major, and the fact that they still please sophisticated audiences is not surprising. Many magisterial examples have been lost. The manuscripts have been found, and from them the performances were arranged. The slow movement of the Sonata testifies to the fact that they were both in the composer’s mind at the time. The story of the ballet is “Prometheus,” a lofty spirit, who found the men of his day in a state of ignorance, and civilised them by giving them the arts and sciences. Starting from this idea, we are shown two statues brought to life and made susceptible to all the passions of human life by the power of music. Act II is placed in Parnassus, and shows the apotheosis of Prometheus, who brings the men created by him to be instructed by Apollo and the Muses, thus opening the gates of knowledge and culture. This description comes from a contemporary theatre bill; the original book of the ballet was lost. Beethoven seems to have combined the three myths of Orpheus, who was endowed with godlike power by music, Prometheus, the heroic benefactor of mankind, and Pygmalion, the sculptor whose statue came to life.

The music contained some of his best up to that time. The overture is in advance of the Symphony, and in places anticipates Leonora III.

In the finale is a theme which he used in the finale of the Third, Erotica, Symphony, and for a splendid set of variations. The ballet was a great success, and doubtless gave him a breathing spell, at least, from monetary troubles. It first performance took place at a memorable concert, the programme of which consisted of that work, the Scond Symphony and the Third Pianoforte Concerto, in which he played the solo part. The last rehearsal took place at 8 a.m. in the theatre at 8 a.m. Beethoven arrived at quartet-writing after he had produced mature works in several other music forms; also after lessons in quartet-writing under Förster, whose own examples were then much played. He was thirty when no, consisting of no less than six quartets, was published. At a similar age Haydn had written over twenty. Beethoven’s own less to Haydn’s influence than most of the other compositions of this “first period,” and they seem to have owed their origin to Count Apponyi, although the dedication went to Prince Wenzel Lobkowitz. Chamber music was usually published in batches of three or six, and the order of these in op. 18 is Beethoven’s own. They appeared in two lots with two new ones in each. The two weakest are the set diplomatically placed at numbers 3 and 6! The manuscripts have been lost.

Charming works, with hints of the efforts he was obviously taking to break away from the past, but definitely inclined that way. Number I must have cost him much anxious thought; no fewer than sixty pages of the sketch book were devoted to touching up the first subject. It came in for future polishing when the whole work was revised in 1800. Number 2 is nicknamed the “Compliment,” from the supposed resemblance in the opening phrases to a ceremonious meeting between two eighteenth-century elegants. The whole set shows how he succeeded in equalling, or perhaps in surpassing, both of his great masters, Mozart and Haydn, who had succeeded in reaching.

The first Symphony, in C major, op. 21, was completed at the commencement of 1800. Sir Donald Tovey calls it “a fitting farewell to the eighteenth century.” It might be considered notable as showing Beethoven with his feet—musical feet—planted firmly on the ground and his gaze fixed upon the dawn of the new era.

“Prometheus”

The following year was produced the ballet _Prometheus_, and the similarity between the opening of the overture, and that of the Symphony testifies to the fact that they were both in the composer’s mind at the same time. The story of the ballet is “Prometheus, a lofty spirit, who found the men of his day in a state of ignorance, and civilised them by giving them the arts and sciences. Starting from this idea, we are shown two statues brought to life and made susceptible to all the passions of human life by the power of harmony. Act II is placed in Parnassus, and shows the apotheosis of Prometheus, who brings the men created by him to be instructed by Apollo and the Muses, thus opening the gates of knowledge and culture.” This description comes from a contemporary theatre bill; the original book of the ballet was lost. Beethoven seems to have combined the three myths of Orpheus, who was endowed with godlike power by music, Prometheus, the heroic benefactor of mankind, and Pygmalion, the sculptor whose statue came to life.

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Interesting Notes on Members' Experiments

This month we are again handing over these columns to members who have been good enough to send in letters giving particulars of their activities, and other matters of general interest. We are pleased to note that in spite of these difficult times, many members are giving active support to the club, and are carrying on with their constructional work, which reminds us of a letter recently received from member 6952, showing the results can be obtained through perseverance. Here it is:

You have in the past made many appeals for members to write and tell of their experiences, so here is my report for the last two months.

"I first decided to build my S.W. converter in S.W., and this time built it on a wooden chassis; everything was thoroughly cleaned and soldered, wires were kept short, and I really thought that now my set would work better, viously it was housed in an old box, covered in dust, and had yards of unnecessary wiring. At any rate, trying this new set, I got fair results, the set was not at all oscillating on the higher frequencies and a bad hum was present—consider it a washout, and so I decided to start again. It took about a fortnight to build set No. 3, and when I tried it out results were magnificent. I feed it into a 6-valve A.C. set, now I have a 7-valve superhet to explore the air. In view of my experience I would advise all who try to build converters not just to keep wires short, but very, very short!

