

# Practical and Amateur Wireless

**3<sup>D</sup>**  
EVERY  
WEDNESDAY

Edited by F.J. CAMM

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NEWNES  
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July 1st, 1939.

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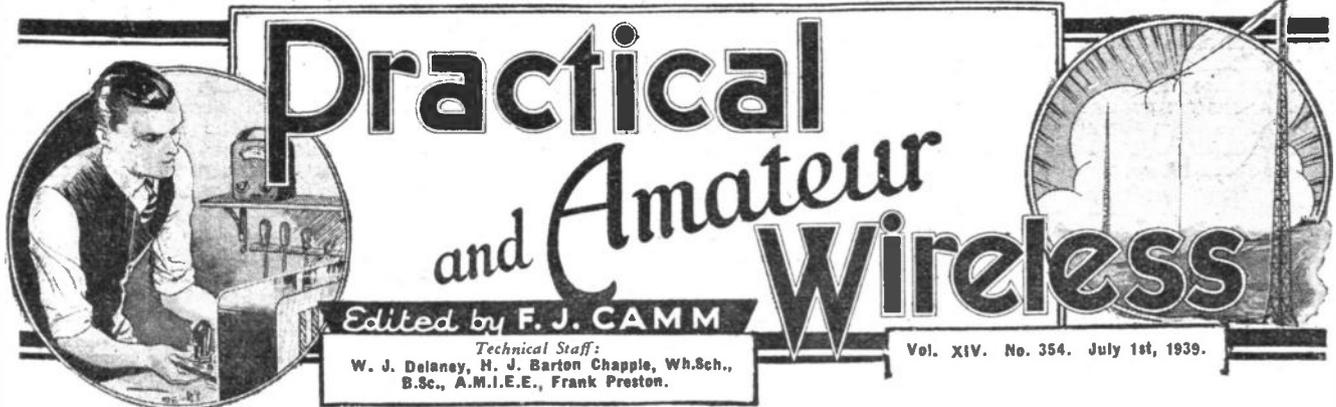
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# CAR-RADIO EXPERIMENTS—See Page 374



## Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:  
W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

Vol. XIV. No. 354. July 1st, 1939.

## ROUND *the* WORLD of WIRELESS

### Electricity From Wind Power

ALTHOUGH it is proposed to enable everyone in this country to have access to mains power for lighting, heating and other purposes, there are still hundreds of places where no such facilities will be available for a long time. There are also many places in the country where the mains supply cables pass close to houses which are unable to make use of the supply, owing to the fact that the district is not provided with the necessary feed from the main supply. To listeners in those places the problem of battery charging is a serious one, as they may have to travel many miles to the nearest service station, and on this account their hours of listening are seriously curtailed. The question of using a mains receiver to obtain the greater advantages which such a receiver offers is, of course, right out of the running. But in such localities it is possible to obtain power for battery charging, or for operating a mains-type receiver, as well as lighting the house by means of a generator driven through a small windmill device, and in America and Canada such apparatus is very common in the wilder parts. Although we do not get winds in this country at such high levels as on the American continent, sufficient power may be obtained with suitable apparatus to fulfil the purposes mentioned, and we give in this issue some further details of the methods of solving this wind-power problem. Further articles will appear on the subject from time to time.

### D.F. Reconstruction and Changes

THE Lorenz "blind approach landing" installation at Croydon airport is being reconstructed, and during the period for which this will be out of action (about two months) the beacon which is installed at Heston Airport will operate on the Croydon frequency—33.33 mc/s for the main beacon and 38 mc/s for the inner and outer marker beacons.

### Arabic Programme Organiser

THE B.B.C. announce that Mr. A. E. H. Paxton has accepted the appointment of Arabic Programme Organiser in the Overseas Department of the Corporation. Mr. Paxton was educated at Eastbourne College and Oxford, where he obtained honours in Oriental languages and gained the James Mew Scholarship in Arabic. He was English master in

Egyptian Government Secondary Schools and afterwards Lecturer in the English Department, Faculty of Arts, at the Fuad I University (then University of Egypt).

### Swiss S.W. Stations

THE short-wave station at Schwarzenburg, Switzerland, is carrying out tests on eight different wavelengths, 11.70, 13.94, 16.87, 19.60, 25.28, 31.46, 48.66, and 49.55 metres. It is believed that directional aerials are being employed on certain of these wavelengths.

for July 12th. That night he will introduce to Regional listeners something like a dozen further "finds" that he has made in his unending search for talent. Usually he brings his discoveries to one of the studios at Broadcasting House for their programme, but on this occasion the broadcast will take place before an audience from the stage of the Palace Theatre, Plymouth.

The programme will be his first from the West Country, and it will be broadcast also on the West wavelength. It will be a surprise show, and the names of the artists will not be revealed in advance.

### Collecting

A SERIES of six fortnightly talks has been planned round the fascinating subject of "Collecting." It is intended not merely to deal with the obvious subjects such as stamps or coins, although these probably will be included. There is immense scope in such a series since the collecting mania strikes people in such a variety of forms, and listeners, attacked by what is well known to be a most contagious and virulent disease, may well find themselves ardently collecting such apparently useless objects as collar-studs or star-fish. The first talk in the series will be given on July 18th.

### Hay Harvest

A FARM on the slopes of the Cotswold hills has been visited by the B.B.C. Mobile Unit during hay harvest to record impressions of the scene. On July 7th, Sid Carter, of Evesham, and David Gretton will give descriptions and interview farm people in order to convey to listeners a picture of the various operations in connection with hay harvest, including stacking and thatching, and also to obtain the reminiscences of older men who can remember when practically all the work was done by hand.

### Midland Composers Concert

THE last of the six concerts of works submitted and accepted under the Midland Composers' Scheme will be broadcast on July 2nd. Eric Warr will conduct the B.B.C. Midland Orchestra in compositions by A. Hawthorne Baker, of Coventry; Frederick Bye, Birmingham; cellist; George Radford Williams, of Coventry; and C. W. Orr, of Painswick, Gloucestershire. Mr. Radford Williams is a self-taught musician.

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### Television and the Cinema

IN view of the possibility of television being a definite part of cinema installation in the future, a special series of free instructional courses for cinema projectionists is being given by Baird at a special section of their factory at Sydenham. Four lecturers will deal with the theory and practice of big-screen television, and at the end of a two-weeks course the students will undergo a test.

### New "Discoveries" by Carroll Levis

THE name of Carroll Levis, inseparably associated with radio "discoveries," again appears in the B.B.C. variety schedule

# ROUND the WORLD of WIRELESS (Continued)

## New Stations for the Netherlands

IN addition to the Lopik transmitter now under construction, a contract has been placed by the Dutch broadcasting organisations for another high-power station. The transmitters will eventually work on 355.9 m. (843 kc/s) and 413.2 m. (726 kc/s) respectively.

## "A Rose by Any Other Name"

ACCORDING to an official announcement made in Germany, the Prague (No. 2) station at Melnik (269.5 m.-1,113 kc/s), is to be known in future as *Reichssender Boehmen*, and that of Brno (325.4 m.-922 kc/s) as *Reichssender Maehren*.

## INTERESTING and TOPICAL NEWS and NOTES

### Also Another at Caracas

TO commemorate the centenary of the Catholic paper *La Religion*, a public subscription has been opened at Caracas (Venezuela) with a view to presenting it with a powerful broadcasting station to bear its name.

### The Spanish Stations

Transmitters now regularly on the air are: Saragossa and Valencia, 352.9 m. (850 kc/s); EAJ2, Madrid, and EAJ5,

## Radio-telephone Service with Ships at Sea

THE Postmaster-General announces that the radio-telephone service with ships on the Atlantic route has been extended, as from Saturday, June 17th, to the new liner *Mauretania*.

The charge for a person-to-person call will be 36s. for three minutes when the ship is within approximately 1,000 miles of Land's End, and 72s. for three minutes at other times; the charges for each additional minute will be 12s. and 24s. respectively.

