NEW Stentorian speaker—

"AN IMMENSE STEP FORWARD"

Says Mr. Camm
Make a noise like this

What—can’t recognise it? Can’t see it’s a cornet? If you have as much difficulty in recognising a cornet on your radio as you have here, it’s high time you did something about your batteries. Get an Exide.

Exide

BATTERIES FOR RADIO

‘Still keep going when the rest have stopped’

EXIDE ‘HYCAP’ BATTERY (High Capacity L.T. Battery)
For modern multi-valve sets—lasts longer on one charge. For small sets use the Exide ‘D’ Type. Both have the Exide Charge Indicator. Your dealer will tell you which to use.
For High Tension use Drydex.

From reputable dealers and Exide Service Stations. Exide Service Stations give service on every make of battery.
Exide Batteries, Exide Works, Clifton Junction, near Manchester. Also at London, Manchester, Birmingham, Bristol, Glasgow, Dublin and Belfast.
test. Note the positions of the valves—
the H.F. valve being on the right when
viewing the set from the front, the
metallised detector valve coming next,
then the clear valve and finally the output
valve—type P. 220. Turn the reaction
condenser anti-clockwise as far as it will
go so as to remove all reaction
effects, and
Alternatively, you can unscrew them entirely,
and open them out so that they have no
effect at all on the inter-circuit wiring. By
doing this you will make quite sure that
the minimum wavelength on the short-wave
band will be covered. The trimmers which
have to be adjusted for the medium-wave
band are in the coil unit and are identified
by the number “2.” Use a thin screwdriver
or a pointed or sharpened slip of wood for
increased with the trimming adjustments.
The volume control should be turned back
so that a weak signal is maintained, as
this enables the adjustments to be more
easily made. It is very difficult to notice
an improvement in strength if the station
is blaring out on the loudspeaker, but if
turned so that only a very weak signal is
heard, the slightest improvement or loss
of volume will be noticed.

Short-wave Trimming

When the medium waves have been
satisfactorily trimmed it should be possible
to turn from one end of the scale to the
other and pick up stations at various places
on the dial, the stations heard in your
particular locality depending upon
local conditions. For
this reason, we do not publish
a list of the stations which
are likely to be heard. The
direction of your aerial, its
height above ground, any
screening which might be
introduced by surrounding
buildings, trees, hills, etc.,
will all affect results and,
therefore, it is not possible to say
just what you will hear. It
should be possible, however, in most parts
of the country, to pick up quite a
number of stations, both English
and Continental, at good volume.
The long-wave band is trimmed by
adjusting trimmers numbered “3,”
and the same procedure is carried
out as has been mentioned for the
medium-wave band.

For the short-waves the process
is slightly more difficult, and all
adjustments must be made very
carefully indeed. This time the
trimmers used are numbered “1,”
and the location of a station upon
which to make the adjustments
may be found rather difficult if
you have never used a short-wave receiver
before. In spite of the reduction
gearing on the tuning control, the very
slowest adjustments should be made,
and you will probably find that the
reaction condenser may not be used as an
aid to trimming. Advance the reaction
condenser until the receiver is brought to
the verge of oscillation. This will be
indicated by a rushing sound in the loud-
speaker, and if carried too far, a whistle
will be heard. When a station is tuned, a rising
whistle will be heard, and this may fall as
the condenser is turned still further.
Slacken off the reaction control until the
whistle ceases and re-adjust the tuning
condenser.

LIST OF COMPONENTS

Two all-wave coils, type Triogen, with 2-gang spindle (Wearie),
20a. 6d.
One 2-gang condenser, bar type .0005 mfd. (C1, C2)
(Polar), 12a. 0d.
One S.M. drive, V.P. horizontal, with station names (Polar)
6s. 6d.
One differential reaction condenser .0003 mfd. (C3) (B.T.S.),
2a. 6d.
One potentiometer, 50,000 ohms, with 3-pot. switch (R1)
(B.T.S.), 4s. 6d.
One L.F. transformer, type AF8 (Ferranti), 11a. 6d.
Seven fixed condensers: Two 2 mfd. (C7, C10) (type 65)
One .0001 mfd. (C6); One .0005 mfd. (C4); One .0005 mfd.
(C9); One .01 mfd. (C8); One .1 mfd. (C5) (tubular)
(T.C.C.), 10s. 6d.
Seven fixed resistances: One 1 meg. (R3); Three .5 meg.
(R2, R6, R8); One 100,000 ohms (R7); One 50,000 ohms
(R4); One 15,000 ohms (R5) Type F (Dubilier),
3s. 6d.
Four valve-holders, 4-pin chassis mounting type (Clx), 2a. 8d.
Two socket strips, A.E. and L.S. (Belling and Lee), Is. 6d.
Two component brackets (Peto-Scott), 8d.
One Plynmax chassis, 12in. by 8in. by 3in. (ready drilled for
valveholder) (Peto-Scott), 5s. 9d.
Two spades, L.T., L.T.+ (Belling and Lee), 4d.
One fuse and holder, 100 mA (Microfuse), Is. 6d.
Four valves: 210VPT (met.), 210DET (met.); 210DET (plain),
220P (Cossor).
One speaker, Stentorian Junior (W.B.),
One H.T. battery, 120v.; One G.B. battery, 9v.; One accumu-
lator, 2v. (Exide).
EVERYTHING ALL-WAVE

PETO-SCOTT’s 1938 Range of ALL-WAVE and SHORT-WAVE APPARATUS is again unsurpassed for RELIABILITY, QUALITY and VALUE. This all-round supremacy is the natural outcome of PETO-SCOTT’s long experience in Direct-to-the-Public Radio. You knew in 1919 . . . you know TO-DAY, that you may order from PETO-SCOTT in the knowledge that you will receive BRAND-NEW GOODS, backed by a GUARANTEE of SATISFACTION. PILOT AUTHOR KITS are guaranteed to specification . . . build one and be SATISFIED. YOU ARE WARNED AGAINST CHEAP SUBSTITUTES — only PILOT AUTHOR KITS are EXACT to AUTHOR’S SPECIFICATION.

PILOT AUTHOR KITS — Exact to Specification

Corona

ALL-WAVE 4

KIT “A” £4:7:6
Cash or C.O.D. Carriage Paid

Complete kit of FIRST SPECIFIED PARTS, comprising PETO-SCOTT specified ready-drilled PLIMAX chassis, wire, flex and screw. Two Cabinet and Speaker KITs.

KIT “B” £7:10:6

KIT “C” £8:15:6

KIT “D” £6:7:6

KIT “E” £7:10:6

KIT “F” £8:15:6

Kit with Valves and PETO-SCOTT Finished Chassis Cabinet and Speaker.

KIT “F” £9:15:6

KIT “G” £10:15:6

KIT “H” £11:15:6

KIT “I” £12:15:6

Complete kit of FIRST SPECIFIED PARTS, comprising PETO-SCOTT specified ready-drilled PLIMAX chassis, wire, flex and screw. Two Cabinet and Speaker KITs.

Bargain 332 (illustrated). Special for the Corona ALL-Wave 6. Further inc.”, payment on the issue $20.00 payable. Pay 25% and 25% down 6 months.

FREE—2 BOOKLETS and 9 BLUEPRINTS!

1938 STENTORIAN SPEAKERS

Peto-Scott ALL-WAVE and GENERAL CATALOGUE

The PILOT “SHORT and ALL-WAVE EXPERIMENTER”...

PILOT KIT Short and All-Wave Experiments, one of which is illustrated. Each of these is a complete kit, including all parts necessary for assembly of the ‘Short-Wave Receiver. The Peto-Scott Kit contains all parts necessary for assembly of the ‘Short-Wave Receiver. The Peto-Scott Kit contains all parts necessary for assembly of the ‘Short-Wave Receiver. The Peto-Scott Kit contains all parts necessary for assembly of the ‘Short-Wave Receiver. The Peto-Scott Kit contains all parts necessary for assembly of the ‘Short-Wave Receiver. The Peto-Scott Kit contains all parts necessary for assembly of the ‘Short-Wave Receiver.
The Hivac Harries A.V.C. System

How it is Used with All-stage Valves

AUTOMATIC volume control using ordinary valves involves the use of a variable-mu grid in the valve. This grid has to perform two functions, namely, that of amplifying, and that of A.V.C., to decrease fading. The design of this grid is, therefore, a compromise.

The new method involves the utilisation of two separate grids in each controlled valve. One grid is used for amplification, and has what is known as a "straight characteristic," which is most suited for distortionless amplification, and for the reduction of undesired noise level. The A.V.C. voltages are applied to another grid. That is, no compromise is involved. The A.V.C. performance can be made very considerably higher, and the otherwise unavoidable distortion and sensitivity to noise of variable-mu valves is avoided.

Delayed diodes and amplified A.V.C. circuits are rendered unnecessary.

The drawing Fig. 2 shows a comparison between the characteristics of ordinary A.V.C. and the new system of A.V.C. used with the Hivac Harries All-stage valve. The heavy line curves are those of the new valve. The dotted curves are those of receivers using corresponding ordinary valves. A change of output has to be of at least 4 db, to be audible. It will be seen that, over ordinary changes of signal strength due to fading, the resulting change of output with the new valve is inaudible. This is not the case with the older and more-complicated type of A.V.C. circuit. With small limits from 10 micro-volts up to 1 volt.

Automatic Local-distance Circuit

In Fig. 1 the new system of A.V.C. is combined with an automatic local-distance circuit. For the best amplification of weak and moderately strong signals the grid bias on the first valve is usually about -6 volts. When the receiver is tuned to a broadcasting station which is very near by, then a very large peak voltage will appear on the first grid of the valve, and the valve might overload. This overload is avoided by a grid leak and condenser R1 and C. The negative bias from R2 causes C and R1 to be inoperative unless the signal becomes very powerful. When it becomes strong enough the A.V.C. cuts down the anode-current and changes the characteristic of the valve so that it will operate with a greatly increased negative bias. The valve will then draw a very small grid current, which, flowing through the resistance R1, causes an additional negative bias to be applied to the control grid enabling the valve to accept the very strong signal without distortion.

The Cathode-ray Oscillograph

THERE is no piece of apparatus more valuable in radio testing than a cathode-ray oscillograph. This is a piece of apparatus employing a small cathode-ray tube, and by suitable design it is possible to measure such features as amplification, distortion in L.F. amplifiers, modulation depth, of transmitters, distortion in valve stages, performance of L.F. transformers, voltages and many other factors which are necessary either in connection with the design or the performance of modern radio apparatus. Not only may these various factors be seen in a very clear manner, but it is possible to take photographs of the results and thus keep a permanent record of the tests. An ideal cathode-ray tube for use with this type of apparatus is illustrated, and is supplied by the Mullard Company. It has a 4-volt 1-amp. heater, and for the first and second anode potentials of 300 and 800 volts are required. The screen diameter is 7 cm. A valuable handbook is supplied by the Mullard Company, giving full technical details of the tube and of the method of supplying the requisite voltages, together with the method of making many of the tests mentioned above. It also includes a few pages on the method of photographing the images thrown on the screen of the tube. The book may be obtained on application to the Mullard Company at Mullard House, 225, Tottenham Court Road, London, W.1.

P.M. or Energised?

In our issue dated September 25th, 1937, we included on pages 38 and 39 illustrations of two public address loudspeakers. Unfortunately the captions for these two models were transposed, and it should therefore be noted that the speaker on page 38 is actually a Goodman model, whilst that on page 39 is the Reslo model.

The Mullard type E40-G1 cathode-ray tube.
Short Wave Section

Some Short-Wave Problems Explained
By the Experimenters

Our Popular Contributors reply to some of the Inquiries
Received from Readers Concerning Difficulties in Short-
Wave Reception.

We are flattered to think that readers of Practical and Amateur Wireless have taken an increased interest in short-wave reception, since we began to devote more attention to this aspect of home construction. Letters received regularly tell us that new reunits have been gained for the ranks of S.W. experimenters. This is a good sign, because short-wave work provides an interesting change from normal broadcast reception, and gives real space to experimental work.

On the short waves we are always coming up against new problems and new difficulties—and they make home construction worth while. Among recent letters there have been a few from readers who have built their first short-wave receivers, and who have met minor difficulties that they find rather confusing. For example, one reader has built a two-valve Det.-L.F. battery set, and finds that it is almost impossible to obtain oscillation at the “top end” of the tuning scale, although the detector oscillates very easily, with only one-third of the reaction-condenser capacity, at lower tuning-condenser readings. Our friend concludes his letter with the word “why?”

Several Possible Reasons

We don’t know, but we can make various suggestions, from which he can easily find out the reason. You see, unless a number of tests are made it is impossible to give a definite answer; that is because there are so many things which could produce precisely the effect described. You might think that increasing the capacity of the reaction condenser would overcome the trouble, but we doubt if it would. More likely, it is a matter of the smallest bit of difference.