Amplifier and P.U.

"I have also been fixing up an amplifier and P.U. for gramo. records for a play. Just one thing of interest cropped up: we have an amplifier so that when the hall is empty, and with quite a lot of noise going on, we could make the records ear-splitting as well as having some space volume. However, when the audience arrived, and we switched on, the result was that those near the front were nearly deafened, and those at the back had quite good volume. But we had overlooked the fact that 'audience noise' is much greater than is usually imagined, so that at times the amplifier was drowned. If anyone can help me in this matter, that would be helpful, for I would like to have their hints and suggestions.

"I have had a lot of difficulty in identifying some S.W. stations, when this is announced in English. I heard this call recently: "Radio Andom (Andor ? Angora?)" on Nov. 25-26 m. at 8.30 p.m. D.S.T., with a lady announcer; at times a gongs is struck. Speech is in French and Spanish. Any further information about this station will be welcomed. (By the way, I know it is not Radio Andorra.)"

Charles A. Marshall, 99 Rutland Avenue, Southport, Lancashire.

Making the Best of It

Member 6,225—Hendon—writes as follows:

"I append a short description of my rig.

The vertical S.W. aerial used by member 6773. The top of the aerial is approximately 52 ft. from the ground.

4v· A. dial light. As for the H.F. side of the circuit, bandspread tuning is used, in conjunction with a 5-1 dial, and in conjunction with home-made coils of 18 s.w.g. wire. The whole set is built into a zinc chassis and cabinet (with hinged lid) and painted grey. The photo shows the Rx with log-book, 'phones, etc. All amateur reception is done on 14 m.c."

Good Listening

Member 6,773—E. M. Barlow—who hails from S. Yorks, sends the following report of his recent activities:

Here is a little news from this area. DX has been poor for some time since January's 'bas. Best DX for May as follows:


All reception on a commercial 6v. communications receiver, with either inverted 'L' aerial, N.S., or 6½ ft. high vertical copper rod—6ft. dipole.

The above is the very best DX. WRUL, WBS8, WGOO, E. W. QGOO, WUOT, WCX, WNB, GQ, OD, PAP (YUA), RW96, RNE, EQA1, EQA2, CSW6, CSW7, CSW8, GSA, SMO, SMP, SR, are received nearly every evening.

"I have experiments here which have recently been confined to the construction of this dipole antenna, and the construction of a small standard low-frequency amplifier for L.S. In the l-l1l R.C.K. Rx, and all was placed.

"Enclosed please find rough sketch of the new dipole recently erected."

Radio Magazines Wanted : News in English

Member 6,535, Mr. John E. Hodgkins, 43. Hawthorn Avenue, Bury, Lancs., writes as follows:

"Will any members who have a New American radio magazines to spare please let me know and I will pay postage on them. Also, I shall be glad to get in touch with any one who is interested in S.W. listening. For the benefit of other members here is a short list of news bulletins in English heard recently at this Q.R.A.: RJ 6-25 Call and R.C.K. "MOUH."

31.45 PMA (Batavia, N.E.L.) 15.45 mc.
19.15 TAP (Ankan, Turkey) 31.7 m.
19.30 WCX (Wayne, N.J., U.S.A.)
20.45 (Brazzaville, Fr. Eq. Africa)
21.06 (Brazzaville, Fr. Eq. Africa)
21.55 (Brazzaville, Fr. Eq. Africa)
22.05 (Brazzaville, Fr. Eq. Africa)
22.45 WRUL (Boston, Mass., U.S.A.)

News commentary. 22.30 (Tokio, Japan) 31.57 mc."

Contacts Wanted

Member 6,695—S. Nash, 9, Holbrook Road, Reading, would like to get in touch with local B.L.D.L. members with the view of comparing notes on radio matters.

Member 160—F. L. Leach, 38, Wellington Street, Gloucester—interested in contacts residing in the Boston or Lincoln district who is interested in amateur radio.
TEN thousand radio enthusiasts are urgently needed for vital "Radio-location" duties.

If you are keen on radio, here is a wonderful opportunity for you to get into a highly specialised job and gain experience which can be of tremendous value to you after the war. More men are also wanted for radio service with the R.A.F. Or, if you are not liable for service, there are excellent opportunities for you to earn good money from spare-time radio work.

Never before has there been such a demand for trained radio men.

We have already successfully trained many hundreds of men, but we can train you. Even if you know nothing about radio, you can study at home in your spare time, and become a qualified Radio Technician.

Now, more than ever before, the outstanding success of our method of tuition is being proved. Remember, we specialise in Radio, and our Courses are praised and approved by leading Radio Authorities.

If you wish to learn modern radio or radio mathematics thoroughly, waste no time, but post coupon at once for free details of our Home-Study Courses.

T. & C. RADIO COLLEGE 29, Market Place, READING.

/posts in unsold envelopes, 1d. stamp/ Please send me free details of your Home-Study Radio Courses.