## July Out of Doors

THE many enthusiastic followers of William Aspden, who broadcasts in such a likable manner on out-of-doors subjects, will be glad to know that he will soon be at the microphone again. "July Out of Doors" is the subject for his talk on the Northern wavelength on Monday evening, July 3rd.

## "New Brighton Night"

VICTOR SMYTHE is putting on a "New Brighton Night" on July 6th, with broadcasts from the resort's Tower Ballroom, where the Playboys Dance Band will be busy; from Frank A. Terry's show; "Pleasure on Parade," at the Floral Pavilion; and from the variety bill at the Tivoli Theatre.

## Brass Band from the North-east

ONE of the best of the many good miners' brass bands in the North-east, the Ravensworth Colliery Band is to broadcast from the Newcastle-on-Tyne studios on Sunday afternoon, July 2nd. Before it was taken over by the local (Ravensworth, Co. Durham) miners' lodge in 1933 this was known as the Birtley Town Band. Through the lodge, the band is very well supported by the colliers of the Anne and Betty Pits, who pay a weekly levy to it.



Members of the Sudanese Government Departments are here seen in the Control Room at Broadcasting House recently, when they made a tour of inspection.

## Argentine's Fonopost

THE Ministry of Posts and Telegraphs at Buenos Aires (Argentine Republic) has authorised the establishment of a correspondence service to be known as "Fonopost," by which electrical recordings of verbal communications can be forwarded through the post as ordinary mail. The sender registers a message up to 200 words in length through a microphone placed in special kiosks installed in various parts of the city; it is recorded on an unbreakable disc which can be reproduced on any ordinary gramophone instrument. A strong envelope is supplied with the record, the cost of postage being fixed at 1 peso for the Argentine, and slightly more for foreign destinations. If the service proves successful it is proposed to extend it by permitting the sender to secure such recordings through a telephone transmitter in his own home. By this means time would be saved, as the resulting record, duly addressed, would be despatched direct to its destination by the postal authorities.

## More European Stations?

THE *Plan de Montreux* allocates the channels 219.6 m. (1,366 kc/s) to the Principality of Monaco, and 198.7 m. (1,510 kc/s) to the little State of Liechtenstein, both of which propose installing transmitters in the near future.

Seville, 410.4 m. (731 kc/s); EAJ1, Barcelona, 377.4 m. (795 kc/s); EAJ15, Barcelona, 293.5 m. (1,022 kc/s); EAJ7, Madrid, 309.9 m. (968 kc/s); EAJ8, San Sebastian, 233.2 m. (1,286 kc/s); Burgos, 238.5 m. (1,258 kc/s); Albacete, 201.7 m. (1,487 kc/s); Santiago, 201.1 m. (1,492 kc/s); Alcala and Santander, 200 m. (1,500 kc/s).

## Them's Our Sentiments

SINCE the annexation by the German *Reich* of the Lithuanian broadcasting station at Klaipeda, the name has been altered to *Reichssender Memel*, and the call-sign is now DAM, which doubtless also expresses the feelings of the inhabitants of that city!

## Lord Halifax to Broadcast

THE speech by Lord Halifax at the Annual Dinner of the Royal Institute of International Affairs, which takes place at Grosvenor House, will be broadcast in the National programme on June 29th at 9.15 p.m. Lord Astor, who will introduce Lord Halifax, will also be heard.

## Variety from the North

MAE BAMBER, Laurie Howard and Les Crossley and his Harmonica Rascals will be the artists of a twenty-minute Variety programme on the North Regional wavelength on Saturday, July 1st.

## SOLVE THIS!

### Problem No. 354

Matthews had an A.C./D.C. receiver which gave very good results and which he used on his A.C. supply. He changed his address to a district which was supplied with D.C. and when he connected his receiver to the supply he could obtain no signals. He thought that it had been damaged in transit and returned it to the makers, but it was sent back marked O.K. He tried it again but could still obtain nothing on it. What was wrong? Three books will be awarded for the first three correct solutions opened. Entries should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 354 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, July 3rd, 1939.

### Solution to Problem 353

The wire which Jackson found in his spares box was resistance wire and thus the coil which he wound for his wave-trap was heavily damped and the tuning was accordingly very flat. This accounted for its failure to function in the recognised manner.

The following three readers successfully solved Problem No. 352 and books have accordingly been forwarded to them:

H. V. Kerrick-Walker, 59, Holywell Avenue, Monkseaton, Northumberland; J. Stewart, 72, Deane Road, Liverpool, 7; H. G. Reed, 298, Malden Road, Cheam, Surrey.

# WIND-DRIVEN CHARGING PLANTS

## Further Notes on the Construction of Windmills for Driving Generators for Accumulator Charging or Receiver Operation

**I**NCREASING interest is being shown in the design of wind-operated chargers, and some very ingenious ideas have been put forward by various readers in connection with this subject. As already explained in these pages, the basic idea is to erect a mast upon which an ordinary car generator may be mounted, and this is operated through gearing from a small windmill device. There are thus three main problems—the design of the windmill, the method of driving, and the method of mounting so that the windmill may always face into the wind. The generator is a standard device but is available in many different patterns. One of the simplest ideas is to pay a visit to a car-breaker's yard, where generators may be picked up from 10s. upwards. The same yard will also be able to supply gearing suitable for connection between generator and windmill. With regard to the generator, the 12-volt type should be selected and if possible the appropriate cut-out should be obtained at the same time. In some cases readers who have tried out the device find that a 6-volt cut-out is to be preferred. From details which have been submitted by various readers the following data may be summarised.

### Windmills

The best form of drive is undoubtedly a large aeroplane type propeller, but this is expensive and, unfortunately, Government surplus of this type is not now readily available. A good carpenter could make up a suitable prop. and a length of about 3ft. to 4ft. for each blade is most satisfactory. If you wish to make a really reliable propeller for yourself one of the best plans is to make it in laminated form, obtaining  $\frac{3}{4}$ in. boards 6in. wide by 6ft. in length. These should be thoroughly cleaned and glued together, afterwards drilling at various intervals and pinning with short pins made from  $\frac{1}{4}$ in. dowel rod. The assembly should be put under firm pressure whilst the glue hardens. The blades should then be marked out and carved, checking the pitch and cross-section at intervals, and to ensure both halves being properly matched templates should be cut for the various sections from stout sheet metal. The work is tedious but a good job can be made with the exercise of a little patience, and when approaching finality the propeller should be carefully balanced by drilling the centre and placing on a spindle locked to the workbench. Perfect balance is, of course, essential to avoid vibration and to ensure perfect starting in the lightest breeze. A simpler windmill can be made from sheet metal cut to a number of small blades, bolted to a disc of metal as indicated in the short constructional details at the end of this article, and as illustrated in Fig. 2.

### Gearing

The next problem is the drive between propeller and generator. The standard timing gear may be obtained with helical gears having a ratio of 2 to 1 and these are quite useful. The only difficulty is that of providing lubrication and an

enclosed oil-bath may be difficult to arrange. This may be overcome by using bicycle gearing and chain, either the standard chain-wheel and rear sprocket, or two rear sprockets being employed, according to the gear ratio needed. When using a chain drive the tension may be easily adjusted, the best method being to mount the

proof conduit or weatherproof covered wire used, and the cut-out should be mounted on the mast or as near to the unit as possible.

### The Mast

For a support either a built-up lattice mast or a metal tubular structure may be used. In either case, as the unit has to be free to rotate, a tubular support is needed and will therefore have to be mounted in the top of a lattice or similar mast. Standard 2in. electrical conduit is suitable for the purpose, and by using the 1-in. material for the main support, this may be dropped inside the larger diameter material and will give a free movement. One interesting suggestion which has been made is to cap the lower end of the large diameter tube and to place inside three large ball-bearings. These should be of such a size that they nearly touch in the centre, and then when a fourth similar ball is dropped in it will ride on the other three, and then by placing a disc over the end of the small tube and dropping this in it will turn freely on the top ball. Furthermore, it will then be possible to take one part of the electrical circuit from this, provided that the balls are a good fit.