If the coil is a home-made one, it might be that the number and arrangement of reaction-winding turns is unsuitable. Sliding the reaction winding down the former so that it is slightly nearer to the grid coil often cures a trouble of this kind. On the other hand, it might be better to add, say, a couple of turns to the reaction winding, and then to slide it a fraction of an inch further away from the grid coil. Another reason for the fault could be that the aerial is connected to one end of the grid coil, through a condenser of too great a capacity; a .0002-mfd. variable or pre-set condenser is often useful in this position, for then the most suitable setting can easily be found.

An alternative method is to join the aerial to a tapping on the coil, or to use a separate aerial winding, as shown in Fig. 2.

Using a Doublet

The last-mentioned is the method that we prefer. You can place the aerial winding either over the grid coil, or near one end of it. In either case it is worth while to experiment with the number of turns, although it is generally satisfactory to use one-half to one-third the number on the grid coil. A great advantage of this method is that the size and self-capacity of the aerial become of little consequence. Another advantage is that you can use a doublet aerial, which is ideal for short-wave reception. This consists, as many of you are aware, of two separate lengths of insulated wire arranged end to end, and with the leads in twisted together, as shown in Fig. 1. Each horizontal portion of the aerial should be about 30 ft. long whilst, theoretically, the down-lead should be half the wavelength long. That is, for 40-metre reception the lead-in should be approximately 60 ft. Of course, it is rarely convenient to adhere to this, besides which you do not want to be restricted to any particular wavelength. In consequence, it is customary to make the lead-in of any convenient length, unless outstanding

Unstable Reaction

Quite another reason for the trouble under discussion might be that there are long leads in the reaction circuit, which result in a peculiar form of damping. That is why, in the portable receiver described a fortnight ago, we included a 250-ohm fixed resistance in series with the reaction winding. It tends to reduce the tendency for oscillation at lower settings of the tuning condenser, but in doing so smooths out reaction over the tuning range.

One rather unusual form of reaction trouble was noticed recently in a simple type of single-valve-with-reaction set. Oscillation could just be obtained when the tuning condenser was set near to its minimum capacity and the reaction condenser fully advanced. At higher tuning positions, oscillation ceased completely. In this case the set had previously operated correctly, so it was evident that a fault had arisen. It was eventually found that one terminal of the H.F. choke was loose, so that a proper contact was not made with the end of the winding. Measurement with a milliammeter showed that only a small fraction of a mA was passing to the detector anode. The same fault can arise if the choke is defective, or if the L.F. transformer, coupling resistance, or die-coupling resistance has developed a partial open circuit.

Screening on S.W.

A letter which was received recently was from a reader who was rather surprised to find that we rarely advocate the use of screening in the simpler type of short-wave receiver. He pointed out that he had always found that hand-capacity effects, difficult tuning and malfunction were experienced if use were not made of a metal panel and metal screens between the coils and the L.F. portion. Another point that he made was that he considered that copper extension spindles were a practical essential.

We disagree. It has always been our view that if stability cannot be obtained without screening (in the simpler type of set, of course), the design is wrong, or the earth lead is inefficient. For that reason, we use screening only when it is absolutely necessary. It is not just pride that prompts this idea, but the fact that screening on short-waves can produce far more losses than.
are desirable in a simple set. If you earth the frames, and rotors, of the condensers mounted on the panel, and carry a few of the earth leads behind the panel and fairly near to it, the screening is generally adequate. Of course, if electrical interference is picked up in the set, it is a different matter, and there is then every justification for housing it in a screening box, of which a number of different makes are available. In that case, make certain that the box is earth-connected. Hand capacity is more often due to a bad earth than to lack of screening, it might also be due to the 'phone or speaker leads running close to the aerial lead-in (except with a doublet, when the lead-in is "dead" for practical purposes), or to the absence of a .001-mfd. condenser between the anode of the output valve and earth.

Another "Portable" Idea

A propos our recent discussion on the subject of making a short-wave portable, we received a circuit diagram and a number of interesting "snaps" from K. G. Hammond, of Portsmouth. We received his letter after writing the article on our portable, which was published a fortnight ago, so we could not make reference to it in that article. It appears that Mr. Hammond used a circuit almost identical with ours, and he tells us that it works very satisfactorily. Unfortunately, the "snaps" are not quite clear enough to reproduce, so we have asked a Practical and Amateur Wireless artist to make a sketch to show the form of construction employed. The set is neat and compact, being built on the "step" principle. Eleven flash-lamp batteries connected in series are used for H.T. supply and for G.B., while there is space for a fairly large two-valve accumulator. Other readers might like to try this form of construction if it happens to suit a carrying case which is available.

More Details, Please

Although it is not a short-wave matter, we must refer to a letter received from J. C., of Coventry, concerning the single-valve set which we described in the issue dated June 5th of this year. We should have replied by post—as we do to all our correspondence dealing with subjects not necessarily of general interest—were it not for the fact that J. C. omits to give his full name; why not tell us who you are, J. C.? We will not mention your name in these notes if you wish otherwise. This reader tells us vaguely, that "when I tune in the stations I cannot get any sound at all without using a lot of re-action," and asks what is wrong. We suspect that either the detector valve is defective, or that his H.T. battery is run down; if all components are of the specified values. We have had a few requests for details of a more adapted form of short-wave receiver preferably a superhet. What are your views on this subject, and what circuits or special features do you suggest? Drop us a line, you short-wave "lurk."
SAVE £1 ON YOUR CORONA KIT!

**STAR-WAVE-KIT BARGAINS**

"3-in-1" Short-Wave Kit.
RECEIVER - ADAPTOR - CONVERTER
List Value 37/6 BARGAIN 25/-

- 12-94 meters. A 63- or 12-42 watt converter.
- Easy to connect to your battery set.
- All bands can be tuned with 4- or 6-pin plugs.
- Kit "I" contains every part for assembling.
- Make your own adjustable dial with 4- or 6-pin plug.

D UIAlertController: 3/- or 2/- caliperized in degree.

Kit "I" contains every part for assembling. Requires 3/- or 2/- caliperized in degree. Make your own adjustable dial with 4- or 6-pin plug.

- 2, 4, or 6-pin plugs.
- Easy to use.
- Send for free facts.

SPECIAL OFFER FOR 4 WAVE BANDS. WE ARE NOW OFFERING A COMPLETE, ALL-WAVE 4 KIT.

**CORONA ALL-WAVE 4 KIT**

Immediate Delivery

**Every Part Guaranteed Matched Proved Tested**

**KIT I"**

CASH OR C.O.D. **BRIDGE PAID**

- Comes complete with power supply, tubes, and all necessary parts.
- Kit "I" contains every part for assembling.
- Requires 3/- or 2/- caliperized in degree. Make your own adjustable dial with 4- or 6-pin plug.

**These are the items in Kit "I"**

- Any part available at a parable. Orders over 5/- sent carriage and C.O.D. charges paid.
- Batteries are included.
- Send for free facts.

**AMPLIFIERS**

**For Public Address or Home Broadcasting**

7-watt A.C. MODEL e-worthy, dependable, high-quality reproduction.

- Radiodistorted output unit. Can be used for public address or home broadcasting.
- Complete with 7-milliamper output transformer. Can be used for public address or home broadcasting.

- 4-watt B.B. FULL-AMPLIFIER O.P.P.

- 4-watt B.B. FULL-AMPLIFIER O.P.P.

- Complete with 4-watt B.B. FULL-AMPLIFIER O.P.P.

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- Complete with 4-watt B.B. FULL-AMPLIFIER O.P.P.

- Complete with 4-watt B.B. FULL-AMPLIFIER O.P.P.

**BARGAIN**

Cash $3.10. Or 6 or 12 months payments of $1.25.

**List Value** $4.19.6

**S.G.3 CHASSIS**

With knobs and escutcheon, less value.

**LIST VALUE 60/- BARGAIN 19/-

- A.C. SUPERHET CHASSIS Amazing Offer!**

- List 8 Gns. BARGAIN £4.17.6 Cash or C.O.D.

- Complete with 5 VALVES, KNOBS & ESCUTCHEON.

**1938 RECEIVER BARGAINS**

**ALL-WAVE 5-valve A.C. SUPERHET CHASSIS Amazing Offer!**

- List 8 Gns. BARGAIN £4.17.6 Cash or C.O.D.

- Complete with 5 VALVES, KNOBS & ESCUTCHEON.

- You must order now to secure models.

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56 (Pr.W. 35), LUGDURNE HILL, LONDON, E.C.4.

Please send us the Cash/C.O.D./H.P.

**SAVE £1 ON YOUR CORONA KIT!**

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- Complete with 5 VALVES, KNOBS & ESCUTCHEON.

- You must order now to secure models.
BRIEF RADIO BIOGRAPHIES—20

Monte Rey

Fans of Monte Rey, the romantic singer of Geraldino's orchestra, may be surprised to learn that he is single and his age is thirty. Incidentally his real name is Montgomery Fyne.

His parents are well-known amateurs in Scotland, and from early youth they trained him in singing and dancing. He was also taught the violin, and played and sang in a small country band. As a nigger minstrel he made his first public appearance at a Sunday school performance.

The family chose a business career for him so he went into an office, and passed many degrees for accountancy. However, while he was still in his teens he was singing grand opera in Glasgow in the rôle of Radames in "Aida." Unfortunately, his clothes had been made for a very large man so that he had to be safety-pinned into them and take great care never to turn his back to the audience.

His firm transplanted him to London which gave him the opportunity to take lessons from a famous singer, and eventually he threw over his office job. The Duke and Duchess of Montrose, with other patrons, made it possible for him to study singing in Italy, and when he returned to London he began a professional career under the name of Fyne. Through a serious operation he met the Italian singer Vartano Loria, and continued his lessons in London. He gave recitals at the Wigmore and Albert Halls, and broadcast classics several times. He studied Italian, and went to Monte Carlo to appear in "Madame Butterfly," but a serious illness followed, and he returned to London a physical wreck.

Through an early broadcast he was offered an engagement at a Society function, and this led to an introduction to Geraldino for whom he still sings in his "Music Shop" programmes, as well as records and stage shows. He took the name of Monte Rey and the part of a Spanish tenor. Then Joe Loss engaged him as well for late night dance broadcasts.

Monte lives in a quiet village twenty miles from London. His hobbies are gardening, dog breeding, bird keeping—and going to bed early!

Sutherland Felce

SUTHERLAND FELCE, the radio joker and compère, was first heard over the air at the age of seventeen from 2LO. Since then he has had over 60 engagements to broadcast in variety and music-hall shows, and with dance bands. His most exciting bit of compéring took place in the air whilst doing a stunt for Gordon Selfridge when he took up Gloria and Dawn with six other mannequins in an Imperial Airways liner. He was one of the first artists to be televised, and has made several appearances since then.

Sutherland is the only boy of his family and lives with his mother—whom he declares is his best critic—at Wimborne. As a child, though good at his studies, his chief interest was conjuring. He used to baffle his schoolmates and masters with his tricks until one sad speech-day when he appeared in a sketch called "Silent and Mysterious." It was a great occasion with 2,000 people present. Sutherland was supposed to finish his programme with a handkerchief stunt à la Houdini, but at the critical moment of "Hey, Presto!" he discovered that instead of being able to how the audience in triumph he was still struggling with the handkerchief!

Monte Rey in his Spanish gypsy costume.

Sutherland Felce in characteristic mood.

On a summer vacation from school he went to the South of France, and one day, while watching professional dancers, decided to appear in cabaret. He began as a silent magician, and proved so successful that he was booked for a further three weeks.

Henry Sherek, the theatrical impresario, gave him his first big break, as compère at the London Pavilion, since when he has appeared at numerous restaurants, theatres and clubs all over the country.

PRACSICAL AND AMATEUR WITRES

SPIRIT MESSAGES AND THE LOST CONCERTO

With reference to the first performance in England of the recently discovered Violin Concerto by Schumann, which was played by Jenny d’Aranyi at the first B.B.C.Symphony Concert at the Queen’s Hall on October 29th, we are now able to give the full story of the sensational circumstances which led to the discovery of the Concerto. Written in 1833 at the end of the composer’s stay at Dusseldorf, the manuscript was in the possession of Joseph Joachim and his heirs, who, in 1882, gave it to the Prussian State Library in Berlin. Not only was it transcribed, with an autograph note by Joachim himself, and its whereabouts was known to anyone else, the Curators of the Library and the two members of the Schumann and Joachim families. Moreover, it had been stipulated that the Concerto should on no account be published or performed until one hundred and sixty years after the composer’s death.