NAME

ADDRESS

P. 18.

INTRODUCING RADIO RECEIVER SERVICING

By E. M. Squire. One of the best books available on this important and practical subject introduction to the practical operations of a radio receiver which is especially valuable to students and Radio Engineers, technicians and radio enthusiasts enabling all to attain a working knowledge of receivers and servicing equipment in a very short time and with out unnecessary theoretical frills. 6s. net.

"Of real value to the student... and is strongly recommended to teachers... as a useful textbook." (Electronic Engineering.)

SHORT-WAVE RADIO

By J. H. Rayner. A comprehensive practical survey of modern developments in the use of short, ultra-short and wave-meters. It provides a great deal of valuable data concerning the practical methods of their use in radio and television transmission. 12s. 6d. net.

"One of the first short wave treatises available." (Journal of the Institute of Engineers, Students Quarterly Journal)

THE SUPERHETERODYNE RECEIVER

By Alfred T. Wells, A.M.I.E.E. This is a book you must read if you are interested in modern radio. A practical and handy guide to Superhetories, telling you all about their working methods and maintenance. Especially recommended to radio mechanics serving with the Forces. 5s. 6d. net.

"Remarkably up-to-date." (Wireless World.)

GREAT CLEARANCE SALE

We have assembled a huge collection of surplus electrical radio and television gear. Many items are absolutely unobtainable to-day through ordinary channels. Most of it is new and unused. All lines are free of Purchase Tax, and for fourteen days we are reducing our already low prices to make room for stock. This opportunity cannot occur again. Act now!

TRANSFORMERS

LOT 1 Made by Standard Telephones. Beautiful job, weight 12lb., in 41in., 36in.-300-180-120 V. M.P. Four tapping points, giving 8, 12, 16, 20, 24 v., 3, 6, 9, 12, 15, 18, 21, 24 v., and 24, 30, 36 v. but new and unused. 25/- each, carriage forward.

LOT 2 By Television manufacturer. Heavy duty mains transformers, Input 240 v. A.C. One tapping at 5,000 max. 25 amp. o/p for supplying filament of Mullard H.V. 20 v. (c. 85 amps.), Shrouded in metal box, 16 in. each, carriage forward.

AMPLIFIERS

LOT 3 Four-valve, five-watt, 220-250 v. A.C. Shockproof, heavy gauge chassis, ten inch output, 5 watt unsortted output for gram and mike. Ten inch enclosed speaker. Absolutely complete, brand new. 5/-/15.


LOT 5 One only. Super heavy duty transformer, 200 watts output for cinema, big public halls and outdoor work. Input 200/250 v. A.C. Output 1,000 watts. Suitable for use with Q.A. or Two U.A., 30/- in Class A/B arrangement. Heavy steel chassis, shockproofed, 100 watt output tapped for 3.6 Speakers. Hardy used, in new condition. Price, to clear, 25/-.

PERRY'S

PREVAIUNG CONDITIONS MAKES IT IMPOSSIBLE TO REPLACE MANY ITEMS

CHASSIS

LOT 6 Beautifully finished, highly polished, new crudomet chassis. Not the ordinary cheap model made. 14in. by 14in. by 4in. Drilled for 6 valves transform­ers, etc. 4 each. Also heavy gauge metal chassis, finished battleship grey, 12in. by 6in. by 2in., 1/3 each. Also 9in. by 10in. by 3in., 1 each. Also 10in. by 6in. by 3in., 1 each. Assembled complete chassis, price &d. each.)


LOT 8 A big parcel of brand new 8in. energised moving coil speakers. Ex-famous maker, brand new, one of the most famous speakers made. To clear, last transformer, 5/-/6 each; with transformer, 9/-/6.

TELEVISION EQUIPMENT

LOT 9 Osco Cathode Ray Oscillograph or Television Tubes. Impossible to obtain through ordinary channels. Electro­ static deflection and focus. Type No. 3214, overall length approx. 10ins., diameter of tube approx. 3ins. Also Type No. 3211, overall length approx. 20 ins., diameter of tube approx. 7ins. /7/-/6. Collection by purchaser.

LOT 10 Osco Television time base and sound chassis (Television sound wave-hand only) for above transformer H.T. transformer for tube supply, transformer for heater and valves. Eight-inch energised speaker, 10 valves, 7. 6A. In bale to be removed. Suitable for volume, contrast, tuning, etc., banks of condensers, resistances, etc., etc. On heavy metal chassis 17ins. by 10in. by 3in., wired, used, for use, brand new. 8/-/10. Carriage forward, plus 2/-/6 for packing.

LOT 11 Complete time base and sound chassis as above with tube type No. 3214, 8/-; or with table cabinet in walnut, the complete instrument, 8/-; (Cabinet 12in. by 21in. by 16in. supplied separately at 7/-.) Carriage forward, plus 2/-/6 for packing.