To keep the unit into wind a tail must be employed, and again standard small bore electrical conduit or gas piping may be used to support this. Screwed joints enable it to be locked to the main part of the assembly, and it may be sawn through for part of its length with a hacksaw blade, so that the metal tail may be let into the rod and then bolted in position. Weight is not necessary in this position, but as large a wind-deflecting area as possible should be obtained. It may be cut sail-shape, or merely shaped similarly to the flight of an arrow. A length between two and three feet, with a width of about 12 or 18in. should be sufficient, and it should be about 2 to 3ft. behind the pivotal point. It is obviously impossible to deal with all of the points of construction in one general article, but it is hoped that the foregoing remarks will assist those who wish to undertake experiments in connection with this type of apparatus, and in the meantime we are preparing constructional details of a definite design which will be published in due course. In the meantime the following are the main details of one such unit which has been made up by one of our readers, and he claims that this is giving very good results.

In this case the fans are made from zinc sheeting, fastened to an old fan taken from a motor lorry. This is of the ball-bearing type, and in turn is coupled to a 12-volt car dynamo. On the rear of the fan is a large sprocket wheel with 106 teeth, and this is cut from a sheet of boiler plate, with four large holes in it to reduce weight. It is bolted to the fan, and addi-

(Continued on next page)

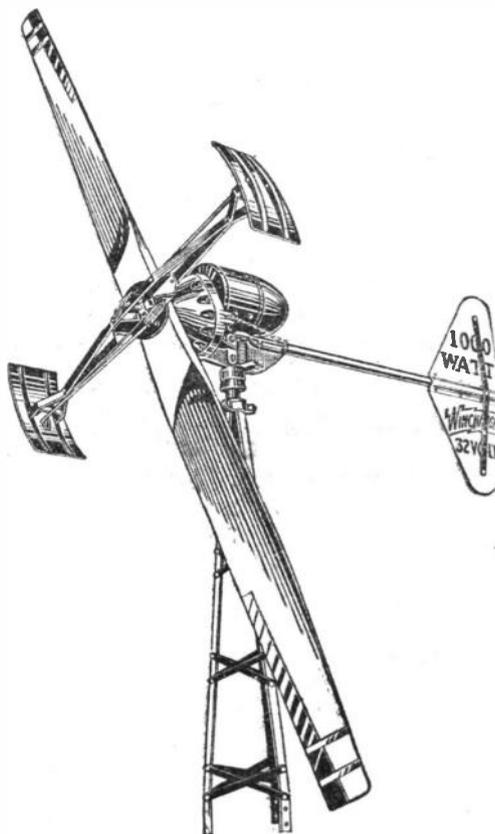


Fig. 1.—The American "Wincharger," which is obtainable from Messrs Gordon Equipments, Ltd., in this country.

generator on a sliding bracket. From some metal yards it may be possible to obtain larger gear wheels, but a useful limit may be set by the weight of the entire assembly.

### Electrical Connections

The next and most important point is that of obtaining the electrical pick-up from the generator. As the head of the device must turn in the wind it is obvious that a wiping contact must be used as the head must be free to rotate continuously in every direction. A slip ring is one way of arranging for the contacts, using spring-loaded brushes for contact, but they must be totally enclosed against weather effects. Rings of copper or brass, with copper gauze or carbon brushes, are obtainable for standard electrical purposes and may be turned to account in this connection. They should preferably be mounted horizontally and well greased and enclosed in a weatherproof box. The leading-out wires should be taken through weather-

# IMPORTANT BROADCASTS OF THE WEEK

**NATIONAL (261.1 m. and 1,500 m.)**  
 Wednesday, June 28th.—Irving Berlin programme, relayed from America.  
 Thursday, June 29th.—Speech by Lord Halifax.  
 Friday, June 30th.—More than Murder, by Norman Edwards: The Cruising Family Robinson by Mabel and Denis Constanduros.  
 Saturday, July 1st.—Music Hall.

**REGIONAL (342.1 m.)**  
 Wednesday, June 28th.—Organ recital, from St. George's Chapel, Windsor.  
 Thursday, June 29th.—Square Pegs, a domestic comedy by Lionel Brown, from Midland.  
 Friday, June 30th.—Stanelli's Crazy Cruise No. 2.  
 Saturday, July 1st.—Paul Jones, feature programme.

**MIDLAND (296.2 m.)**  
 Wednesday, June 28th.—Orchestral Concert, from Reichssender, Saarbrücken: Franz Lehar conducting.  
 Thursday, June 29th.—Square Pegs, a domestic comedy, by Lionel Brown.

Friday, June 30th.—Mr. Ponsonby's Fairy, a fantastic comedy with music.  
 Saturday, July 1st.—Orchestral and choral concert.

**WELSH (371.1 m.)**  
 Wednesday, June 28th.—Welsh Chamber Music.  
 Thursday, June 29th.—A Welshman's Calendar: June.  
 Friday, June 30th.—Spirit of Youth: Orchestral programme.  
 Saturday, July 1st.—The Urdd Olympic Games: An eye-witness account, from the Gnoll Field, Neath, Glamorgan.

**WEST OF ENGLAND (285.7 m.)**  
 Wednesday, June 28th.—Orchestral Concert, from Reichssender, Saarbrücken: Franz Lehar conducting.  
 Thursday, June 29th.—Orchestral programme, from the Winter Gardens Pavilion, Weston-super-Mare.  
 Friday, June 30th.—Holidays in the West: presenting summer on the coasts of Devon and Cornwall.  
 Saturday, July 1st.—Dance Cabaret, from the Polygon Hotel, Southampton.

**NORTHERN (449.1 m.)**  
 Wednesday, June 28th.—Southport Cutting! an entertainment tour.  
 Thursday, June 29th.—Public Enquiry: Second of new series from public meetings.  
 Friday, June 30th.—Morecambe Merriment: entertainment tour.  
 Saturday, July 1st.—Saturday Concert Hall.

**SCOTTISH (391.1 m.)**  
 Wednesday, June 28th.—Night Out in Perth: a programme from the Ancient Capital of Scotland.  
 Thursday, June 29th.—Old Glasgow Favourites.  
 Friday, June 30th.—Collaborate Concert with Sweden.  
 Saturday, July 1st.—Another Night at Knowles: A Bothy Concert.

**NORTHERN IRELAND (301.1 m.)**  
 Wednesday, June 28th.—Chamber Music.  
 Thursday, June 29th.—Irish Rhythms: Orchestral concert.  
 Friday, June 30th.—Granny's Birthday, a play by Mase Haughton.  
 Saturday, July 1st.—Flute and Pipe Bands.

## WIND-DRIVEN CHARGING PLANTS

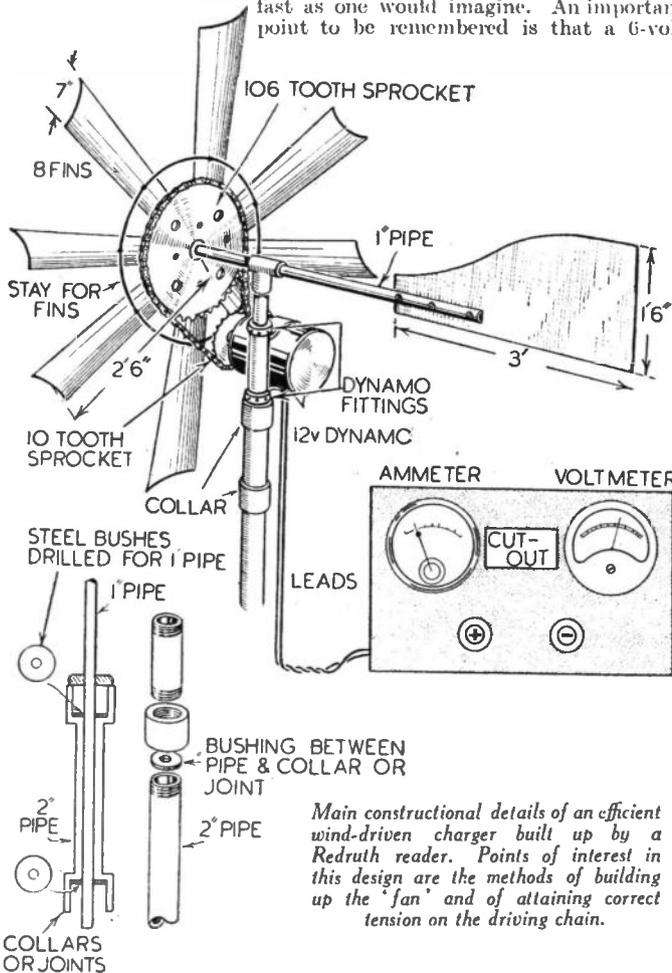
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tional strength is obtained by fastening a  $\frac{3}{8}$  in. iron hoop behind the blades.