This was the position until some three years ago, when a message purporting to come from the spirit of Schumann appeared by Jenny d’Aranyi, urging her to find and eventually play a posthumous work of his for the violin. The recipient and one sister, the well-known violinist, Miss Fachi, had for some time been experimenting with a view to establishing contact with the spirit world, and many spirit messages had already been received. No medium was employed, but the system adopted was the well-known one of allowing an inverted glass or tambour, touched with three or four persons, including a sensitive, lightly to place their fingers, to spell out messages by pointing to the letters of the alphabet disposed in a circle round the table, and all those taking part were at all times fully conscious and awake. The information received in this mysterious way about an unknown work for the violin by Schumann came as a surprise to all concerned, but steps were immediately taken to discover what the work might be and where it could be found.

First of all, however, the question was asked: Was it really Schumann himself who had sent the message? The answer came promptly—and in German this time, although the language used habitually was English—"Ich war es selbst, ich selbst" ("I was myself"). Fortified by this assurance (and by many others received during this period), the recipients of the mysterious messages began a serious search for the missing manuscript. Finally, after many disappointments, their efforts were rewarded and a score of the long-lost Violin Concerto was discovered in the Prussian State Library in Berlin. The manuscript, however, bore the inscription "Unfinished," and reports from other sources stated that the work was completely finished, suggested that the Berlin Library might not have got the right copy. As it turned out, this conjecture proved to be correct, and when Herr Strecker, of the firm of Schott, the well-known music publishers (who by this time, had been acquainted with the facts), extended his investigations he discovered that there were less than four copies of the work extant, one of which was the manuscript score of the lost work. Thus, the "spirit" messages proved to be accurate in every particular; and it is owing to them entirely that the missing Concerto was ever brought to light.
"A TECHNICAL HITCH!"

Interesting Details of How the B.B.C. Engineers Deal With Breakdowns Due to Lightning and Other Causes

It sometimes happens that one of the B.B.C.'s many transmitters is "off the air" for a few minutes, a fact that is recorded in its technical nakedness in the log of transmissions at Broadcasting House.

But great technical progress has rapidly lessened the number of breakdowns, and also minimised the duration of any interruption to programmes that may be due to what engineers call a transmitter "shut down." To the ordinary listener, actual radiation of daily programmes is a mysterious process about which from time to time they ask many questions of the technical experts at Broadcasting House:

How many transmitters are operated by the B.B.C.? What is the commonest cause of breakdowns? Are masts used as aerials? And many other questions of a similar nature.

Come, then, to an office near the Control Room, eight floors above Portland Place, and meet Mr. L. Hotine who, a Superintendent Engineer (Transmitters) knows all the answers.

"To-day," he will tell you, "the B.B.C. operates 23 transmitters at 13 different stations, including, of course, the Empire transmitters at Daventry.

Lightning Trouble

"The commonest cause of trouble nowadays is lightning; it strikes masts and aerials and creates terrific surges which damage the tuning circuits at the base of the mast. Of course, we see that these circuits are as well protected as possible by lightning arresters and other devices, but man knows so little about lightning that our safety measures do not always work. Lightning will sometimes ignore safety 'gaps' and prefer to jump through space for a distance of four or five feet. Only a colossal pressure of many millions of volts makes that possible.

"We have modified circuits so that surges get the best paths to earth, and lightning causes far fewer breakdowns than it did only a few years ago. Valve failures were once a frequent cause of trouble. Every station uses a large number of valves; there are about 30 in one transmitter at Brookmans Park. And they are all bound to 'die' eventually.

"Some of the valves we use are as small as those in ordinary receiving apparatus, and the biggest, at Droitwich, are of between 3,000 and 4,000 hours. At our more modern stations a valve failure does not cause the transmission to cease for more than a few seconds. Isolating switches make it simple to cut any particular valve from the circuit and continue the programme by slightly overrunning the others, replacing the faulty one at the end of a transmission.

"It is very unusual, by the way, for an aerial to break; it has happened only once or twice since broadcasting began. But, we always take the precaution of having sufficient spare wire at every station to replace an aerial within a few hours. Perhaps the time will come when aerials will be completely obsolete, even now the B.B.C.'s newest stations-Lisnagarvey, Burghhead and Stagshaw—do not use aerials in the old sense at all. The mast itself, sitting on a massive insulating pedestal, is the radiating element; a convenient arrangement, the main value of which, apart from obvious mechanical advantages, is that it reduces firing.

"Because enough wavelengths are not available a number of our transmitters are synchronised. The bare statement that the three National transmitters—London, North and Scottish—work on the same wavelength does not mean much to the ordinary listener. But it matters an enormous amount to broadcasting engineers.

Tuning Forks

"Each of these three stations has a tuning fork vibrating at the same speed in an oven kept strictly at a constant temperature. One of the three stations is a master; it takes the output of its tuning fork, amplifies it, and puts it on a telephone line to the two others. They in turn, multiply it to the correct radio frequency and drive their transmitters with the tone. This ensures that all three stations are perfectly synchronised. If anything goes wrong with the telephone line or with the equipment supplying those vital vibrations—we call them oscillations—the tuning forks at the two other stations automatically switch themselves in and continue to drive the transmitter, until the line interruption has been cleared.

"An immense amount of work has to be done at all transmitters every day, normally during the early hours of the morning. There are many things to be checked before transmitters begin, and everything must be scrupulously clean.
A New 40-Page Booklet—Free

This booklet gives particulars of the many opportunities open to trained men engaged in the Radio industry. It also gives full information about the specialized instruction offered by the I.C.S. This instruction includes American broadcasting as well as British wireless practice, and provides ambitious men with a thoroughly sound training.

Here are the I.C.S. Courses:

- Complete Radio Engineering
- Complete Radio Radio Servicemen's
- Elementary Radio
- Radio Service and Sales
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Preparatory Courses for:

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- I.W.T. Exams.
- C. & G. Exams. in Radio Communications
- P.M.G. Certifs. in Wireless Telegraphy

The Complete Radio Course covers equipment and radio principles as well as practical work.

Efficient Servicing is of first importance to every wireless dealer and his assistants. The Service and Sales Course enables the salesman to hold his own with the most technical of customers.

Television will soon be a tremendous branch of the industry. Our Course deals adequately with this subject.

I.C.S. Courses do not cost more than those of other reputable schools teaching by correspondence; indeed, in some cases they cost less. An important consideration lies in the fact that all I.C.S. instruction books and special textbooks are supplied without extra charge. The students of many postal concern have to buy the books required, that often involving an additional expenditure of several pounds.

SEND FOR OUR "RADIO" BOOKLET

And, if you wish, ask for our free advice.

A AUTUMN OUTSIDE BROADCASTS

The Provisional B.B.C. Programme of this Autumn's Outside Broadcasts will introduce to Listeners Some New Ideas While Many Old Favourites Remain

The Lord Mayor's Banquet

The Lord Mayor's Banquet will again be a high spot of this autumn, and here the Outside Broadcast Director is investigating the possibility of introducing a new broadcasting procedure at this important function. As a rule, listeners have been transferred from the studio to the Mansion House just in time to hear the toastmaster proposing the Prime Minister's health. This year it is proposed to switch over to the Mansion House a few minutes before the speeches begin, to enable the observer to describe the rich setting and pageantry of this great civic function. It is here, in the person of the commentator, that a new idea will be introduced. It is hoped to find an "average listener" able to describe the brilliant scene and the appearance of the distinguished people doing honour to the Lord Mayor. The possibility of a woman commentator has not been ruled out.

Darts

As a change from the more serious outside broadcasts, it is proposed that the microphone shall visit, during the autumn, an Island Dart Derby. The teams are drawn from well-known hostels whose clients annually challenge each other. The enthusiasm and skill is of a high order, and the Outside Broadcast Department is trying to find two colourful commentators to do justice to what invariably proves an amusing occasion.

Boxing

Boxing has been carefully reviewed from the broadcast angle. London will see some big matches this autumn, and it is proposed to cover these whenever possible. It is felt that it might encourage amateur boxing if broadcast time were reserved for the more outstanding contests such as those held by theService and Oxford and Cambridge. Similarly, the Outside Broadcast Director has been assisting county cricket this season by giving added publicity to the game.

Rugby

While dealing with this matter of commentators and observers, a very interesting suggestion is in hand with regard to the University Rugby matches. It is proposed to select a date shortly before the inter-university match when both universities are engaged. Captain H. B. T. Wakeham will visit one venue and Howard Marshall another, and a description of half of each match will be broadcast. By this means, the form of each university can be studied in the same afternoon, while listeners will have the added amusement of comparing the two styles of observers.

Skating

Ice Hockey has now a definite place in the radio programmes. It is a fast game which lends itself to radio description, and for it the B.B.C. has built up a small team of expert commentators who will again be in attendance. Besides the matches of the Ice Hockey League, the Outside Broadcast Director feels that there is the making of some excellent entertainment in the figure skating championships.

Military Spectacle

London is rich in military spectacle, that of the summer being the more familiar. Less known are the regimental tattoo which occur throughout the year at barracks and depots. The Brigade of Guards, at all their barracks and at Windsor, carry out "Tattoo," with a splendid ceremony. It is proposed to listen to some of these with a view to introducing a short period into the radio schedule. The words of command, and the martial music drawn from such spectacles, have ever been popular with listeners.

Another great annual function, that of the British Legion Armistice celebration at the Albert Hall, is to receive a careful review to see how much it is possible to broadcast. This is a great national festival, occurring at a time when many are thinking of the First Armistice. It has a universal appeal, and as the Army springs from the people, a more careful study of the possibilities of this annual celebration is to be made.

The London Scene

The Outside Broadcast Department's offices contain many suggestions for utilising various happenings in London's streets and parks. Many of these occasions are of sectional interest, but the majority have considerable entertainment value. Hyde Park, for instance, has several gatherings unknown to the general public, which have considerable charm. Some of these are unofficial meetings of musical people for the purpose of singing national songs. It is proposed to investigate these to see if, with the aid of an observer and commentator and the spontaneous singing, a broadcast of considerable value could not be obtained.

One of the endeavours of the enthusiastic staff of the Outside Broadcast Department is to prove that the old tag, "There is nothing new in entertainment" is wrong. Listeners may rest assured that a large majority of the suggestions for outside broadcasts reaching the B.B.C. are explored. This, in itself, takes an immense amount of time and effort. The Outside Broadcast Department has to investigate possibility and availability before even a suggestion can be submitted. Quite frequently, after some weeks of work involving countless journeys and conferences, promising ideas have to be abandoned.

With regard to this autumn, it is safe to predict a most interesting and effective programme of broadcasts from outside the studios.

EVERYMAN'S WIRELESS BOOK

By F. J. Camm

Wireless Principles and Fault Testing simply explained.

Ultra-short-wave Reception

Some Notes on Stations that are Well Received Below 10 Metres.

The long-awaited moment when stations below 10 metres would once again entertain us has arrived. The dials of a 10-metre set are alive with stations, amateur, police, and brodcast. The idea of what to expect “down here” may be gauged by the fact that the following amateur stations have been coming in well up the 10-metre amateur band: WAEIL, WSGX, W901S, W6HKM, W6NDG, WEERT, W6NT, W6OAC, W7EMP, W8PWU, W9DRQ, W9KZN, Y2SKX; a batch of stations including Colorado and Dakotan stations, a sure proof that ultra-short-wave reception is thrilling.

Broadcasters
Numerous broadcasters are also being heard, and the following schedules and wavelength details will add much to your enjoyment:

- **WIXX**: Springfield, relays WBZA from 11:30 a.m. to 5 p.m. daily on the same wavelength, whilst WIXX, Valdosta, may be heard relaying WBFR around 3 p.m.
- **Other interesting stations are WAXN**: which relays WMC, Memphis, during the afternoons; WAXAI, Rochester—often a good signal between 3 p.m. and 8 p.m.; and WAXJ, relay station of WWJ, Detroit. The schedule of this station is as follows: Sundays from 7:30 p.m. to 12:30 a.m., and from 11:30 a.m. to 5:30 p.m., and Saturdays from 7 to 10 p.m.
- **WXH**: Minneapolis, relays WCCO on Mondays to Fridays from 12:15 p.m. to 5 p.m.; and Saturdays from 7:30 p.m. to 5 a.m. Sunday transmissions are made between 2 and 3 p.m.

On 5 Metres

Although less lively, the 5-metre amateur band is well worth attention. In the London area 85WW, North London; G6DF, Watford, and G8KL, Wands- worth, are coming in well.

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**Eight Wander Plugs.**

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RADIO CLUBS AND SOCIETIES

The Croydon Radio Society

This society's 1937-38 season has been opened on Tuesday, October 8th, in St. Peter's Hall, Leyburn Road, South Croydon, members are invited to some interesting programmes. All the old familiarities are on the bill, but the society is increasing in interest in the field of realistic reproduction of broadcast music. Much has to be done in educating the great British public as to what is real and what is not correct reproduction, and far too many wireless set owners are content with sounds from their loudspeakers which to the expert are distinctly distorted.