LOT 12 As Lot 11, but with tube type No. 3221 (see above); 8/-; complete in walnut pedestal cabinet; 11/-; (Cabinet 16in. by 20in. by 36in. also supplied separately at 2/-.) Carriage forward, plus 2/-/6 for packing.

LOT 13 Power Pack and Amplifier chassis. Includes heavy mains transformer 350-350, 110 v. a.m.p. tapping. High voltage transformer for supplying R.H. to various condensers, including 16 x 16 mfd. 550 volt working, 1,156 mfd. 450 volt working, 20 x 10 x 2 mfd. B.L. Condensers, etc., etc. Pentode output transformer, 118/5/6, by D.A. 31/- in Class A/B arrangement. Heavy steel chassis, shockproofed, 100 watt output tapped for 3.6 Speakers. Hardy used, in new condition. Price, to clear, 25/-.

LOT 14 Tube Supply Units. For high voltage 16/18in. Tubes. Approx. 6,000 volts output. Includes B.I. 1 x 1 mfd. 7,000 volt d.c. test condensers with porcelain insulators, transformer and rectifying valve, all complete in metal case. 49/-; (B.I. condenser supplied separately at 3/-.) Carriage forward. Plus 2/-/6 for packing.

LOT 15 Vision Units. To fit on Time Base. Consists of 3 Mullard T.X.E.E. and 1 Mullard T.X. Valves, Amplifiers ranging from 75-75,000 ohms, and about 200 condensers of various values, with Resistor, Grid and various Band Pass Coils, also approximately 10 chokes of various des­criptions and W.T. Rectifiers. Completely wired and screened. Unused as received direct from the manufacturer, 6/- each. (Complete circuit and service manual available, price 6/- each.) Carriage forward. Plus 2/-/6 for packing.

LOT 16 Time base chassis. For 8in. Cathode Ray Tube. Size 17ins. x 14ins. x 3ins. containing approx. 15,000 capacitance adjustable, five variable resistors, 2,000 to 30,000 ohms, approximately 14 various tubes and electro­ lyte condensers, also sundry focus and scanning coils and chokes. Price 20/-, carriage forward circuit and service manual available, price 6/- each.) Carriage forward plus 2/-/6 for packing.

LOT 17 Cathode Ray Tubes (magnetic type). Size 17ins. As examples we quote the following prices, all subject to being unsold: Approx. 100 x 10ins., 45/-; 100 x 11ins., 65/-; 100 x 12ins., 85/-, carriage to be collected by buyer. No responsibility accepted for carriage.

THE LONDON CENTRAL RADIO STORES

23, Lisle STREET, W.C.2 (GERARD 2969)
Blitzed Radios

Sir,—The following particulars of an emergency measure will, in many cases, enable the listener to restore reception within a few minutes of his set being put out of order by the blast of a bomb.

The most probable casualty being the loudspeaker (especially the cone, speech coil, and usually both), and the most probable time of the casualty occurring late at night, an immediate replacement of the damaged component is out of the question. You can, however, disconnect the speech coil from the output transformer secondary, and take a pair of insulated leads to the terminals of your house-bell. High quality reproduction should not be expected in such a case, but you may be delighted—as I was recently—to find your house-bell revealing that "The King is Still in London." A little consideration of the matter will reveal that there is really nothing strange in the behaviour of the bell. Occasional ringing on overload may be prevented by a slight readjustment of the components of the bell (usually a screw and a spring) used to break and make the magnetising current.

If the set has external loudspeaker sockets already fitted, and the connections to it are taken from the speech coil, as they are sometimes, use may be made of them, and time and trouble may thereby be saved. When the bell is once properly adjusted (and if the set incorporates an automatic volume control, it will never ring when receiving speech, but may still do so occasionally when musical items are being received) this is an important point, as there is then one to receive news, announcements, talks, etc., undisturbed, these broadcasts being of greater interest during wartime than vocal and instrumental numbers.

M. LASDO TELKS (Maidenhead).

Identification of S.W. Stations

Sir,—In the May issue of Practical Wireless you published a letter from John Parkin ( Hull), in which he asked about a station in Havana, and another station on about 25.2 metres. The call sign of the Havana station is COH, and the wavelength 29.96 metres. Regarding the other station I find there is a reply in your July issue stating that it is the New British Broadcasting Station (a German station supposedly in Britain, but actually in Germany, which broadcasts "Stop the War Now" propaganda).

Personally, I believe the station is the Bulawayo station in Southern Rhodesia, which I picked up myself round about the date he mentions, at that time, playing dance records and closing down with "God Save the King" at 9 p.m. B.S.T. Reception of this latter station was extremely poor and I was unable to obtain the call sign or frequency. The New British Broadcasting station is "Station COH, Sports Palace, Havana, Cuba."