The tail piece is cut from sheet metal and is held in place by cutting down a length of tubing with a hack-saw and passing two bolts through the assembly. To mount the dynamo a gland is made and, as shown in the illustration, this is provided with clamps so that it may be attached to a length of lin. piping. It may be raised or lowered so as to obtain the necessary tension on the driving chain.

The main support is a length of 2 in. piping and locking collars and bushes are provided so that the lin. pipe may be held rigidly central in the larger pipe. I have found that the load on the dynamo has its effect on the speed of rotation of the fan, and, on a 2 amp. load it rotates much faster than

it does on a 5 amp. load. Although the fan may appear rather large and with too many blades, it does not turn as fast as one would imagine. An important point to be remembered is that a 6-volt



cut-out must be used, and not a 12-volt one, as is generally employed with a 12-volt dynamo.

It is important to remember that if the unit is mounted at a distance from a house, then very heavy gauge wire must be employed for connecting to the receiver or accumulator to avoid loss in the connections. For normal charging purposes, of course, a shed may be in a convenient position and will avoid this difficulty, but even so, good heavy flex should be utilised for the connections in the apparatus so that full advantage may be taken of the maximum output.

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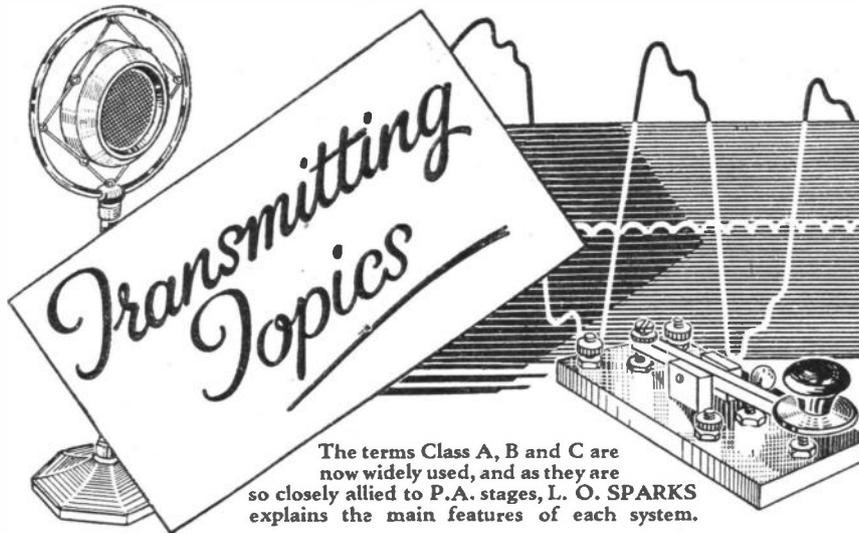
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Main constructional details of an efficient wind-driven charger built up by a Redruth reader. Points of interest in this design are the methods of building up the 'fan' and of attaining correct tension on the driving chain.



LAST week's article brought us to the question of modulation and P.A. stages but, before proceeding with these, it is essential to give some little consideration to the various forms or classes of amplification which can be utilised. There appears to exist a little misunderstanding regarding the operation of the different types of circuits and, although they are not so much removed from

and component characteristics are, of course, different in certain respects, as will be appreciated later.

**Power or Voltage Amplifiers**

When considering valves with relation to amplification, it is always advisable to bear in mind that such circuits can be divided into two sections, and these can be grouped under the headings of *voltage amplifiers* and *power amplifiers*.

For the sake of clearness let us take an imaginary receiving circuit employing, say, one stage of H.F. amplification, a triode detector, which is followed by an L.F. stage feeding into a super-power valve. All the valves in the circuit act as amplifiers, bearing in mind that with a leaky grid detector rectification takes place in the grid circuit, and amplification is provided in the anode circuit. The H.F. valve will receive a comparatively small input signal, and in that stage one is chiefly concerned with obtaining the maximum amplification of the *signal voltage* irrespective of any thought of power. The same applies to the detector and L.F. stage, therefore it is quite usual to apply the term of "voltage amplifiers" to such circuits.

When the final or output stage is reached, one is concerned with obtaining a certain power sufficient to operate a loud-speaker, so it becomes necessary to use a valve which, when fed with quite a *small* amount of power, in fact, one might say a minute amount, can deliver considerable power from its anode circuit.

Such valves usually have a very large

grid swing when compared with those used in the preceding stages, so from the point of view of voltage amplification, the ratio of the input and output voltages is naturally on the low side. If power amplification is considered, it will be appreciated that the power ratio will be high as the power input is minute while the power output is large. The ratio and output power will, of course, depend on the type of valve in use.

**Forms of Amplification**

So far as this article is concerned we will assume that the various forms or types of amplifying circuits suitable for the work under consideration can be divided into three distinct classes. These are Class A, Class B, and Class C. The most common of these is Class A, and a thorough understanding of the operation of a valve or valves when working under these conditions can be obtained from the curves shown in Fig. 1. The small curve G represents the input signal and by producing the vertical lines A and B it will be seen that it affects only the straight part of the characteristic curve C. To the right of this curve will be seen another curve which, if its wave form is examined it will be found to be an identical though magnified reproduction of the input signal curve G.

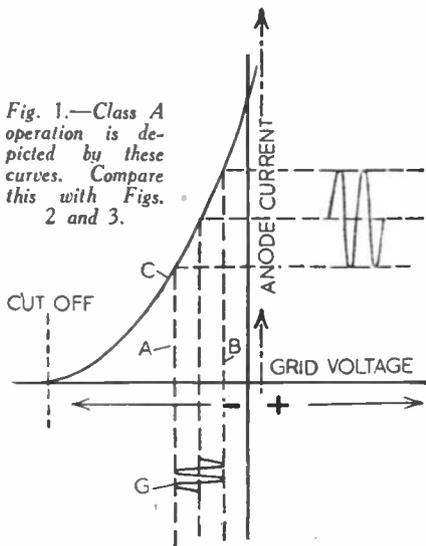


Fig. 1.—Class A operation is depicted by these curves. Compare this with Figs. 2 and 3.

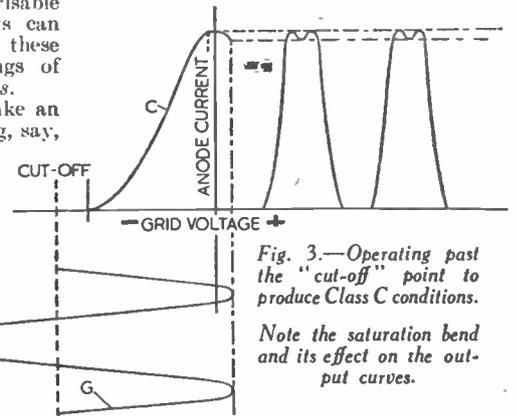


Fig. 3.—Operating past the "cut-off" point to produce Class C conditions. Note the saturation bend and its effect on the output curves.

To obtain this faithful reproduction it is essential for definite operating conditions to exist, and as these are invariably supplied by the makers of the valve, it is not difficult to obtain satisfactory amplification under such conditions. The main requirements are correct anode and bias voltages and an appreciation of the power-handling capabilities of the valve in use.