The society's meeting night on November 23rd is a date to be remembered, and an ever-popular pick-up night on October 19th is likely to be an instructive evening. Experts on loudspeaker design appear on October 26th and November 9th. Nor is television neglected, and a talk on "A" Cathode-ray Tubes for P.E. Television is merely one evening devoted to this topic.

Above all, however, the society is as anxious as ever to welcome PRACTICAL AND AMATEUR WIRELESS readers to its ranks. Both have the same ideals, namely a better understanding of the science of radio, and, in time, they will probably be glad to see both readers, together with all particulars of the society. Hon. Pub. Sec.: E. L. Cumber, Maycourt, Campden Road, S. Croydon.
THE BRITISH LONG DISTANCE LISTENERS' CLUB

Stationery for Members

MEMBERS should remember that we can supply pads of forms upon which reports of reception may be entered for submission to transmitters in order to obtain Q.S.T. cards. These pads contain 50 such forms upon which columns are provided for the entry of all the essential details of a transmission, and the price is 1s. 6d. Even if you do not wish to send out reports, it is worth while keeping a careful log of all signals received, and printed on these together with a space for the member's number, and you should always use this paper when writing for component parts to other members, or to stations regarding transmissions. A white manilla folder in which the log sheets may be kept costs 2/4d., and badges are available for 1s. each.

As we have previously stated, we have had to discontinue the practice of forwarding on members' reports to various stations, owing to the difficulty which has been

<table>
<thead>
<tr>
<th>Radio Station</th>
<th>Listener's Name</th>
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<tr>
<td>ADDRESS</td>
<td>ADDRESS</td>
</tr>
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<td>COUNTRY</td>
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Dear Sirs,

I am very glad to confirm the reception of your station on a wave length of... m (k.c.)

The following details of my reception will double be of interest to you:

<table>
<thead>
<tr>
<th>Date</th>
<th>Time (GMT)</th>
<th>Frequency</th>
<th>Volume</th>
<th>Fading</th>
<th>Space</th>
<th>Mode</th>
<th>Remarks</th>
</tr>
</thead>
</table>

I should be grateful for your confirmation of the above report.

Date ____________________________

Signature ________________________

Member of the BRITISH LONG DISTANCE LISTENERS' CLUB

This is a reproduction of one of the verification sheets which we supply. The full sheet is 8in. by 40in.

Although an ordinary notebook can be ruled up for this purpose, it is much better to use a ready-printed log sheet, and a pad containing 50 sheets for this purpose may also be obtained from us for 1s. 6d. In addition to these two items, we can also supply printed writing paper at 1s. 3d. per packet of 50 sheets. The B.L.D.L.C. badge is experienced in obtaining replies in many cases. New readers who are anxious to join the Club, for which no membership fee is required, should complete the form on this page and address it to The British Long-Distance Listeners' Club, Geo. Newnes Ltd., Tower House, Southampton Street, London, W.C.2.

BRITISH LONG-DISTANCE LISTENERS' CLUB

ENROLMENT FORM.

I wish to enrol my name as a member of the British Long-Distance Listeners' Club, it being clearly understood that no financial obligation is thus incurred. I am especially interested in... (medium waves*), Ultra-short-wave...

Full Name (Block letters)...

Address...

*Strike out words not needed.

Optional: Please forward me... pads of 50 log-book sheets price 1s. 6d.,... badge price 1s. each...

for which I enclose a cheque for £...

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PRACTICAL AND AMATEUR WIRELESS

November 9, 1937

ETTERS FROM READERS

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied, by the name and address of the sender (not necessarily for publication).

Progressive Superhet Construction

SIR,—Regarding M. H. Walters' letter, published in a recent issue, I should also like to see some articles on progressive construction. Although I vaguely understand the superhet, I have never passed the H.F.-Det.-L.F. stage.

I think these articles should begin with, expanding gradually to a 0 to 6-valve.—J. F. HITCHCOCK (Fetcham Park, Surrey).

Station CQCM

SIR,—In your issue of September 25th, under the heading “New Cuban Stations,” you publish details of the station CQCM. Actually this is not a new station, as it was received here every morning during the week ending October 22nd, 1936. It appears, however, to have altered its schedule, as when heard on that date, it closed down at 05.30 G.M.T. The receiver used was 0-60. A report was despatched but no reply has yet been received. In conclusion, let me adjure those listeners whoexpérience by return of post to be patient. I send several reports a year ago, and the replies are just beginning to roll in.—E. PARSONS (Luton).

CUT THIS OUT EACH WEEK.

Do you know?

—THAT the selectivity of an L.F. transformer may be modified by opening the coupling and connecting a few turns in series with the secondary, lightly coupled to the primary.

—THAT when the above modification is carried out the additional winding may be omitted, and the transformer can be further improved in this manner, a few turns being wound on the transformer core and leaving the above mentioned winding intact. The transformer core must be made to operate correctly, this will yield a better result.

—THAT for reception of the present B.B.C. television transmissions a dipole aerial should be arranged vertically, not horizontally.

—THAT when a D.C. set is operated on short waves it may be found desirable to connect all the receiving direct to a separate earth.

—THAT for the reception of the present B.B.C. television transmissions a dipole aerial should be arranged vertically, not horizontally.
A Valve Tester

SIR.—May I make a few suggestions about the valve tester that has been proposed for the subject of an article in your weekly?

There are three things that are desirable in the way of types of tests: (1) to determine the emission of the valve in question, if a triode-hexode or other dual valve, the emission of each section independently from the other; (2) to determine the amount of leakage in the elements, and (3) to determine whether or not any of the elements are open-circuited. Of these three the first two are necessary, and the third a desirable feature which would only be incorporated in an expensive instrument.

About the tester in general—it should be flexible and designed with an eye to the future, and it should be able to accommodate additions for future varieties. Above all, it should be able to take care of American as well as English valves.

This brings up the question of the octal base, and in the majority of these the filament is brought out to pins numbered 2 and 7, but quite a few have been released using pins 2 and 8 for this purpose; later a 6P7 was brought out using pins 5 and 7, and several of the octal base valves have been brought out since using pins 8 and 7 for filament connection. The proposed valve tester should operate from the mains, and incorporate a rectifier so that D.C. can be used instead of the A.C. that is used in so many commercial testers. A push-button arrangement would take care of whether a negative or positive voltage should be applied, and this would enable the emission of both diodes and the triode of a double-diode-triode to be checked separately.—John B. Pollock (Oprington).

"The Exide Mystery"

SIR.—The article in the September 18th issue of PRACTICAL AND AMATEUR WIRELESS, entitled "The Exide Mystery," has cleared up a mystery for which I have long sought the solution. Some time ago I built and overhauled a private lighting plant which was out of order. Instead of the full output of 100 volts, only 40 volts was registered. As we once suggested the storage batteries, and proceeded to test each cell individually. After testing four and getting the usual 2 volt reading from each, you can imagine my surprise when on testing the fifth cell the voltmeter read 10 volts! Something wrong here, I thought, and gave the meter a sharp tap; it still insisted on registering ten volts, however, and I began to wonder. Further examination of the cell (which incidentally was the one causing the trouble), showed that there had been leakage of electrolyte through a crack, the plates being uncovered about an inch at the top. There was some sulphonation, and on trying to remove this, several of the plates parted from the positive lug.

I have often puzzled over the phenomenon, and when I have asked some of my learned electrical friends if they can explain it, I have been met with sceptical smiles and advised to take more water with it. Thanks to your article, I am now vindicated.—A. H. Ovryn (Hitchin).

Logged at Mill Hill

SIR.—As I have not seen a 20-metre log from my district lately, I enclose mine. All received between August 15th and September 16th on an o-v-2,
Nearly Perfect Amplification

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See also Page 111

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The Corona All-wave Four

The success of the all-wave receivers on the market has led to a demand for a more powerful receiver for battery use, designed on somewhat similar lines. In the past we have described several receivers of this type, but it has been necessary to utilise standard broadcast coils for tuning on the medium and long-wave bands, with special short-wave coils for the short wavelengths, and this has necessitated special switching. Such an arrangement is quite satisfactory provided that the switches are well designed and that the wiring from coils to switches is efficiently carried out. Many constructors who have tried to build a receiver on these lines have found that the short-wave performance has been poor, and in the majority of cases this has been definitely traced to the use of a wrong type of switch, or bad wiring between the various components. The introduction of the modern three-range coils has removed these difficulties, and it is thus now just as simple to build an all-wave receiver as a standard broadcast set. The receiver described in this issue is a four-valve, having a single H.F. stage and two L.F. stages, and thus may be relied upon to provide not only a wide range of reception, but also a really good volume which will enable many short-wave stations to be received at worthwhile strength on the loudspeaker. In addition, the performance on the broadcast bands will also be such that the receiver may be regarded as a standard for domestic purposes.

Short Waves Again

To add to the already numerous applications of the short waves in normal commercial undertakings, it is now reported that the rate of growth of seeds may be measured by ultra-short wavelength. It is stated that a Californian farmer measures the hidden capacity for growth in his lettuce seeds by means of a special ultra-short-wave receiver, and is thus able to sort his seeds into groups which will mature at definite periods. Several short waves will be thus tested by radio.

Nottingham B.B.C. Studio

It is stated that the B.B.C. have not given up hopes of eventually finding a site in Nottingham for a broadcast studio. Difficulty has been found in obtaining a site which will provide the necessary amenities of a broadcast studio, but the Midland Regional director states that a further instruction is shortly to be undertaken with a view to obtaining a suitable site.

Stagshaw Transmitter

The Stagshaw transmitting station, designed to improve listening conditions in Northumberland, Durham, Cumberland, Westmorland and North Yorkshire, will also be such that the receiver may be regarded as a standard for domestic purposes.

Quality and Superheats

It is interesting to note that this season several firms are introducing all-wave receivers in which the circuit has been designed to perform a dual function. For long-range work the circuit performs as a superhet, but a switch cuts out certain stages or makes circuit changes so that when the local or quality reception is desired, a straight T.R.F. circuit is employed. This is no doubt a beginning of the general return to straight circuits.

Variety from America

An interesting sample of American variety will be heard each week by English listeners through the medium of a new programme, which has been arranged in conjunction with the Columbia Broadcasting System. Listeners will, on October 18th, and on each subsequent Monday at 8.30, hear a programme of American variety, broadcast by the Columbia System. This, as is interesting to note, is the first regular feature of American radio artistry to be broadcast in this country.

For Housewives

An important series of discussions will commence in the Midland programme on October 13th, under the title "How to Get Your Money's Worth." Margot Smith, speaking for the housewife, will interview J. C. Tranter, President of the Birmingham and District Retail Butchers' Association, with a view to providing guidance for shoppers on points about quality and value to look for when buying meat.

"Crying the Neck"

LISTENERS who are interested in surviving ancient customs should listen to the West of England programme on October 12th. A commentary on the ceremony of "Crying the Neck," at Trelowarren, Cornwall, will be broadcast by Peter Sandry. This ceremony marks the conclusion of the harvest, but there are only a few places where it survives. The "Neck" is a sheaf of corn—it may be the last sheaf cut on the estate, or it may be composed of the finest ears selected from the various fields. In the old days, after the last sheaf had been cut, all the labourers on the estate gathered round while one of their number would raise the sheaf three times in the air, the rest bowing or kneeling. In some places it is given to the best horse on the estate, in others it is hung up in the farm kitchen until the next harvest. At Trelowarren the ceremony is held in front of the house of the landlord and concludes with an old Cornish harvest hymn, before everyone goes in to the harvest supper.
ROUND the WORLD of WIRELESS (Continued)

Here's To the Next Time!

WHEN Henry Hall and his Dance Orchestra finished the late dance music programme a fortnight ago it marked the severance of the official connection Henry has had with the B.B.C. for the last five years. Although the B.B.C. Dance Orchestra was disbanded some months ago, Henry has been under contract to the B.B.C., but this is now terminated. He has begun a music-hall career with his new orchestra.

Applications for Auditions

THE B.B.C. recently announced, owing to an already overlong waiting list, no new applications for general drama auditions can be considered before the end of March, 1938. As yet there has been no chance to give parts to many applicants who were successful at auditions last autumn and winter. During the summer months auditions were suspended and hundreds of would-be broadcasters who have since applied must be heard before a new list can be formed.

Meanwhile, drama auditions will be given at regular intervals to those who have already applied. In turn each gets a summons to Broadcasting House for an individual microphone test. This process takes time, but only in this way can the B.B.C. be sure that no type of talent is overlooked.