In your May edition I noticed a request by E. J. Roberts for anyone who has verified Guatemala City to communicate with him. I have picked up TGWA on both the 19 and 31 m. bands, the latter being a very powerful signal, every morning from 5.15 to 6.45 a.m. B.S.T. The stations over which they broadcast at this time are TGWB (the station E. J. Roberts verified), TGZ behind the alternative call sign of 40 m. band, TGWA on 31 m. band, TGWC on 2,920 kc/s, and TGW on the broadcast band.

In the issue you published a request by a Welsh reader for identification of a station calling London at approximately 10.45 p.m. B.S.T. The station he refers to is LEX, Buenos Aires, on 28.99 m., and the Original music he refers to is actually typical Argentinean music, though it sounds strange to British cars.

On June 8th, at 5 a.m. B.S.T., I heard WGEA announced on "the station" in Havana, and another station on 96 m. band, and time and trouble may thereby be saved. (on any station), and the output of your house-bell. High quality reproduction should not be expected in such a case, but you may be delighted—as I was recently—to find your house-bell revealing that "The King is Still in London." A little consideration of the matter will reveal that there is really nothing strange in the behaviour of the bell. Occasional ringing on overload may be prevented by a slight readjustment of the components of the bell (usually a screw and a spring) used to break and make the magnetising current.

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M. LASDO TELKS (Maidenhead).

Heard on a Home-made 4-valve

Sir,—Regarding the station mentioned by your reader, F. Whaley (Taunton), this is undoubtedly a German station posing as British; it calls itself the "New British Broadcasting Station." It also broadcasts on Sundays at 5.30 p.m. B.S.T., and the announcer, F. Whaley, tells me that the German and American stations are similar to those in Latin America.—OSWALD LETTLE (Annfield Plain).

Medium-wave D.X. Stations

Sir,—Recent letters concerning medium-wave D.X. programmes appeared to be most interesting, and I enclose my latest log of some of these stations for the benefit of other readers:

282 m.—A Canadian Home Service station heard at 2.30 a.m. 402 m.—WIF (1.30 a.m.). Reception of both about R6-6.

496 m.—A conversation in English between Havana residents and Londoners (1.30 a.m.) at R4-5. (Can any listener identify this station?)

I would be very pleased to hear from any reader concerning this topic, also from any beginner in Morse code. I will undertake to answer all letters.—ERIC WILSON (3, Back Meal Street, New Mills, N. Stockport).

Correspondent Wanted

W. W. POLLARD, "Devonia," London Road, Datchet, Bucks, would like to get in touch with any short-wave enthusiasts in the district with a view to correspondence and personal contact.

LATEST PATENT NEWS

These particulars of New Patents of interest to radio amateurs are published by permission of the Controller of H.M. Stationary Office. The Journal of Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at the uniform price of 1s. each.

EXPERIMENTAL CIRCUITS

Sir,—Congratulations to the writer of the article, "Experimental Circuits," in the June issue.

This is the type of article that many experimenters have been waiting for, and this one in particular. The first thing noted, as there are so many most unusual circuits illustrated, particularly those numbered 2, 6, 8, 9 and 10 (which I've never seen before!)

Like many other readers, no doubt, I intend trying out these circuits, and hope to get some interesting results.—P. W. BARNETT (St. Albans).
RADIO CLUBS & SOCIETIES

Club Reports should not exceed 500 words in length and should be received by the First Post on the third Monday of each month for publication in the next issue.

NORTH MANCHESTER RADIO AND TELEVISION SOCIETY
Head Qrs.: R. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield, near Manchester.

It has been suggested that meetings of the above organisation be held in the Preston, Whitefield areas from time to time during the period of the war. Dates and the number of times meetings will be held are not yet fixed, so if all interested will write to the Secretary at the above address stating when they would like meetings to be held, an attempt will be made to arrange a night or day suitable to the majority. Old members of the organisation are particularly asked to note this announcement.


In spite of the war this club has been able to carry on. Many of our British members, however, are finding it difficult to renew their membership owing to the war. We should therefore like to inform them that we shall be pleased to send a copy of our International Short-Wave Club, East Liverpool, Ohio, U.S.A. a great many PRACTICAL WIRELESS readers are members of this organisation. We should also like to hear from members who are in H.M. Forces. These should write to the club at the London address, given at the head of this note.

AMATEUR RADIO CONFERENCE IN MANCHESTER

A N. Amateur Radio Conference was held in Manchester on Sunday afternoon (June 8th), at which there were radio enthusiasts from Cardiff, Sheffield, Pilkington, Sale, Leigh, Ashton, Whitefield, Westhoughton, Blackpool and Bury, etc. A good will message was agreed upon, addressed to President Roosevelt and American radio enthusiasts, and same has been passed to the American vice-consul, Manchester for forwarding to the U.S.A.