For the purpose of enabling Class A amplification to be compared with the other types to be described, it should be noticed that the plate current is, for practical purposes, constant irrespective of whether an input signal is applied or not. Another point to observe is that the grid is never driven into a positive state or so far that it reaches the "cut-off" point of the plate current. This point is indicated on the diagram.

**Class B**

A striking example of the difference between Class A and Class B can be obtained by comparing Fig. 1 with Fig. 2. The latter shows that the input signal G is no longer applied to the straight portion of the characteristic curve C, but to a point quite close to the "cut-off" point.

This condition is produced by biasing the valve to such an extent that hardly any anode current flows

(Continued on page 380)

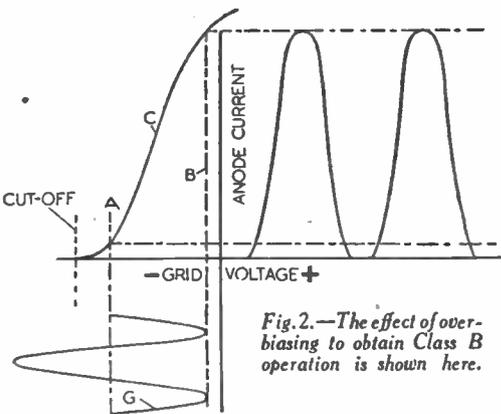


Fig. 2.—The effect of over-biasing to obtain Class B operation is shown here.

ordinary L.F. circuits, a thorough understanding of the individual characteristics must be acquired.

To commence with, there is the term "power amplifier," or P.A. as it is more usually called in transmitting circuits. This must not be confused with power amplifiers of the L.F. type. Many people call a powerful L.F. amplifier, such as that used for public address work, a power amplifier and, although I do not intend to enter into a debate as to whether the term is applicable in such instances or not, it would be advisable for beginners not to confuse the two types.

For transmitting, the P.A. is called upon to amplify signals at radio or high frequencies, and not audio or low frequencies as in the case of their L.F. counterparts.

The two can be likened to each other; in fact, such procedure will, no doubt, enable a better understanding of P.A. operations to be obtained as both use the same fundamental types of amplifying circuits, although operating conditions

# Signal Strength Measurements

How to Fit Various Forms of "R" Indicators to Standard Types of Superhet Receivers - By W. J. DELANEY

THE amateur transmitter needs for his work a standard by means of which reports may be made concerning amateur signals which he picks up. At present these reports are given in "R" values, from R1 to R9, and there is no standardisation. It is usual to give R1 as an indication that the signals are only just audible, and R9 for those signals which are heard at full loudspeaker strength, but on most receivers it is not a simple matter to differentiate between an R8 and an R9 signal, and it may often be found that one transmission is very much louder than another, but the interval between switching over from transmitting to receiving may result in a difficulty in judging any slight difference in the strength of the received signal. Unfortunately, many amateurs use only simple types of receiver, or commercial receivers which are not provided with a calibrated dial, meter, or other

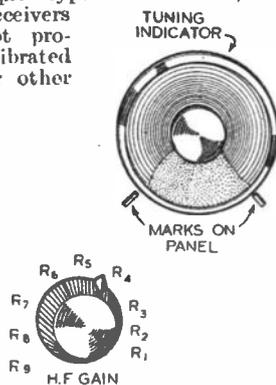


Fig. 1.—If an H.F. gain control and visual tuning indicator are fitted, the former may be calibrated to give "R" values.

indicator by means of which signal strength may be directly compared and therefore much of the value of a report during a QSO is lost. Undoubtedly there will come a time when a standard will be adopted, and this should be based upon the actual signal input to the aerial compared with the audio output—microvolts input against watts output. This will mean complicated apparatus, or a method of calibrating each receiver so that an exact measurement may be given.

## Cathode-ray Indicators

Many commercial receivers are provided with cathode-ray tuning indicators, whilst others have milliammeters connected in some part of the circuit which is controlled by the A.V.C. action. In each of these cases more or less accurate signal strength measurements may be made. With a cathode-ray indicator a shadow is cast, and this varies with the signal strength. In the position of "no signal" the shadow area is greatest, and as the signals are tuned in the shadow area decreases. With a very powerful signal the lighted area may spread and overlap so that there is no shaded portion. As the carrier input affects the amount of shadow it is obvious that a control may be fitted which will regulate the input and thereby control the indications on the cathode-ray device. A good receiver will be fitted with an R.F. (or H.F.) gain

control, and this is just what is needed to control the indicator, and therefore to obtain an exact comparison between signals all that is required is to fit a dial to the control and with a pointer knob on it we may mark off settings indicating the R values from 1 to 9. For this purpose a very weak station should be tuned in, and this should be one which just causes the shaded area to close, as distinct from a station which is so weak that it does not move the indicator on your particular receiver. In this position, of course, the H.F. gain control will have to be set at maximum. A point should be indicated on the gain control dial to be afterwards marked R1. Now tune in a very powerful signal, one which you will designate R9, as distinct from an R9 plus signal. This should, preferably be one which, with the H.F. gain control at minimum, just gives the same amount of movement to the shaded area of the indicator as was obtained by the R1 signal. This point on the gain control dial must be afterwards marked R9. The intervening space between R1 and R9 may now be divided to indicate the intermediate values, and a logarithmic sub-division is to be preferred to an equal division. Small indications should be made on the panel to show the exact boundaries of the shaded area on the tuning indicator and thereafter when ascertaining a signal level all that is necessary is to adjust the H.F. gain control so that the edges of the shaded area coincide with the panel marks and the pointer of the gain control will show directly the R value. In some circuits it may be necessary to switch off the A.V.C. when making signal measurements. Although the R values as given by this arrangement will not agree with another listener's values, your own measurements will be standardised and therefore when working a station you will be able to give exact indications of changes in volume which may be effected by any changes made by the transmitter, or by variations in local conditions.

## Current Meters

An anode current meter may also be calibrated for use as a signal meter, but in some circuits the meter will give a steady reading which will fall back towards zero when a station is tuned in. The meter may be in the anode or cathode circuit of a controlled valve, or of the second detector in a superhet. A low reading meter is

needed and in some circuits it may be necessary to shunt the meter with a variable resistance which may be adjusted for a "zero" setting and which may be calibrated as in the case already cited. A better arrangement is to connect the meter so that it forms part of the screen supply of the I.F. stage (the last if there are two or more). In this case a rather complicated network is called for so that a standard bridge circuit is formed, one variable element being included so that the meter may be balanced. The screen-cathode resistance of the valve forms the variable factor in the bridge and thus, by balancing it in the "no signal" condition by the variable resistance, a true indication of signal strength may be obtained on the meter.

The arrangement may be seen more

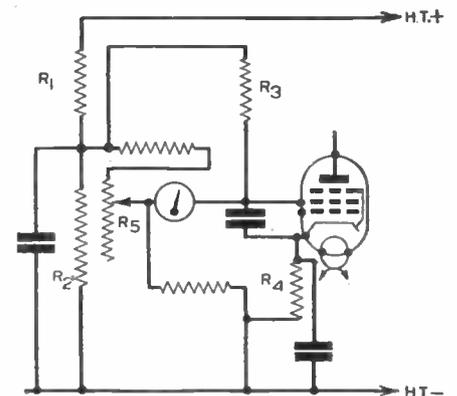


Fig. 2.—A bridge circuit for a signal strength meter: R1 and R2 are the screen voltage potential divider resistors: R3 is a screen decoupler: R4 is the bias resistor, and R5 is the meter balancing resistance.

clearly on reference to Fig. 2, which shows the essentials of the meter circuit. A potential divider is used to obtain the screen voltage, and as this may serve more than one valve a decoupling resistance must be included (R3). The bridge is formed by this network of resistances, and internal valve resistance as already mentioned, and the balancing resistance should be about 1,000 ohms.