“In Town To-night”

HERALDED once again by the “Knightbridge March,” its well-known signature tune, “In Town To-night” will be revived by the B.B.C. on October 30th. It will be the same “In Town To-night” that listeners have always known, bringing to the microphone each Saturday night the personalities, celebrities and colourful characters visiting, or working in, the Metropolis.

A. W. (“Bill”) Hanson will again regularly produce the programmes, which will be introduced three weeks after the end of Alan Keith’s alphabetical miscellany, “The B.B.C. Presents the A.B.C.”

“Z” being reached on October 9th.

A Manchester “Tuesday Concert”

THE second broadcast concert of the Manchester Tuesday Midday Society’s weekly programme will be heard from the Hulme Hall, Manchester, by Northern and London Regional listeners on October 12th. The soloists will be Carmen del Rio (soprano) and Muriel Taylor (violin-cello). Albert Hardie will be at the piano forte.

A New Radio Revue

“YOU NEVER KNOW,” a new revue by Muriel Levy, who is one of the best known broadcasters in the North, is to be broadcast on October 14th. This promises to be a show full of bright burlesque. David Porter, who is the producer, has written the lyrics, and the music is by Henry Reed. The artists will include Marjorie Westbury, who is best known to listeners in the Midland region. The

INTERESTING and TOPICAL NEWS and NOTES

Judy Shirley, well-known radio favourite, as Maurice Winnick’s Band. Conducting the band is G. Robinson. The picture was produced at the Denham Studios.

A new picture of Henry Hall at the piano. He has delighted thousands with his solos which have sometimes been included in the dance-orchestra programmes.

SOLVE THIS!

PROBLEM No. 264.

When King's home-designed A.C. receiver was first switched on the quality of reproduction was poor. Voltage tests were made and it was found that the heater voltage was 3.5 volts instead of the required 4 volts. What was the fault? Three books will be awarded for the first three correct solutions.

Solution to Problem No. 263.

The fault was short-circuiting the speaker chassis and this was directly connected to the set chassis.

The following three readers successfully solved Problem No. 262, and books are accordingly being forwarded to them: A. B. Pollard, 1, Nevill Rd, Cowes; B. R. P. Lee, 22, Heathfield Rd, Acton, W.3; J. de Morava, Gc, University Dr, Liverpool, 8.
The Amateur Set Designer

Further Notes on Resistance-Capacity Coupling, and Transformer L.F. Coupling are Given in this Fifth Article of the Series

(Continued from page 58, October 2nd issue).

There is no peculiar virtue arising from the fact that a transformer winding is involved. Similar phase splitting could be done with the aid of a centre-tapped resistance, provided that the centre point is held constant in potential and connected to cathodes.

Thus, if there is a signal voltage developed by a valve across the whole of R, Fig. 18, then the points A, E and B of Fig. 17 could be connected to those similarly marked in Fig. 18. The main practical problem arises in connection with the getting of R into the circuit of one valve. Obviously R of Fig. 18 could not be connected between the anode of a triode or pentode and H.T. because of the centre earth. It could not be placed between cathode and negative H.T. because the negative H.T. line will itself be at constant potential, and we want the middle of R to be constant, not the end of R. One could, however, split R into two equal parts and place one half on the anode side of the valve, and the other on the cathode side.

Fig. 19 shows a workable arrangement with a diode detector (H.F. filtering omitted). Note that a direct earth connection cannot be taken to the input tuned circuit.

A very useful method of phase splitting, although it involves an extra valve, takes advantage of the fact that, with a resistance load in the anode circuit of a triode valve there is 180 degrees phase difference between the grid and anode signal potential. One of the first push-pull valves is fed direct while the other receives its input via an extra valve which is provided to give the necessary phase reversal. Fig. 20 shows the idea schematically. V is the extra valve mentioned and points A, E and B could be joined to those of Fig. 17.

The reader is bound to see at once the possibility that the amplification of V might upset the equality of grid signal voltages at A and B, i.e., might upset the balance of the two push-pull valves. The prevention of this is simply that of sufficiently reducing the input to V by potentiometer control. (See Fig. 21.)

Fig. 22 shows two push-pull output valves. V3 and V4. V3 is fed direct from V1, while V4 receives its input via the phase-reversing valve V2.

An alternative to the way in which V2 picks up its input voltage as shown in Fig. 22 would be to connect the grid of V2 to a suitable tapping on R1, the grid leak resistance of V3. (See point X in Fig. 22.) In this case the grid leak and condenser CK (Fig. 22) would be omitted.

Obviously R of Fig. 18 could not be connected between the anode of a triode or pentode and the other on the cathode side and the other on the grid side.

It is important for the receiver designer to be familiar with certain basic facts about inter-valve transformer ratios. Ratio is not everything where the transformer is concerned, and any idea of obtaining a colossal stage gain by using a transformer with an exceedingly high turns ratio is foredoomed to failure. The transformer can step up only the voltage that is operating directly in its primary, and a vital point is that in series with the primary (see Fig. 23) we have the valve impedance (anode A.C. resistance, if you prefer that term). If the primary reactance is low the proportion of the effective signal e.m.f. that will be available at the primary will be small. This means that a comparatively large primary inductance is required, particularly where the lower frequencies are concerned. Ignoring the resistance of the primary winding, the ratio of voltage across the primary to the total signal e.m.f. acting in the anode circuit is at the lower end of the frequency scale:

\[ \frac{1}{\sqrt{R_i^2 + X_a^2}} \]

where \( R_i \) = valve impedance

X = reactance of the primary

It is easy to see that if the reactance of the transformer primary is made equal to the valve impedance the above ratio resolves to \( \frac{1}{\sqrt{2}} \), i.e., the primary gets 70.7 per cent. of the total e.m.f. This would be reasonably satisfactory but it is going to mean a primary with a large number of turns. How about the secondary winding? Obviously, a very high turns ratio would mean a transformer with an enormous secondary which would lead to difficulties in connection with the magnetic leakage on the one hand and a self-capacity on the other. An alternative way of getting the high ratio would be to use a very small primary winding, but that is just what we do not want to see in the transformer. It will be appreciated, therefore, that there are very good reasons for the common use of inter-valve transformer ratios of the comparatively low values of 1:2, 1:3, and 1:4.

The frequency response of the transformer is a very important consideration. A transformer of poor design might show a bad falling off in the lower register, due to insufficient primary inductance, or it might, due to effects concerned with the self capacity and leakage inductance, have a nasty resonant peak followed by a severe falling away in response at the upper frequencies.

Makers of good quality transformers are generally pleased to supply the frequency response of their transformers. (Continued on next page)
THE AMATEUR SET DESIGNER

(Continued from previous page)

response 'curves and it is advisable when studying any particular transformer to note all details given as to the operating conditions under which the specified response will be obtained.

When a transformer connected as in Fig. 23 the D.C. component of anode current must necessarily pass through the primary winding of the transformer. Any given transformer will only take up to a certain value of direct current before distortion will be caused by core saturation. It is therefore useful to know the maximum permissible D.C. value for the transformer, and extremely important to see that the D.C. component of anode current does not exceed this value.

The shunt feed method of using a transformer will, of course, overcome all difficulties in connection with D.C. in the primary.

Shunt Feed Transformer Coupling

By keeping the primary of the transformer out of the series anode circuit and feeding it via resistance-capacity coupling as shown in Fig. 24, there is gained the considerable advantage that no D.C. passes through the primary; the primary winding of the transformer will be at some corresponding value, and there is no possibility of trouble due to D.C. core saturation. The stage gain will not be quite so high as with direct transformer connections, assuming that the transformer is used in the manner shown in Fig. 24.

It will be observed that both the secondary and the primary winding run to earth on one side. In the battery-operated receiver the secondary will generally go to earth via the auto-transformer connections, therefore, become possible, and Fig. 25 shows the transformer of Fig. 24 connected up as an auto-transformer. Note that although the primary winding still acts as such, the secondary now consists of the two windings in series, since both windings come between grid and earth.

Thus the effective ratio of the transformer has been raised. Alternatively, by reversing the connections of one of the windings, the resulting voltage opposition would have the effect of bringing down the working ratio. As a matter of fact, with a 1:4 transformer having separate primary and secondary terminals there would be a choice of effective ratios of 1:3, 1:4, and 1:5.

The possibility of using auto connection with the shunt feed system has, of course, led to the introduction of transformers definitely built as auto, and having three terminals only.

The anode resistance, R (Fig. 24), will have a bearing upon the stage gain. There should be no need, however, to make it unduly high, in view of the step-up action of the transformer, and thus difficulties due to severe loss of anode volts at V1 should not arise. If V1 is a triode, a value for R of about two or three times the specified valve impedance will meet the average case.

In regard to the coupling condenser there will be no risk of grid blocking effects so the way is clear to use a large capacity. If so desired, however, it is possible, by a careful choice of capacity for the coupling condenser, to exert some control upon the audio-frequency response characteristic of the system. The capacity of a coupling condenser that resonates with the primary inductance near the lower end of the frequency range is to be preferred. It is possible to lift up the otherwise smooth audio-frequency response to the extent of giving a few waves, and there will be no irritating resonant peak in normal circumstances, the damping of R will see to that. Makers of transformers have their own ideas as to the best feed arrangements for their particular products, and the amateur designer will be well advised to note and to copy such arrangements.

A fairly wide range of values are used for coupling condensers in different cases, and

\[ R = \frac{1}{\mu N^2} \]

where \( \mu \) = amplification factor of valve, \( N \) = anode-tube ratio, and \( R \) = valve impedance.

The above does not take into account the fact that the anode load is actually made up of R in parallel with the joint impedance of the transformer primary and the coupling condenser in series, but it is a simple formula, useful when making rough estimate of gain.

A very commonly used arrangement is that of the H.F. battery-operated pentode grid detector coupled by a shunt fed transformer to the output valve.

A coupling resistance of 50,000 ohms is normally satisfactory. This can be looked upon as a resistance of comparatively moderate value, and the fact that it is not necessary to use a very high value is particularly welcome in view of the precious nature of anode voltages with the battery-operated detector.

The Anode-bend Detector

Not much is heard of the anode-bend detector at the present time for the reason that the greater sensitivity of the grid detector on the one hand and the freedom from distortion and high power consumption of the diode detector on the other hand has made the latter two the popular detectors of today.

The anode-bend detector has one point in its favour and that is that it imposes upon the preceding tuned circuit a damping load which is comparatively small in value. A grid load resistance is not required and the grid is biased back to an operating point on the lower bend of the anode current—grid voltage characteristic. The detection action arises by virtue of the asymmetry of the characteristic about this operating point.

The biasing back of the valve necessarily makes the working valve of anode impedance much higher than the value appropriate to amplifying conditions, and as a consequence, resistance-capacity coupling to the next valve is generally the most suitable form of coupling to use.

One big disadvantage of the anode-bend detector, although it must be observed that the grid detector gives the same trouble in a different way, is represented by the fact that it overloads easily. The grid voltage swings, during reception, are centred on the negative bias voltage, and not on the grid alternating component of voltage. This means that the grid current will be much greater than the anode current. The input signal voltage must be kept short of the value which causes the triode current to be set up. For the most part, this is found to be quite out of the question to use a valve that requires a big negative bias at a reasonable anode voltage, but it will pay to use a valve on a bias voltage as high as is possible, as will be understood when it is remembered that the greater the anode voltage the greater will be the negative bias which is required.

(To be continued)
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New GEC Sets
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New GEC Sets
On Your Wavelength

By Thermion

Those Free Components
I PUBLISHED the details of a generous offer by one of my readers who had some wireless components to dispose of. I received a large number of applications, and I have forwarded those on to the donor who by this time has disposed of them to what he considers to be the most deserving case. I mention this to indicate that the offer is now closed and I cannot entertain further applications.

Offers of Back Issues
VERY often a reader who for reasons of space has to dispose of his back issues asks me to publish a paragraph indicating that he would be glad to dispose of them for a reasonable sum. I am unable to do this, for such readers are likely to be put to such considerable expense if a demand for one issue exceeds the supply. The reader would be compelled to return the money. If you have issues for sale they must be advertised in the Miscellaneous columns. If you have issues to dispose of free, such parcels should be sent carriage forward, otherwise dozens of readers will send remittances for carriage which will have to be returned.

Important Dates
DO you know the date on which Marconi was born, or when the first patent was granted for wireless telegraphy, or when the first signal was transmitted across the Atlantic, or when wireless was first used for life saving at sea? There are a lot of important dates in wireless which you should note in your diary, and I give a list of them herewith. As I have been to considerable trouble to dig out these dates, they are worth setting on record, and so that I may make the list more complete if there are any which occur to you, I shall be glad if you will drop me a card.