The future of amateur radio was a point which was discussed very carefully, and after considering as to whether or not O.D.C. licences were going to be issued in the country, and the splitting of bands for phone and C.W. work, the conference decided to make the following recommendations which they hope will help to form any new conditions which may be contemplated, when the time comes for the re-issuing of amateur transmitting licences, after the war. It is suggested that there be three grades of licences, and the following are the ways in which it is suggested that they work:

A. A licence to be granted to beginners on the lines similar to those covering the A.A. licence in the pre-war days.

B. A novice test of 12 w.p.m., with a fairly simple technical test, should entitle a person to operate a phone or C.W. transmitter with a power of up to 25 watts on restricted bands.

C. A test of 18 w.p.m., with a rather stiffer technical test, should entitle a person to operate a phone or C.W. transmitter on all the amateur bands, with increased power.

There was quite a lot of discussion on the subject of whether there should be certain bands set aside for C.W. and others just for phone.

The report of the H.M. Forces was another point discussed, and the chairman emphasised the fact that a much needed voluntary training course was offered to the radio amateur who was still in civilian life, and he stated that he thought that there must be many radio enthusiasts now doing A.R.P., who would be glad to notify any radio amateur or emergency service who will be glad to hear from members who are in H.M. Forces. These should write to the club at the London address, given at the head of this note.

Radio-Service Man, Dealer and Owner

The man who enrolls for an I.C.S. Radio Course learns radio thoroughly, completely, practically. When he earns his diploma, he will KNOW radio. We are not content to teach the principles of radio; we want to show our students how to apply that training in practical, everyday, radio service work. We train them to be successful!

INTERNATIONAL CORRESPONDENCE SCHOOLS


Please fill in your address in the subject marked X.

Advanced Radio Engineering

Radio Service Engineer

Elementary Radio Television

If you wish to pass a Radio examination, indicate below.

Institute of Radio Engineers

P.N.S.C. Certification of Radio Engineers

Provisional Certificate in Radio Telegraphy and Telephony for Aircraft

City and Guilds Telecommunications

Name: ........................................... Age: ...........................................

Address: ........................................................................................................

(Use penny stamp on sealed envelope.)

Install an extra speaker.

Give her 'MUSIC WHILE SHE WORKS'

Your wife may be alone for a good part of the day—in times like these loneliness is not good for her. Why not bring to her side while she works the cheery company of radio entertainment? If your set is in the living-room—and your wife spends a good part of her time in the kitchen—she needs a Sestorian Extension Speaker. Its superbly faithful reproduction of her favourite programmes will lighten many otherwise dreary hours. Ask your dealer for a demonstration NOW.

Cabinet models from 21/-

Channel models from 19/3

STENTORIAN

The Perfect Extra Speaker for ANY Set

WHITELEY ELECTRICAL RADIO CO., LTD., MANSFIELD, NOTTS.

Literature on application.

Dits and Dats!

THIS IS THE LANGUAGE OF THE AIR AND WIRELESS TELEGRAPHY OPERATORS ARE URGENTLY REQUIRED FOR THE ARMY, NAVY AND AIR FORCE

Candler Code Courses will help you either to increase your present speeds or start you on the right road to securing a thorough morse code training so that your services will be valuable to one of the branches of government service, merchant marine, or to commercial companies.

If you are seriously interested in becoming an efficient operator, fill in the Coupon below and receive full details of the following complete Candler Code Courses—

JUNIOR Scientific Code Courses for beginners. Teaches all the necessary code fundamentals scientifically.

ADVANCED High-speed Telegraphing for operators who want to increase their w.p.m. speed and improve their technique.

Courses supplied for Cash or on Monthly Payment terms.

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Name: ...........................................

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(Please send me Free and without obligation a copy of the Candler's "Book of Facts".

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P. O. Box 121, Kingsway, London, W.C.2.

CANDLER SYSTEM CO., Ashville, North Carolina, U.S.A.

(Copying of the above information is strictly prohibited.)

PRACTICAL WIRELESS 349

August, 1941
Replies to Queries

D.C. Resistance and Impedance

"I am in possession of a moving-coil loudspeaker, which is listed with a speakercable of approx. 10 ft. in length. When tested with my Ammeter it did not register any D.C. ohms resistance. Can you give me the ratio of A.C. ohms compared with D.C. ohms, as the problem I have in mind is to wind the speech coil of 8 ohms impedance, but I have no formula as to how many turns of wire I should put on the former to give 8 ohms resistance? Also, how do I arrive at the impedance of the choke or any type of inductance?"

We would advise you that it would not be possible to determine the impedance of the wires you mention by only three coils. Instead, you would require coils of different diameters, such as using the above formula as follows, assuming the use of a 0.0055 mf condenser and formers of 4 mm diameter:

- 95-250 metres: 35 turns
- 200-500 metres: 75 turns
- 400-800 metres: 100 turns
- 800-1,000 metres: 125 turns

The first two coils may be wound with 22-gauge d.c. wire, and the other two with 24-gauge enamelled wire. It would be desirable to give the cotton-covered wire a coat of shellac varnish after winding to render the insulation proof against moisture.