## Precautions

With all these forms of signal measurements there are two or three points to be borne in mind. Firstly, if A.V.C. is fitted it may or may not be necessary to switch this off when making measurements, and therefore before giving a report of signal strength the A.V.C. control should be operated so that reports are standardised. Similarly, if there is a B.F.O. unit this should be switched off, as it will not be used for telephony reception, and for C.W. there may be a movement of the signal indicator due to its attempting to indicate carrier level. Therefore, reports must be made with a steady carrier (without signals), or alternatively some special form of meter may have to be adopted, combining an input sensitive voltmeter with an accurate output A.C. meter.

## PRACTICAL MECHANICS HANDBOOK

By F. J. CAMM,

400 pages, 6/- or 6/6 by post

from

GEORGE NEWNES, LTD.  
Tower House, Southampton Street,  
Strand, W.C.2.

# ON YOUR WAVELENGTH



By Thermion

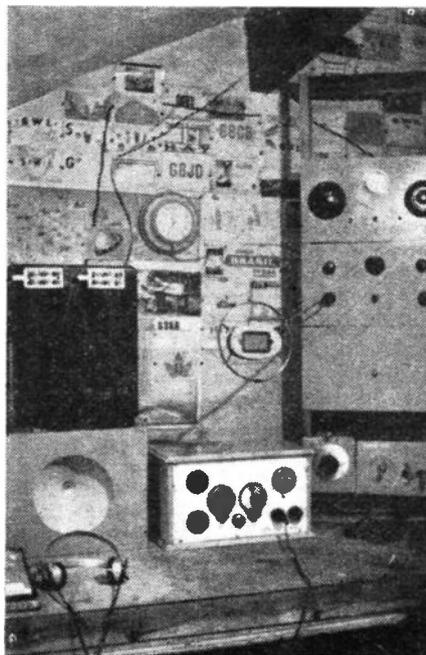
## Is He Fey?

WE often use the expression that people talk through their hat, but have you ever considered the possibility that they may be able to listen through it? The following letter seems to suggest that someone is either talking or listening through a hat, or else the person concerned is fey—which doesn't mean that he is a fairy but gifted with some occult power. This is the letter I have received: "I am writing to you in the hope of getting your assistance and advice in a very queer yet proved phenomenon. A local medical practitioner is able to hear wireless signals from outside without the aid of any apparatus whatsoever. He has been suspected of suffering from hallucinations, but careful medical observations refute this charge. As I am the only amateur in the town, I have been approached by him to solve the mystery. I remember reading on occasions some such cases reported, and I should be much obliged if you could inform me of any literature on this subject or any tests which I can apply."

I cannot trace any literature on this subject, nor do I believe that any person can receive wireless signals without apparatus, otherwise he would be suffering noises in the head, reminiscent of the Tower of Babel, all day long and all night. I suspect a catch somewhere. An easy test would be to have the person concerned thoroughly examined to make sure that there was no apparatus secreted upon him, and then to put him in a room out of earshot of any wireless programme radiated by a wireless set, and to have another individual in another room receiving a programme from a foreign station, preferably one whose programme has not been announced. This assistant should make a note of the items, and then ask the fey one to name them. I am certain that he will not be able to answer such a test. There are still people who would believe in the impossible, and who think that in future instead of buying a wireless set we shall only have to take a dose of ether—the right type of ether, of course!—in order to be able to pick up the world's wireless programmes. I dismiss the suggestion with contumely.

## Wireless Licences

THE Post Office issued 455,174 wireless receiving licences during May, this figure representing a net increase of 21,544 in the number of licence holders during the month, after making allowance for expired licences and renewals. The approximate total number of licences in force at the end of May, 1939, was 8,984,250, as compared with



A corner of Mr. H. Simpson's wireless den.

8,627,860 at the end of May, 1938, an increase during the year of 356,390. During the month there were 536 successful wireless prosecutions.

## Radiolympia Suggestion

ONE of our keen members of the B.L.D.L.C. makes the suggestion that it would be a good idea if various members of the B.L.D.L.C.

got together a Radiolympia party and visited the Show. They could then fix up future meetings, have a Dinner at Radiolympia and invite the Editor or Thermion to be present. If any B.L.D.L.C. reader is interested in the suggestion I shall be glad to act as compère.

## Wireless Dens

A PROPOS my remarks recently concerning wireless dens, H. S. (Bradford) writes me as follows: "You made a remark, 'littered with wire and apparatus.' Never O.M.; the true fan takes a pride in his attic, or den."

He also encloses a photograph of his den, which I reproduce on this page.

## Mr. Gerald Cock on Television Prospects

MR. GERALD COCK, B.B.C. Director of Television, who has just returned from a visit to the U.S.A. where he has been inspecting the progress of television there, addressing a gathering of the Radio Manufacturers' Association recently said: "England still leads the world in television, but American interests are watching us."

"The National Broadcasting Company, Columbia, the Film Industry, the New Deal itself, all these organisations with their vast resources are waiting to take up television at the point to which we have brought it."

"It behoves this country to move forward in the television field at such a pace that we still continue to maintain our lead."

"If only this country will go on developing television, the rest of the world will come to us for television equipment, not only for receivers, but for the transmission equipment itself."

"In every country of the world, except England, television is in the experimental stage. In this country, it is already a practical proposition."

"We know we have a three-years lead on the others. It is up to us to maintain this lead while offering the results of our experience to other nations with the object of helping them to enjoy the facilities we already possess."

Mr. O. C. Stanley, Chairman of

the Television Development Sub-Committee of the R.M.A., said that the sooner the whole of the people of Britain were given the facilities of receiving television, the more certain we should be of providing a new market for British export and a new source of employment for British labour.

The Radio Industry in this country has expended vast sums of money in bringing television to its present state of perfection. The officials of Alexandra Palace had always done their best to co-operate in this work.

It was now up to the Government and the Post Office in particular, to assist in enabling the Radio Industry to reap the reward of its labours in providing the facilities for Provincial transmission.

### Ammurricanese

A HUNDRED per cent. Tough Guy Ammurrican from Chicago, replies to "Thermion's" criticism of American "English."

#### "TOUGH GUY"

Huh! So ya won't talk Ammurrican, hey?  
Well, listen, big shot;

Jes' cum ovah here to Ammurrica,

An' we'll put ya on de spot.

Caise ya caint pull dat stuff on us, Buddy,

Per de English we talks is "O.K.,"

An' Ah guess, when it comes to talkin',

De Limeys is beat any day.

Caise de hunner per cent. Ammurrican;

He sure can spill de beans;

He can talk all roun' de clock, brother,

An' say things in between!

Waal, maybe yer up in raddio,

"Okey-Dokey" yer second name,

Although in lil' ole England

As "Thermion" yer known ter fame.

But ya gotta get dis, ole timer,

If ya wanna come out on top,

Ya mus' learn Ammurricanese, bo,

Caise dat language ain't gonna stop.

Dead on da schnozzle it gets ye,

An' it bites like a gol-darn bug.

Don't yer B.B.C. give lessons

When de songs dey starts ta plug?

Don't dat bring home de bacon,

An' de British public please?

Dat puts yer in big money

When ya writes in Ammurricanese.

When yer jaws on yer "gum" keeps a-workin',

An dey sees ya's a poker face,

Dey knows yer ain't never yaller;

An der's more. . . .

THEMION: Sure! But dey ain't no space!

"TORCH."

### Television Features

IT is interesting to note that television programmes are becoming more and more entertaining. For instance, Ruth Draper, the famous American diseuse, will perform selections from her repertoire before the television cameras at Alexandra Palace in the afternoon and evening programmes early in July. It is believed that Miss Draper's unique art will be specially suited to the television

## Notes from the Test Bench

### "Live" Spindles

THERE are still many components on the market in which the spindle is in direct contact with the moving element and thus difficulties are sometimes introduced when such a component has to be mounted on a metal panel. The difficulty is usually encountered with volume controls as it is often necessary to join the moving contact to a grid or similar point which must on no account be earthed. One simple way of overcoming the difficulty is to use insulated bushes for mounting purposes. These consist of two "dished" washers and are obtainable from such firms as Messrs. Bulgin. One is placed on each side of the panel and a larger hole than usual is called for so that the washers may be held immovable. An alternative idea, and one which possesses a further advantage, is to mount the component on a bracket on the baseboard or chassis (using, of course, an insulated bracket) and then to operate the control through an extension spindle of the insulated type.