January 1st, 1894, Professor Hertz died.
January 20th, 1904, First Press message across the Atlantic.
January 31st, 1926, Rugby Telegraph Station opened.
February 2nd, 1896, Marconi came to England.
February 11th, 1847, Thomas Alva Edison born.
February 14th, 1922, Writtle (2MT) Transmitter opened.
February 19th, 1745, Alessandro Volta born.
February 22nd, 1837, Professor H. R. Hertz born.
March 3rd, 1899, First use of wireless in life saving at sea.
March 3rd, 1847, Dr. Alexander Graham Bell born.
March 5th, 1827, Alessandro Volta died.
March 9th, 1930, First dual transmission from Brookmans Park.
March 16th, 1877, George Simon Ohm born.
March 20th, 1727, Sir Isaac Newton died.
March 30th, 1930, B.B.C. commence television broadcast.
April 27th, 1791, Samuel F. B. Morse born.
May 30th, 1927, Baird Television by wire between London and Glasgow.
June 2nd, 1896, Marconi’s first British Patent granted, No. 12099.
June 12th, 1851, Sir Oliver Lodge born.
July 20th, 1937, Marchese Marconi G.C.V.O., died.
August 1st, 1922, Dr. A. Graham Bell died.
September 9th, 1737, Luigi Galvani born.
September 22nd, 1918, First messages transmitted by wireless to Australia.
September 16th, 1929, First Regional Station, Brookmans Park, opened.
September 30th, 1922, First Radio Exhibition at Horticultural Hall.

On October 18th, 1931, T. A. Edison died.
November 16th, 1904, First Fleming Valve Patent granted.
November 25th, 1642, Sir Isaac Newton born.
December 12th, 1901, Marconi succeeded in transmitting and receiving signals across the Atlantic Ocean from Poldhu, Cornwall, to St. John’s, Newfoundland.

November 14th, 1922, London (2LO) First British Broadcasting Station commenced.

I observe that many of the wireless diaries do not include these important dates, although I understand that one to be produced this year will do so.

Component Shortage
ALTHOUGH matters are improving, I am still receiving complaints from readers who find difficulty in obtaining components. They seem to think that I can wave a magic wand, for quite a number of them are expecting me to do their shopping for them. A number of others dash off a letter written in vitriol, and when I come to investigate the matter I find that their complaints are not justified. The facts are usually on the side of the manufacturers in those cases of complaint regarding delivery or overcharging for repairs. You will remember that in a recent case a reader complained that he had been charged heavily for the repair of an earpiece. When I investigated the matter with the makers I found that two carpieces had been repaired. Also, that the invoice shown to me by the makers differed by is. from the amount which the reader said he had been charged. It was less by is. Before writing letters of complaint to me, don’t allow your annoyance to colour your statements. Where I find them inaccurate I can do nothing further.

Televising the Cenotaph Ceremony
I AM informed that the Home Secretary has given permission for the televising of the Cenotaph service on Armistice Day. It is hoped
to begin transmission at 10.30 to enable viewers to see the waiting crowds and to watch the assembly of troops and the arrival of members of the Cabinet and His Majesty the King. Three cameras will be used, two of which will be mounted at first-floor level in Richmond Terrace to give scenes near the Cenotaph, and it is probable that telephoto lenses will be used. The third camera will give comprehensive views of Whitehall and, if lighting permits, a distant view of Big Ben.

Experiments in Science

The cycle bell of an ice-cream vendor which seemed to be ringing itself attracted the attention of Professor Mary Waller, of the London School of Medicine for Women. She investigated on the spot and discovered that the "trick" was due to the action of the solid carbon dioxide used as a freezing mixture. Experiments with solid carbon dioxide are to be televised in the first of a series of "Experimental Science" transmissions in the afternoon programme on October 7th. Professor Waller will show how this substance can be used to test the genuineness of diamonds and pearls, which give ringing tones of varying quality when touched by solid carbon dioxide. Perhaps the most spectacular experiment in front of the television camera will be the making of patterns in silver sand. Beautiful shapes are made simply by waving the solid carbon dioxide over the sand.

"Padded Cells"

I understand that the "padded cells" in the Philco Radio factory at Perivale might spin tales as romantic as any ever created by Aladdin and his magic lamp. There are four of these "silent" rooms, and each has its own use in the tests performed on wireless receiver components and finished sets.

The incoming inspection room is one "padded cell" in which all radiogram motors are tested for quietness of operation. In the "Sales Acceptance" room finished sets are tested from every angle to be sure there is nothing the matter with them which will prevent satisfaction for the owner after it is sold. Every speaker is tested in another "padded cell" and the fourth "silence chamber" is located in the research laboratories, where new designs are tested for acoustical properties and general performance. The silence achieved in the speaker test-room is typical of the others. It is

Microwave Howl

Readers using a microphone for the first time generally experience instability in the form of a howl. This can be due to the use of an unsuitable amplifier—lack of decoupling in the tube circuits can cause instability. When the decoupling is inadequate the howl is set up on radio as well as on gram., however, and therefore if the howl occurs only on gram. it will be due to the close proximity of the microphone and loudspeaker. The microphone is actuated by the speaker's voice as well as by the output from the loudspeaker. The cure for this is to screen the microphone from the loudspeaker.

Pick-up Hum

Another trouble commonly experienced is excessive hum when a pick-up is connected to a receiver of the mains-operated type. In most cases this is due to the pick-up leads being unscreened, and if the leads are passed through a screening cover the hum will be eliminated. The metal screening should, of course, be connected to the axis. Hum also can be due to interaction between the gram. motor windings and the pick-up winding, but this can generally be eliminated by earthing the motor casing.

H.T. Supply from 110 Volts

We often receive inquiries from readers living in country districts or aboard ship concerning a suitable unit for supplying H.T. to their sets from 110 volts D.C. mains. The normal type of D.C. mains unit, such as the one described in the issue of PRACTICAL AND AMATEUR WIRELESS dated 23rd November, 1935, may be used for this purpose, but as the voltage is 110 volts instead of the normal 220-250 volts the main dropping resistance will not be required. The smoothing choke resistance should also be kept as low as possible in order to keep the voltage as high as possible. Optimum results cannot be obtained even from battery type valves with a voltage of 100 volts, but as this voltage is steady it is preferable to a dry battery, as most listeners allow their dry batteries to drop well below 100 volts before renewing them. It is a simple matter to increase the mains voltage to the permissible maximum by the addition of a low voltage dry battery, of course, but if a push-pull output stage is used this should not be found necessary.

Notes from the West Bench

So perfectly silenced that the quietness actually "hurts" the ears.

The insulation and construction of this, and other "padded cells," prevent reflection of any sound, whether of 30 or 20,000 oscillations a second, although speakers usually are geared and tested for top range of something like only 10,000 vibrations a second. Many persons are unable to hear sounds in such high frequencies as 20,000 to the second. While that is the limit, Philco Radio has a sound pressure measuring instrument capable of measuring frequencies considerably higher than can be detected by the most sensitive human ear. In fact, the apparatus can detect sounds audible only to insects.

The New Transmitter at Stagshaw

The afternoon of October 19th brings an event of major importance in the history of broadcasting in the North of England; a day specially to be noted and remembered by listeners in the North-East. As mentioned elsewhere in this issue, the new station is to be opened by the Duchess of Northumberland.

This giant transmitter, whose one huge mast (towering skywards for 48 feet on a hill which stands 700 feet above the sea) is itself the aerial, is to improve listening conditions in Northumberland, Durham, Cumberland, Westmorland and the North of Yorkshire. The station, situated in a lonely but lovely district, which many Northumbrians know as Bewlady, is almost on the line of Hadrian's Wall, and the grand views which its commands include a fine prospect to the Cheviots in the North, and an outlook over the Tyne valley to the South.

Hawaii Listens-in to Insects

With the proper sensitivity in microphone construction, the Hawaiians find it possible to detect the presence of insects in growing crops.

Sound Systems, Inc., of Cleveland, recently received an order from Honolulu for sound equipment to serve this purpose. The specifications called for a contact microphone and amplification of at least 100db. The unit is portable and battery operated. It includes a small high gain amplifier operated by dry cell batteries. It is built in a compact and durable carrying case, and among the accessories are a contact microphone and the highly sensitive crystal headphones.

With the low signal input produced by insects, it is not advisable to use a loudspeaker. With the highly sensitive crystal contact microphone, crystal headphones and the high gain amplifiers, the faintest sounds are audible.
PRACTICAL WIRELESS (25/9/37) SAYS:—

"Better on the score of sensitivity . . . . better tone-characteristic . . . . smoother . . . . thousands will be highly pleased with the extra quality which results from fitting this new speaker."

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"Good and bad sets will be improved by it. It is an important advance in speaker technique."

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TELEVISION CONSTRUCTOR AIDS
Details of Some of the Main Television Constructor Accessories which may Now be Obtained.

NOW that more amateurs are becoming interested in the television transmissions it is worth while discussing the various accessories which are available for experimental purposes. The modern television receiver may be divided up into four separate sections—the Mains unit, the Time-base Generator, and the two Radio units, one for Sound and the other for Vision. Into each of these sections components and valves such as are normally used for broadcast apparatus may be incorporated, but there are many special parts and valves which must be supplied. The radio section for sound may be disqualified as follows normal ultra-short-wave practice, whilst the time-base generator will also employ only standard components and valves except where a special gas-discharge tube is employed. This may be considered, however, as a valve and presents nothing out of the ordinary in its connection or mounting. The first consideration among the unusual or special parts required for the complete apparatus is the connection between the various chassis. The mains unit may be built to develop all of the voltages required in every section, and thus multi-cables will have to be employed for inter-connection. Apart from the fact that some interaction may be experienced if all of these cables are run in a single ‘bunch,’ there will also be difficulty in providing adequate insulation. The supplies for the cathode-ray tube will, therefore, be kept separate, and for the various leads high-quality flex or rubber-covered V.L.R. cables should be used.

Connectors
Multi-contact connectors will be needed on each chassis, and for these the Bulgin or the Belling-Lee components illustrated on this page may be used. Large diameter insulated sleeving may be slipped over certain leads to provide increased insulation, or rubber tubing such as is used in player pianos may be employed. Care will have to be taken to keep the various leads separated according to the voltage and are preferred by some experimenters. There are several advantages in the use of this type of rectifier for the very high voltage-low current supply which is required.

Special Valves
For the vision-radio chassis certain special valves are now on the market, amongst these being special diodes for the second-detector stage. Special I.F. transformers to provide the requisite band-width, or special chokes where choke-coupling is employed, are also now available from such firms as B.T.H., Sound Sales, Haynes Radio, Heywood, and other firms. Although ordinary valveholders
The Telephone Linked with Television

A s far back as 1929 when the first television exhibition was staged in Berlin in conjunction with the annual radio exhibition, the German Post Office demonstrated two-way vision and sound between two booths over a short length of line. A large spiral apertured disc was used at each end, the scanning section for transmitting operating on the spot-light principle and being located at the top section of the disc with simple photo-electric cells picking up the reflected light to generate the television signals. The bottom section of the disc acted as reproducer, giving a small and rather indistinct low-definition picture with the aid of a flat plate neon lamp. While admitting quite freely that the results obtained were crude, it showed a special form of development as far as the telephone associated with television is concerned, and this German appreciation of the ultimate coming, commercial and political future for such a scheme has never been allowed to lapse. Nearly three years later two-way vision and telephony was demonstrated to a higher degree of perfection in Paris between a studio in the Galeries Lafayette and the offices of the French newspaper Le Matin. The pictures seen by the persons talking were much clearer and brighter, the head and shoulders appearing as a back projected picture on a translucent screen 10in. by 5in. A crater type neon lamp functioned as the source of light modulated by the television signals with a mirror drum as the scanner. The transmitter still worked on the light-spot principle, but for the first time infra red rays were used to scan the sitters face, and in consequence the slightest trace of discomfort was experienced by those using the telephone in this way. The equipment for this French installation was designed and built by the Baird Company.

Later Developments

LITTLE more was heard until March, 1936, when the Germans brought into service a well-designed installation to operate between Berlin and Leipzig. The standard of definition employed was 180 lines per picture and 25 pictures per second, and this service has functioned continuously and become quite a profitable "side issue" to the German Post Office activities. Still not content with this, the co-axial cable has been extended to Nuremberg, a distance of approximately 25 miles, and shortly an additional section between Nuremberg and Munich will be opened for public use. Apart from the telephone calls, the direct relays of Nazi Party rallies will be undertaken over the public lines, and these later pictures will be shown in the public viewing rooms in some of the German cities. At the moment the repeater stations associated with the co-axial cable are positioned at approximately 21-mile intervals. This limits the signal frequency fed over the line to a figure capable of reproducing with the minimum of distortion the 180 line picture standard.