Using an Eliminator on A.C.

"The H.T. supply was obtained from the mains, which were D.C. I made my own eliminator. If I use the set where I am at present stationed, I could not use the eliminator 2.000 in D.C. I have wired the valve-holders as in the Visite superhet."

You can certainly operate the receiver from the A.C. mains by using the smoothing unit which you have, in conjunction with a mains transformer as a rectifier. Provided that your unit was suitable for D.C. mains, it is satisfactory for A.C. working, when used with the transformer and rectifier mentioned. You do not state the values of the resistors, but I think I may remain unaltered provided that the output from the rectifier is approximately the same as that from the D.C. mains with which the unit was used.

A suitable rectifier would be the Westinghouse type H.T. 15, fed from a transformer with an output of 250 volts, 80 mA. This transformer can be obtained through any good radio dealer, whilst the rectifier can be obtained from the Westinghouse Brake and Signal Co. Ltd., Pew Hill, Chippenham, Wilts, who will also supply you with full details of the rectifier. In passing, it should be mentioned that the L.F. transformer you indicate is not ideal as a smoothing choke, although it will work if the H.T. current is low.

Universal Meter Queries

"I have constructed the 'Universal Meter' described in your 'Radio Service Manual,' and the meter is working perfectly. My particular unit is completely self-contained in a case 16 in. by 16 in. I now wish to increase its utility by using the meter in the construction of a wave-current tester."

We regret that we cannot give you your advice on the following points:

1. What is the anode current, and voltage likely to be required for wave testing?
2. Should H.T. + tappings be taken from H.T. secondary on transformer or by resistances after rectification?
3. What voltages should I select on H.T. selector, G.B. selector, and filament selector?
4. What method is adopted for obtaining the 2-volt D.C. for battery valves?
5. Where must the milliammeter be placed?

"I have wired the valve-holders as described in the 'Radio Service Manual,' i.e., anodes in parallel, filaments in parallel, etc. Will this wiring hold good for the anode conductance test?"

The anode current will depend on the type of valve under test, and may vary from 2 mA's to say, 40 mA's when testing tube valves. The correct anode and screen voltages are always given in manufacturers’ leaflets.

H.T. tappings can be taken from secondary of mains transformer. It is a good idea to have some test purposes. The voltages will depend on the valve. G.B. supply is obtained easiest from an external battery.

A.C. can be obtained from A.C. 2-2 volt filaments for testing purposes, provided that care is taken to apply correct value.

The mA meter must be connected in the anode circuit. The anode conductance is obtained by noting the change in anode current when G.B. is varied by 1 volt. The valve-holder wiring is in order.

Portable All-dry Battery Set

"I have purchased an American all-dry battery set called the 'Admiral,' which has a 200 A.C. volts, or semi-fixed resistance for it, and it works quite well on 250 A.C. shore, and on battery power, but I wish to run it on a ship's mains of 110-120 D.C. Although the rectifying valve filaments are light up, I cannot get a sound out of it. I have tried it with and without the resistance, but can get no results. Can you advise me, please?"

"We regret that we cannot be as helpful as we should wish, since we are not in possession of any details of this American receiver you mention. As you probably know, there is a very large number of sets of this general pattern, American made, and it is hardly possible to keep a complete file of them all.

It is possible, however, that there is a fixed or semi-fixed resistor in the receiver for which this would be in addition to the cord resistor. In that case, it would probably be necessary to cut out this resistor when working on 110-120 volt mains. If so, it is possible that the receiver is intended only for mains of 200-250 volts.

The coupon on page iii of cover must be attached to every query."
The Blueprint Service... Three wave: Blueprints, 6d. each.
In each... Please read the...
PRACTICAL WIRELESS

August, 1941

RADIO CLEARANCE, Ltd.

LOW-LOSS Ceramic Valve Holders, Lissen H.C., 5/- a dozen.

LOW-LOSS Short-wave Condensers, variable, 5/- a dozen. Large, 5/- each; our price, 2/- each.

PHYSICAL TYPE Diode Rectifiers, 44 each. XAXLEY type Switches, 6-32, 3-each, 3-6, 4-8, 6-3, 5-6 each.

ROLA P.M.S. Speakers, latest model 7½ in., cone, 141/2 in., is power and power transformer, hexed, 7½, 10½ each.

MIDGET SPEAKERS, Goodmans Enlarged, 6 ohm, coned, 1½, 2½, 4½ in. each, new, boxed, 1½ each.

Mains Transformers, Wears 100 watt, tube-transformer, 2½ h.f., 2½ k.w., reverbator, 14½ each.

Mains Transformers, Wearis 100 watt, tube-transformer, 2½ h.f., 2½ k.w., reverbator, 14½ each.

Chassis Mounting Valve Holders, American. 6½ each.