### By-pass Condensers

IT is usual in H.F. circuits to specify non-inductive condensers for by-pass purposes, but it is also important to remember that the usefulness of these condensers may be lost if they are not correctly positioned. They are used in conjunction with a resistance and this prevents the passage of H.F., whilst the condenser carries it away to earth. Therefore a length of wire between the point to be by-passed and the condenser will carry such currents and may lead to trouble due to radiation or interaction. Consequently, by-pass condensers should always be joined direct to the point being by-passed, and the other side of the condenser taken to the nearest earth point.

### H.F. or L.F.?

THE design of multi-valve receivers calls in a number of problems, one of the most important being the use of H.F. or L.F. stages. In some receivers there is also the question of I.F. Tests will show that in some cases the H.F. and I.F. stages will give an increase in volume, but also an increase in the noise level. On the other hand, L.F. may provide an increase in volume without unduly raising the noise level. Two H.F.'s are regarded as the practical limit, and in most superhets it is not practicable to use more than 3 I.F.'s, one being preferable from a noise point of view. Three well-designed L.F. stages will give good volume without noise.

medium as much of the action can be performed in close-up. Accustomed as she is to holding the stage by herself, and yet taking the parts of many people in a single sketch, she will be able to concentrate on the cameras to a degree that is rarely possible in the more normal television performance in which a number of actors are engaged.

Ruth Draper will appear for a quarter of an hour in the afternoon, and half an hour in the evening. Television production will be by Eric Crozier.

### "Fiat Justitia"

DESMOND DAVIS, the television producer, set a new fashion with "O Mistress Mine," a series of famous love scenes which were televised last January. On July 1st, a new motif—Justice—will be the main-spring of a programme, entitled, "Fiat Justitia," in which excerpts will be given from famous trials of literature and drama.

The first is "Like Will to Like," dating back to the sixteenth century, by one Ulpian Fulwell—"very godly and full of mirth"—and selections will be taken from Shakespeare's "Much Ado About Nothing," A. P. Herbert's "Misleading Cases," Galsworthy's "The Silver Box," and Elnor Rice's "Judgment Day."

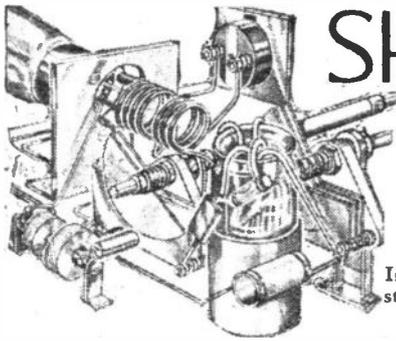
Interspersed will be excerpts from the Trial Scene in "Alice in Wonderland." The cast includes D. A. Clarke Smith, Jessica Tandy, Barbara Nixon, Alan Wheatley, and Newton Blick.

### "Me and My Girl": July 17th.

B.B.C. television cameras will pay a return visit to the Victoria Palace—the home of the "Lambeth Walk"—on the evening of July 17th, to bring viewers another performance of "Me and My Girl," and thus repeat one of the most successful experiments—judged by viewers' letters—yet carried out in televising direct from a theatre.

"Me and My Girl" was first televised from Victoria Palace on May 1st. Since then Lupino Lane has fallen into the orchestra more than eighty times. He has never missed a performance. Altogether, he has made over a thousand appearances. The cast includes George Graves, Teddie St. Denis, Doris Rogers, and Betty Frankiss.

Victoria Palace is conveniently situated for television. Just outside runs the special television cable, which encircles the West End of London, and gives direct communication, via Broadcasting House, with the transmitter at Alexandra Palace.



# SHORT-WAVE SECTION

## AN EXPERIMENTAL THREE - VALVER

In this Article A. W. Mann Describes the Construction of a Choke-capacity Coupled Three-valve S. W. Receiver

**H**EADPHONE type short-wave receivers are preferred by a large number of short-wave enthusiasts, and whilst this type of receiver can be built at low cost, this is not the chief consideration.

Given a suitable receiver and a pair of headphones, weak carriers which would in many instances be missed by the loud-speaker type receivers can be resolved into strong signals, due to the fact that the

two years, and later replaces it with another which is of a different type.

### 'Phone and C.W. Reception

As a permanent receiver was required for amateur 'phone and C.W. reception, in addition to short-wave broadcast reception, and which could be used as a basis of comparison when experimental receivers were on test, it was decided to consider the

impossible to receive anything below R5 due to the high ratio of background noise, is not unknown; therefore, in the choice of circuit the signal to noise ratio was one of the primary considerations, together with average sensitivity, selectivity and ease of operation.

It was therefore decided to rule out the use of L.F. transformer coupling in favour of R.C.C. This, however, brought to mind a favourite type of quality circuit as used years ago for B.B.C. reception, which, so far as the writer is aware, has received but little if any consideration from the short-wave fraternity. I refer to choke-capacity coupling.

As suitable components were to hand it was decided to carry out a series of experiments with a view to designing a head-phones-type receiver of the 0-v-2 type capable of providing good quality reproduction with a high ratio of signal to noise.

### Circuit Details

The first essential was a suitable circuit which, if necessary, could be modified or improved. The original circuit, as shown in Fig. 1, was used as the basis of experiment, and on test proved so satisfactory as to require neither modification nor alteration.

It is a straightforward arrangement consisting of a regenerative detector followed by two stages of L.F. choke capacity coupling. Standard four-pin units are used, and two aerial input arrangements are specified, which will be dealt with later. L.F. choke output is also specified, and the result is a good all round and stable receiver.

Congested bands call for careful tuning, and bandspread is nowadays a necessity, rather than a refinement.

Before going further, a few remarks with reference to the various chokes used in the receiver will perhaps remove the possibility of snags being experienced by experimenters.

### H.F. and L.F. Chokes

In the plate circuit of the detector valve we have an H.F. choke. As the coverage of the receiver, i.e. the tuning range, includes the 10-metre band, also the 160-metre band, together with trawler 'phone bands, the H.F. choke should be of the type which has a guaranteed range through which it will function of from 5 to 170 metres.

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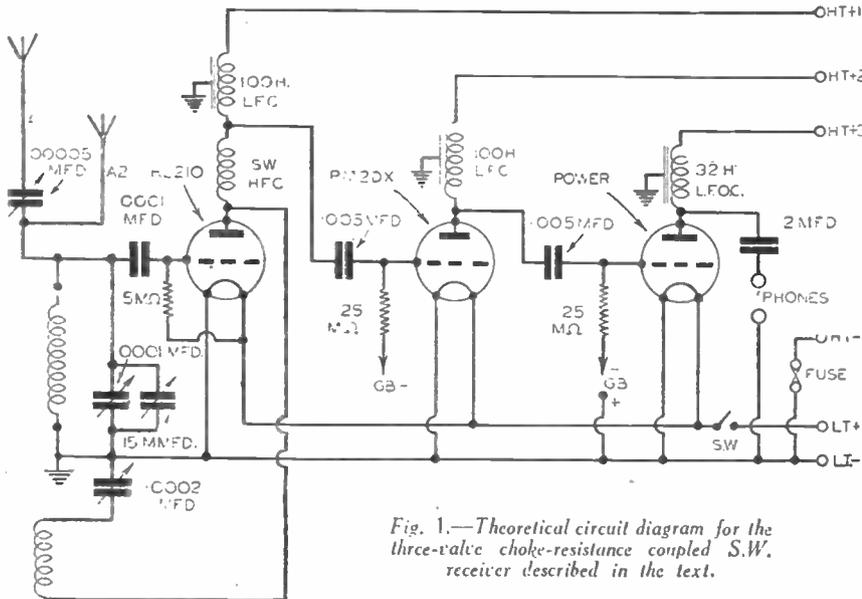


Fig. 1.—Theoretical circuit diagram for the three-valve choke-resistance coupled S.W. receiver described in the text.

ratio of signal to background noise is high.