Steps are now being taken, however, to double the number of repeater stations and so enable the cable to pass the picture frequencies involved in Germany's new television standard of 441 lines, interlaced 50 frames per second. The 180 line scanner for transmitting the head and shoulders of the person telephoning is a highly efficient mechanical one employing a lens drum in lieu of the more simple apertured disc. To increase the peripheral spacing of the highly corrected lenses in the drum a double spiral is employed with a cam operated shutter and in this way a complete picture frame is scanned in two revolutions. This is the arrangement used in the light-spot scanner installed at Alexander Palace prior to the decision to employ electron cameras only. The picture of the person telephoning from the other end of the line is reproduced on a cathode-ray tube receiver so positioned that it can be watched in comfort by the person making the call. With all the modern developments of television which are now taking place so rapidly there is a long scope for the British Post Office to give careful consideration to a television-telephone in this country. It would bring Britain abreast of Germany in this particular sphere, while maintaining the leadership now enjoyed by this country in the realm of a public broadcast television service.
Televiews

Improved Make-up Technique

Readers who saw pictures of the artists taking part in television transmissions twelve to fifteen months ago were amazed at the amount of make-up required. Blue was a very predominant colour, red lipstick was the amount of make-up required. Blue was twelve to fifteen months ago were amazed at paint gave each individual a very grotesque appearance. This was necessary, however, owing to the colour responses of the photoelectricsurfaces then employed either in the photocells or camera electrodes, coupled with the relatively low degree of sensitivity. The maximum degree of contrast was essential if the resultant television picture reproduced on the cathode-ray tube receiver was to embody sufficient depth of light and shade to give pictorial value. Then again, studio lighting was very intense, with the result that artists felt very uncomfortable when endeavouring to lose any degree of nervousness on the occasion of initial broadcast. Technical improvements have now removed this "terror," however, and the conditions under which studio televising is carried out have changed considerably. Vivid colouring is no longer necessary, only delicate shading. Men are given a healthy tan with a liberal sprinkling of powder to reduce any beard effects. A careful study of lighting: both from the standpoint of candle power and distribution, coupled with improvements in the design of the cameras, particularly in connection with mosaic sensitivity, has been instrumental in bringing about these welcome changes. In many cases people have been televised without any make-up on at all, a step which becomes essential when well-known public personalities are persuaded to appear before the television camera either inside the studio or in the open air. Much remains to be done, however, but the progress made in twelve months is a happy augury for the future.

A Range Extension

The extension of the B.B.C. television service area well beyond the original predicted range is now an established fact, but many have conjectured as to the results that could be obtained if the Alexandra Palace Station power was increased and the aerial raised higher than at present. Answers to these questions will no doubt be forthcoming when the French station at the Eiffel Tower is in full swing. At the moment it is working at half its 30 kilowatt rating, while the aerial is about 60 per cent. higher than the mast at Alexandra Palace. It is not beyond the realm of possibility that the Paris station may be seen and heard on the South Coast of England. If so, viewers in that region will have an alternative programme, while if the French adopt the British picture standard the B.B.C. could relay by cable or directional micro-wave links of any of these programmes so that they could be re-broadcast from the London station. A directional aerial system with beamed reflectors may be essential at first, and experiments for reception are already in hand.

Cinema Television

During the last few weeks much has been said concerning the installation of large-size television screens in cinemas. This is a certain indication that big pictures, comparable in detail and brightness to that seen in any modern cinema, are making satisfactory progress. At present two widely different schemes of development are being made. One is electro optical, and the other is mechanical optical, and the absence of a side by side demonstration prevents any direct comparison between the results so far achieved. Another scheme about which little has been said of late is the intermediate-film receiver. For some reasons this appears to be a really sound idea, for it merely means the installation of a piece of equipment next to the standard film projector. This receiver would develop, wash, fix and dry standard 35 mm. film on which television pictures and the accompanying sound had been recorded, so that it could be fed straight into the projector head. The fact that there is a delay of some seconds between the televised event taking place and its subsequent portrayal on the cinema screen is negligible, and all the problems of picture brilliance and size would be solved at once. The main problem so far as cinema television is concerned at the moment does not appear to be a technical one, but is associated with the source of transmitted signals.

Miss Beryl Orde, the famous broadcasting star, amused while watching a television performance on the General Electric Company's table television set, which can be plugged into any existing radio set on A.C. mains. Priced at 35 guineas, it will bring television within the means of tens of thousands of listeners within 30 miles radius of Alexandra Palace and from other stations when they are established.

An experiment unique in the history of television and of football was made at the Arsenal ground recently when one half of the team watched by television the other members undertaking their routine training. From the mobile television unit in the Stadium, the pictures were transmitted to the Alexandra Palace, and from there were re-transmitted on the normal television wavelength and picked up on a Marconi telephone television receiver in the Directors' room in the East Stand.
Our Radiolympia Competition Result

What are the Most Important Features of the Modern Receiver?

In the Competition which was published in our issue dated August 28th last only 15 readers successfully forecast the order of the popular features of modern receivers as shown by the entries on the coupons submitted. Fourteen readers had one mistake each, and thus we have decided to add four more speakers to the 25 originally intended as prizes, and the following 29 readers will therefore each receive one of the latest W.B. Stentorian speakers in due course.

The following readers gave all-correct results:

F. Chilton, 37, Ewart Street, Saltney Ferry, Chester.
G. H. Greenwell, 19, Silver Street, Bradford, Yorks.
A. M. Hawkins, 11, Claverdale Road, Brixton, S.W.2.
S. Zebet, 12, Lubworth Avenue, Marcon, Blackpool.
A. S. Hughes, 3, Pelham Square, Brighton, 1, Sussex.
C. Lepthorn, 3, Brampton Road, Harringay, N.13.
Basil New, 12, Eastvale, Golders Green, N.W.11.
F. Opfer, 22a, Coronation Street, South Reddish, Stockport.
G. Rees, 3, Dunlop Terrace, Penicuik, Midlothian, Scotland.

NATIONAL (261.1 m. and 1,500 m.)

Wednesday, Oct. 6.—Princess Flavia, musical comedy programme.

Thursday, Oct. 7.—Death at Newtownabbey, a reconstruction of a famous Ulster crime in the Seventies, by Denis Johnston.

Friday, Oct. 8.—Contemporary Music Concert.

Saturday, October 9.—Music Hall programme.

REGIONAL (342.1 m.)

Wednesday, Oct. 6.—Instrumental programme.

Thursday, Oct. 7.—Princess Flavia, musical comedy programme.

Friday, Oct. 8.—A Farewell Flight over Blackpool: Organ recital from the Tower Ballroom; excerpts from concert parties from Feldman’s Theatre and the South Pier: Dance music from the Tower Ballroom and a variety act from the Palace Theatre and Pleasure Beach.

Saturday, Oct. 9.—Death at Newtownabbey, a reconstruction of a famous Ulster crime in the Seventies, by Denis Johnston.

MIDLAND (296.2 m.)

Wednesday, Oct. 6.—The Brass Band Movement in the Midlands—1. The Leicester Imperial Ball, preceded by a short account of the history of the Band.

Thursday, Oct. 7.—A Symphony Concert from the Town Hall, Birmingham.

Friday, Oct. 8.—Mary Webb, a programme based upon her life and work.

Saturday, Oct. 9.—The Musician at the Gramophone: A. Brent-Smith.

WELSH (373.1 m.)

Wednesday, Oct. 6.—A Choral and organ recital from St. Asaph Cathedral, St. Asaph.


Friday, Oct. 8.—Blodeuon, a dramatic cantata by Joseph Parry, from Tabernacl Chapel, Cardiff.

Saturday, Oct. 9.—Labour Management and its Problems, a talk.

WEST OF ENGLAND (285.7 m.)

Wednesday, Oct. 6.—Variety programme, from the Empire Theatre, Swindon.

Thursday, Oct. 7.—Song recital.

Friday, Oct. 8.—Concert in Camera—first rehearsal for a performance to be given in the year 1887.

Saturday, Oct. 9.—Orchestral programme from the Pump Room, Bath.

G. Randall, Royal Horse Guards, Windsor, Berks.
M. A. Smith, Cambridge House, Stanley, Pershore.
R. A. Turner, 21, Stewardstone Road, South Chingford, Essex.
J. Wann, Belmount Leuchars, Fife, Scotland.
V. J. C. White, Primrose Cottage, Langrove, Herefordshire.

The following readers had one mistake each:

O. Adams, 34, Dallis Hill Avenue, Cricklewood, N.W.2.
R. Bailey, 77, Knutsford Drive, Cliftonville, Belfast.
C. S. Brown, 31, Whitestone Road, Bermondsey, Middlesex.
L. Burman, 19, Green Lane, Loftus, Yorke.
R. Chamberlain, 2, Cardigan Street, Canton, Cardiff.
F. Heim, 5, Swan Road, Harrogate.
L. Hitchcock, "Brierley," Farm Close, Fetcham, Leatherhead, Surrey.
B. F. Jones, 20, Pagefield Road, Liverpool, 15.
J. Little, 26, Wilson Avenue, Kilmarnock, Scotland.
E. Reay, "Faih Haven," Newton Road, Tankerton, Whitstable, Kent.
V. E. Taylor, 13, Spring Gardens Terrace, Cardiff, Glam.
W. R. Taylor, "Glenview," Spot Lane, Ashford Road, Maidstone.
L. J. Trussell, 23, Oakfield Lane, Darford, Kent.
A. S. Woodley, 18, Duke Street, High Wycombe, Bucks.

NORTHERN (449.1 m.)

Wednesday, Oct. 6.—Orchestral programme.

Thursday, Oct. 7.—Variety programme from the Alexandra Theatre, Hull.

Friday, Oct. 8.—A Farewell Flight over Blackpool: Organ recital from the Tower Ballroom: excerpts from concert parties from Feldman’s Theatre and the South Pier; dance music from the Tower Ballroom and a variety act from the Prince Theatre and Pleasure Beach.

Saturday, Oct. 9.—Announcing commentary on the second half of the Rugby League match, Salford v. St. Helens, from the Salford Football Ground.

SCOTTISH (391.1 m.)

Wednesday, Oct. 6.—Scottish Dances Music.

Thursday, Oct. 7.—Dance Music programme.

Friday, Oct. 8.—Meat and Ale, a By-Rev Ivy, from the Tower, Newry.

Saturday, Oct. 9.—Recital of Scots Songs.

NORTHERN IRELAND (307.1 m.)

Wednesday, Oct. 6.—Dance music.

Thursday, Oct. 7.—Song recital.

Friday, Oct. 8.—Organ recital from the Ritz Cinema, Belfast.

Saturday, October 9.—Death at Newtownabbey, a reconstrucion of a famous Ulster crime in the Seventies, by Denis Johnston.
Making Small Spanners

THE constructor is often in need of one or two small spanners, and very useful ones can easily be made as shown in the accompanying sketch. An ordinary spade terminal is taken, and the insulation removed, after which a metal rod of suitable length is fitted tightly into the terminal stem. The opening in the spanner can be widened to the required width by means of a file.—M. Tirox (Middleton).

Home-made Potentiometers and Resistances

EFFICIENT variable potentiometers and resistances of high value can easily be made from the wire-wound, five and four hundred ohm types, which were much used some years ago. After taking the resistance strip from the circular holder, straighten it out on a flat metal surface. Then, with a not too sharp chisel, cut the turns of wire along the centre, leaving about \( \frac{1}{8} \) in. uncut at each end. The wire, after cutting, will not loosen, but will hold fast to the groove made in the fibre when cutting the turns. Fix one end of the strip to its holder—groove inside—then, as the strip is bent round, fill the groove with powdered black lead or graphite. When the other end of the strip is fixed in position, the powder will be forced into the groove to make good contact with the ends of the cut wires. By experimenting with the amount of powder used, various values can be obtained. Also, a "graded track" potentiometer can be made by suitable distribution of the powder along the groove.—ALEX DAY (Edmonton).

Low-loss Switching

THE efficient switch, shown in the accompanying sketch, can easily be used with a control knob and a cork together with the filament support and glass pinch from a burnt-out electric lamp. A few screws, and a brass strip will also be required, and as these parts are usually found in the junk box, the switch can be made in a very short time. By carefully breaking away the glass globe the pinch can be removed quite easily and the rest of the job is just a case of fitting together and screwing the parts into position.—A. CARK (High Wycombe).

A Small Microphone

THE accompanying illustration shows a simple and efficient microphone which I have constructed. It is made from an empty dentifrice tin, a rubber end used for gas tubing, and a cellophane jam cover, together with some carbon granules, and a wander plug. The tin should be thoroughly cleaned and a \( \frac{1}{8} \) in. hole drilled in the centre of the lid. In the base a hole \( 1 \frac{1}{8} \) in. in diameter can be cut, and this can easily be done with an old wood chisel. Take the rubber end and cut it about \( \frac{1}{4} \) in. from one end; push this piece of tubing through the \( \frac{1}{8} \) in. hole in the lid. Damp the cellophane cover slightly; place it between the lid and base, and allow it to set for an hour or so; the cellophane will then have stretched tightly, forming an excellent diaphragm. The carbon granules can be transferred through the rubber end in the lid, until they are packed tightly against the diaphragm. Insert a wander plug in the rubber end, so that it touches the carbon granules, and solder a wire to the lid. Take a wire from the wander plug and connect the two wires, via battery and transformer, in the usual way to the p.n. terminals on the receiver. Lastly, four hooks can be soldered on the lid so that the microphone can be slung on a stand.—W. E. CAVANAGH (Belfast).