Chassis Connecting Valve Holders, English. U.V type, 4-4-7-7, 34 each.

Centralab Volume Controls, midway type, 2000, 2500, 25000, 50000, 100000 ohms, box each, 2½ each, 6½ each, 2½ each, 5½ each, with switch, 9½ each.

E.W. Push-button Switches, 1½ each.

E.W. Push-button Switches, 1½ each.


10Ft. Cables Connecting Wire, 44 each, red, green, blue and white.

Braided Covered Single, and Twin, per yard.

Push-Pull Lamp Holders, 36 each.

Plessey Single Gang, 0005 Variable Condensers, 1½ each. Sold with Vernier Control, 1¼ each.

Solid Diode Condensers, by well-known maker, 20000, 300000 volt, 1½ each.

Low-pass filters, Electrolytic Filters, 50 mfd., 1½, 1½, 1½ each.

Westinghouse high-vacuum ceramic capacitor wired direct condensers. All sizes up to 0005, 3½ each.

0005, 0005, 1½ each.

0.2 2 mfd. Electrolytic Condensers, 2300 volts, 1½ each.

Condenser, 0.0005, triple, 1½ each.

Bells, 20-30-50 volt copper wire, 2½ each.

1½ mfd. Paper Condensers, 2500 volts, 2½ each.

Double Fuse Holders. Complete with 2 1 amp, inputs, 1½ each.

R.I. Paradox I.F. Transformers, 2½ each.

R.I. Paradox I.F. Transformers, 2½ each.

D.C. Amplifiers, Meters, Microphones, Transmitters, T.C.C., 1½ each.

Spofit., Enamelled wire, good line for experimenters with flexible metal-shafting transformer, 1½ each.

Small mechanical counters, with strikes arm registering up to 9999. Heavily constructed to stand any amount of hard use.

Valve Holders. Belling-Lee special H.F., 3-½, 250 volt, brass casting in black nickel, 6½ each. 6½, 5½, 5½ each.

Plessey, high voltages, 2½-110 volt rated to 60000 volts, 000 0.001 mil, 0.001 mil, 250 volt test, 1½ each, 1½, 1½ each.

Brockton. Valve Holders. 6½, 6½, 6½ each.

Resistances, and Carbon values and for, Set D.C. American, etc. Resistances in short supply.

Tapping main resistors or waste. 1½, 1½, 1½ each.

Wattmeters. 2½, 2½, 2½ each.

Trimmers. Thin trimmers on ceramic base, brand new, to clear, 6½, each.

R.I. Condensers, 2½-, 2½-, 2½ each.

2½-2½-2½ each.

D.C. Condensers. Brand new, 2½, 2½, 2½ each.

D.C. Condensers. Brand new, 2½, 2½, 2½ each.

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2½-2½-2½ each.
PRACTICAL WIRELESS

RECEIVERS AND COMPONENTS

FRED'S RADIO CABIN
75, Newington Butts, S.E.11. Phone: Rodney 2160.
THE SPOT FOR KEEB BARGAINS.
MORE MONEY-SAVING BARGAINS FROM THE
CARLISLE SHOPPER. ARE GETTING DIFFICULT. STAY
IN A FEW SPACES WHILE THE GOING'S THE GOOD.
COIL FORMERS. Most of them have been sold, but we
have a few left; and are going hard in a few more
at the reduced price of 1.50. down to clear.
PAXOIL rare panels, 17 x 4", sockets from 200-
200-250 with two screws each side. New, each.
KNOS. Black bakelite included, with "spindle".
2 "doz. Only a few have left.
MAINS CHOKES. Only a few left to clear, 60 m.m.
150 ohms at special reduced price of 2. each. Also
6 H.T. coil chokes (non-magnetic for transmitting.
15 each.)
CRYSTAL and cathode-plate in tin box. New, lower
price. 66. each. Very useful to experimenters. Also
another permanent crystal detector.
PLESY 3 gang 1000 mfd. Superhet screened variabi-
le condenser, 3" high. 6. each. Ready mounted
radio line at the ridiculous price of 1.50 each.
ECO mains dropping resistance. Total resistance
from 100 to 1000 ohms, 86. each, and just down.
Only a few to be cleared; specially reduced price.
26 each. Also a few "Trivand" mains dropping
resistances. 25 gang, 40 cents each.
LINCOLN STEWARD Serial Eliminator. Cut out interference
and improve reception. 1.50 each.
VARIABLE CONDENSERS. Parcel of 5 to clear.
Commercially manufactured, 5" first-class condition, 2 gang, 000 mfd.
94. each. Cleared.
CRYSTAL Replacements for permanent crystal detectors.
Sold new, 3" high, 746. each.
TRIMMERS. New 200 mfd on Frequent ceramic
insulators. A beautiful line. 64. each.
DUAL-RANGE TRANSFORMERS. A new fine line and a fine job.
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