A Novel Sheet-metal Bender

THE accompanying sketches show how a novel sheet-metal bender can be contrived. The materials needed are 1 length of \( \frac{1}{8} \) in. channel iron, \( \frac{1}{8} \) in. thick; 1 length of \( \frac{1}{8} \) in. angle iron, \( \frac{1}{8} \) in. thick, 2 small clamps, \( 1 \frac{1}{4} \) in. inside measurement, and two screws, to hold the angle iron to the bench. The two holes should be drilled near the ends of the angle iron to avoid having to bend the metal sheet over screw heads. Note that the ends of the screws for the clamps should not be pointed. By this means you have a convenient and inexpensive method of completing what might have been a difficult job.—J. S. TAYLOR (Lincoln).
Full Constructional Details of the Latest Three-range 4-Valve Battery-operated Straight Receiver

I HAVE been connected with wireless for so many years that I have grown tolerant of those whose job it is to write a few odd notes in the daily papers on wireless, and who sign themselves "The Radio Experts." There was a time when their outpourings were the cause of a rise in temperature beneath that band of linen which encircles that portion of my anatomy in which are located the larynx, the epiglottis, the uvula, and the odontoid peg. If the readers of daily papers are so critical, and so helpfully critical, as the readers of my journal, those journalists have heard all about their pecadilloes, and I hope that with such multitudes of counsellors, these experts eventually obtain wisdom. Time and experience narrow the outlook, and ultimately—sooner or later—we learn to tolerate fools gladly. A statement I read in the paper the other day, however, both irritated and amused me. It irritated me because no one with a grain of grey matter within their cranium could possibly have thought of anything so fantastic. Experts seem to rush in where designers fear to tread, and I can only presume that the main qualifications of some experts is that they know nothing of the subject upon which they claim to be experts. It amused me because it is just possible that the expert was pulling his readers' legs. His suggestion was that no one should require to listen to more than three stations, and that every listener should be satisfied with a receiver with a dial similar to an automatic telephone coupled up to the telephone wires. When you wish to tune in one of the three stations you should tune in to No. 1, 2 or 3, as the case may be.

In the same issue of this paper a letter to the Editor was published suggesting that radio would be far more enjoyable, now that all-wave receivers were bringing the voices and the dialects of every race in the world into our homes, if a universal language such as Esperanto were taught and that all programmes were broadcast in Esperanto. These two impossible suggestions, or suggestions impossible of fulfilment, cause me to reflect upon the vast number of requests I receive for a design incorporating some specific feature not to be found in previous designs I have sponsored. I know that every design I publish will not please every one of my readers. I try to please the majority of them. I also know that there will still be requests for a particular circuit not yet published when Gabriel sounds his last rally at the crack of doom. Yes! And I expect that when I am ascending—descending—to greet St. Peter I shall be confronted with an enormous volume of complaints he has received from readers whose requests have been unsatisfied. Or, maybe, I shall be in the goodly company of those who have built my portable, and who may wish to tune into a transmission from the Styx or the refraints from Paradise.

I am not hopeful that even at that time listeners will be satisfied with one programme! These thoughts are engendered by the fact that when I publish a three-valve circuit I receive many requests for a four-valve design, and when I publish the latter many readers require a three or a six. It is quite right that they should express their wishes, for they are filed and when they reach sufficient volume the design is produced. One such design which has been accumulating a steady demand during the past six months is the receiver which for want of a better name I have termed the Corona All-Wave Four.

Among the Romans a Corona was a crown bestowed for distinguished services, and it is my hope that you will award it your praise for the excellent service it will render to you. I do not subscribe to the belief that it is more difficult to christen a set than it is to design one, and sets are given titles more for convenience of reference than to epitomise their design or performance. The Corona Four is a receiver, which, as I have said, has been designed at your express request of many readers. It is a great improvement on the very successful Limit Four produced last year. This bowing to popular demand had only one, tuned circuit on the short-wave band, and publication of the design was followed immediately by a request for a four-valve covering the three wavebands, but having two tuned circuits on the three...
wavebands. Accordingly, this has been incorporated in the Corona.

An examination of the circuit reveals that the four valves employed include an H.F. pentode as H.F. amplifier, a triode as detector, and triodes as L.F. amplifier and output valve respectively. There are two tuned circuits with H.F. transformer coupling between H.F. valve and the detector to ensure a high degree of selectivity. The receiver covers three wavebands—19 to 48 metres, 200 to 550 metres, and 900 to 2,100 metres. Two tuned circuits on the three wavebands are employed as stated, whilst resistance-coupling between the detector and L.F. valve is employed to ensure high quality. You will observe that the detector-anode circuit is adequately decoupled to avoid L.F. instability, whilst a Ferranti transformer couples the L.F. and output valves. The output feeds a permanent-magnet speaker which may be instantaneously and accurately matched to the impedance of the output valve. The coil unit has the wave-change switch incorporated, a further improvement on the Limit Four.

Construction
It will be noted in the list of components that the metal-surfaced chassis is supplied with the valve-holders. This removes the most difficult part of the preliminary constructional work, and the remaining holes required (for the inter-connecting wires) may easily be drilled with an \( \Phi \) in. twist drill. There is only one small point which requires to be mentioned when dealing with the construction of this receiver, and that is concerning the holding-down screws for the condenser, coils, transformer, etc. The metal surface of the chassis is of fairly thick aluminium, and unless a clearance hole is first drilled to accommodate the plain shank of the screws it will be found that the screw head will be twisted off. Therefore, mark out the positions of the screws carefully by pricking through the lugs on the various parts, and then with an \( \Phi \) in. drill cut through the aluminium only. As soon as the wood appears, cease drilling and an ordinary awl may then be used to start the screws into the wood.

Before mounting the coils, transformer, variable condenser and component brackets some of the wiring can be completed and, therefore, the most comfortable plan in building this set is to mount the valve-holders, fuseholder, and terminal strips in that order first, when the chassis may be inverted and will rest comfortably on the workbench whilst the various sub-chassis components are wired into position. Where leads pass through the chassis they may be cut off to sufficient length and led through the relative hole, and afterwards cut off accurately. Another plan, and one which is favoured by many constructors, is to mount every component first and then carry out the wiring. In this case, to enable the chassis easily to be inverted from time to time during wiring, two lengths of wood should be screwed to the side runners, of sufficient length to clear the condenser, and the set will rest on these when inverted and thus stand firm.

Wiring
The wiring should be carried out with a fairly heavy gauge wire—say 18 or 20 bare tinned copper. Make certain that all leads are fairly rigid and stretch them from point to point to avoid difficulties on the short-wave band which might be introduced by wires which move when subjected to vibration. Where the leads pass through the chassis it may be advisable to take some precaution to avoid short-circuits and there are two methods of doing this. Firstly, lengths of insulated sleeving may be slipped over the wires of such a diameter that they wedge into the hole and thus prevent the wire from touching the edge of the metal. A simpler plan is to remove the metal round the hole, either with a counter-sink bit, or by scraping round with a penknife. The insulated sleeving is the most business-like method and lends a finished appearance to the set. The points marked M.C. on the blueprint indicate that the wires at that point are in contact with the metal chassis. The method of doing this is to take a long bolt and two fairly large washers which may then be used to hold in place the wires referred to. On the coil units the two M.C. points will be served by the screws used to hold down the coil screens. Remember, in all of these cases, that the ends of the wires should be turned in a clock-wise direction so that when the screws are tightened up the wires will not be pushed out. If the ends are turned in an anti-clockwise direction, as the screws are tightened the ends of the wires will be pushed out from between the washers or screw-head.

19-48 : 200-550 : 900-2,100 Metres

An Important Point
In the case of the gauged condenser, it is important to note that the two leads which come up through holes 4 and 6 are joined to the tags in contact with the fixed sets of plates. There are two contacts on the underside of the condenser chassis for this purpose, and they are in the same electrical relationship as the tags on top of the condenser, to which the leads from terminals 8 on the two coil units are joined. By making use of the lower tags you avoid the necessity of running long leads up from the chassis to the top of the condenser. It is also necessary, if this is your first attempt at receiver construction, to be on your guard when wiring the five leads to the combined volume control and on-off switch

October 9th, 1937
PRACTICAL AND AMATEUR WIRELESS 97
FREE BLUE PRINT IN THIS ISSUE!

It will be noted on the blueprint that three connections are made to the top and three to a lower part, and the leads from holes 7 and 8 and from the chassis (M.C.) are joined to the switch contacts. These appear on the raised ebonite portion attached to the centre of the component. Round the edge of the larger part of the component are three further lugs and these are joined to the volume control, and to them leads from holes 9 and 10 are joined, whilst the right-hand contact (viewing the component from the panel) is connected to the centre switch terminal and thus to the chassis. If this method of connection is not strictly adopted the control will either work backwards, or may not function at all. If the switch and volume control leads are reversed, the set will not function and you may burn out the component, whilst if the precaution is necessary, and that is to make certain that resistance Rs, across the G and G.B. terminals of the L.F. transformer, is kept sufficiently high above the metal surface of the chassis to avoid the metal ends coming into contact with the metal. Cut off the ends of the resistance wires so that it is held quite tightly across the bakelite casing of the transformer.

Battery Leads

The battery leads are indicated on the under-chassis view by lines with arrow-heads, and these are passed through a hole in the rear chassis strip. To avoid the possibility of these wires being pulled from side of the chassis and solder the end of the resistor (R6) and of the G.B.—1 lead to the screw head. Obviously the screw should be so short that the point does not

reach maximum when in its maximum clockwise position.

When mounting the two coils make certain that they are both the right way round before placing the switch control rod through them. The blueprint shows the position quite clearly, by the marking on the top of the cases. One further word of

tance in the case of the lead for G.B. negative 1, as a resistor is joined to it and may be broken away. In this particular case you may, if you are at all doubtful concerning the strength of your connection, drive a short screw into the under-

FREQUENCY GUARANTEED RECEPTOR

FRANK WONG

Guaranteed

PRACTICAL AND AMATEUR WIRELESS

October 9th, 1937

FULL LIST OF COMPONENTS

ON PAGE 100

Theoretical circuit employed in the

Another view of the completed
THE WORLD AT YOUR FINGER-TIPS!

Operating Notes

The batteries required for this receiver are one L.T. accumulator of 2 volts for the filaments, one 120-volt H.T. battery for the supply of high-tension and a 9-volt grid-bias battery. The leads are clearly indicated on the blueprint and are inserted into the appropriate sockets in the batteries. Spade ends are fitted to the L.T. leads and these are joined to the positive and negative terminals on the accumulator. Remember that the black terminal is negative and the red terminal is positive. The G.B. positive 120-volt socket on the battery, whilst H.T. 1 is the lowest voltage and should be inserted into a point somewhere between 60 and 80 volts. This position may be found critical and therefore experiments should be undertaken when the receiver has been found to function satisfactorily, with a view to finding the best working voltage for the screen of the H.F. valve. More will be said about this later. H.T. 2 is the voltage applied to the first L.F. valve and this may be at a point round about 100 volts. This voltage will be bound up with the grid bias applied to the valve.

plug is inserted into the positive socket on the G.B. battery, and the G.B. —3 plug is inserted into the 9-volt socket at the other end of the battery. G.B. —1 should be plugged into the 3-volt socket and the G.B. —2 plug into the 6-volt socket for the time being, although at a later date you might find that these can be modified to produce better working results. The consumption of H.T. depends upon and thus the maker’s data sheet, or published curves should be studied to make certain that the correct bias is employed with the H.T.

Tuning

So much for the application of the various working voltages and the receiver may now be tested out. Remember, however, that all preliminary tests will subsequently form a basis for the adjustment of such items as

A SELF-CONTAINED ALL-WAVE BATTERY RECEIVER OF MERIT

the grid-biasing voltage which is employed and thus it is wise to use the highest value of bias consistent with good signal strength. The H.T. plugs are inserted in the following order: H.T. 3 is the maximum voltage and should be connected to the.

H.T. and G.B. and therefore do not expect at the first trial to pick up stations from every part of the world. To make certain that all wiring is correct, you can adopt the procedure of going over the blueprint with a pencil, marking out the wires as they are put in, or can check each wire individually when the receiver is ready for