There are various types of circuit from which to choose, and one of the most popular is the regenerative detector, followed by a one or two-stage L.F. amplifier.

When a two-stage receiver (detector L.F. combination using R.C.C. or parallel fed transformer coupling) is used, it is not difficult to obtain a satisfactory signal to noise ratio.

Caution, however, is necessary when two stages of low-frequency amplification are to be used, as much depends on the combination chosen. For example, quite apart from considerations of stability, the use of two L.F. transformers for headphone type receivers is inadvisable, due to the higher noise ratio which would result in the obliteration of weak carriers, and thus offset the advantages of the increased voltage step up, apart from the fact that loudspeaker reception of the more powerful transmissions would be possible with increased volume.

For the above reasons, and in the interests of stability, the most satisfactory combination is to use resistance-fed transformer and R.C.C. combinations.

The writer usually retains one receiver in permanent form for a period of about

problem from the amateur radio point of view.

The fact that in some instances where loudspeaker type receivers are used for amateur 'phone and C.W. reception it is

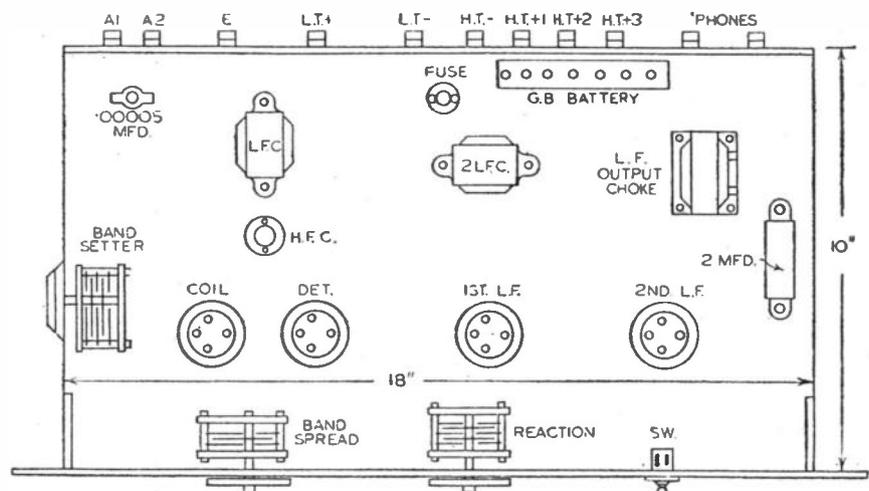


Fig. 2.—Layout of components for the three-valve S.W. receiver.

### SHORT - WAVE SECTION

(Continued from previous page)

This advice should not be ignored, as it is most desirable, for obvious reasons, to avoid peaking due to choke resonance within the specified tuning range.

In series with the H.F. choke is the first L.F. choke, which is, of course, an iron-cored type of similar construction to the output choke, but with different characteristics. The same type is used in the first L.F. plate circuit and is of 100 henries, whilst a 32 henries output choke is used in the final stage.

It will be noted that in the theoretical circuit, Fig. 1, the cores are shown earthed to the chassis. As the original ones used by the writer were of the metal case type, earthing was carried out by means of a fixing bolt which made sound electrical and mechanical contact with clean metal and the chassis foil, respectively.

Where bakelite case L.F. chokes are used, the core is earthed via a separate terminal provided for the purpose. In addition, the individual chokes are arranged so that the fields will not produce interaction, being mounted at ninety degrees to one another.

The well-tried parallel method band-spreading is used, and has much to recommend it, and whilst the band-spread condenser is of 15 m.mfd. capacity, this may be modified according to the amount of spread desired by the individual. A spread of 80 degrees on the 40-metre band is advised, and in any case should be less than the full dial scale in order to include the commercial marker stations at each end of the band.

#### Layout of Components

Passing to Fig. 2, we have the general layout of the component parts. If sufficient ceramic low-loss type valveholders are to hand, these should be used: If not, the detector valveholder and coil base should be of the low-loss type.

The layout, as shown, is a very satisfactory one, and the original receiver is built on a foil-lined wooden chassis, and totally enclosed in a steel cabinet complete with steel panel.

The bandspread, reaction control, and on-off switch are mounted on the front panel, whilst the band-setter is mounted on the left-hand side of the cabinet.

In certain instances the writer has used this arrangement for a number of years, and provided that the band-setter is fitted with a slow-motion dial, as in the case of bandspread and reaction condensers, the receiver will prove very easy to operate.

The Eddystone bandspread kit could be used to advantage in a receiver of this type, although not used by the writer. In any case, once the use of the controls have been mastered and the various band-

settings have been noted, operation will not raise any difficulty, and the general scheme will be found to reduce wiring to the minimum.

It is general practice where a metal panel is used to omit the lead coupling the moving vanes of the band-setter and spreading condenser, and depend on the direct contact with the metal panel.

As modern receivers are capable of working down to 10 metres without modification, as in this instance, the writer does not recommend this practice, and strongly advises that the two condensers be wired in parallel, as would be the case if a metal panel were not used. Eddy current effects which might be experienced will thus be avoided.

There is another point which concerns the wiring of the filament circuit in that

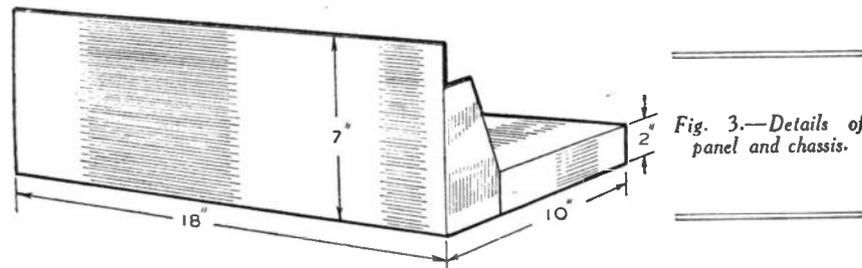


Fig. 3.—Details of panel and chassis.

sometimes constructors take the earth-potential side of the filament circuit directly to earth from each valveholder, via the chassis. It is better to wire through and earth to the chassis from the final stage valveholder.

#### Output-choke Arrangements

Whilst it is possible to build a stable short-wave receiver and omit output-choke arrangements, much trouble would be avoided relative to instability and feedback if such arrangements were incorporated as standard. In this instance they should not be omitted, especially if it is desired to use the receiver in conjunction with an A.C. H.T. eliminator. Apart from the factor of efficiency, the safety factor shouldn't be forgotten, as headphones are to be used.

Whilst the physical dimensions of the L.F. chokes cause the layout to be less compact than would otherwise be the case, the constructor can, if care is exercised, obtain a balanced layout and reduce wiring to the minimum by using wire-end type .0005 mfd. condensers and Erie wire-end resistances, both of which can be supported by the wiring of the receiver.

Fig. 3 shows the dimensions of a suitable wooden chassis complete with metal panel. The chassis should be of robust construction, with wooden brackets trenched into the chassis ends, thus avoiding panel whip, which eventually leads to loose connections,

and cutting out crackling effects, etc. Copper or tin foil may be used to line the underside of the chassis, and direct earth returns made to it by means of small bolts with twin washers and lock nuts.

#### Performance

A few remarks concerning the performance of the original receiver will give some idea as to the results to be expected, other things being equal.

The fact that choke-capacity coupling went out of favour with the early constructors of broadcast receivers was because the L.F. choke in itself does not provide any voltage amplification as in the case of the L.F. transformer. Consequently, we depend for amplification on the valves themselves.

In the writer's opinion choke-capacity

coupling thus offers the short-wave headphones-type receiver enthusiast an advantage which is a useful aid to DX listening, in that whilst the stage gain is comparatively low, a useful measure of amplification is obtainable without undue increase in noise level or background.

Thus we are enabled to make full use of the sensitivity available, and the result is a clear signal of good quality.

One of the most noisy bands is the 160-metre band, and it is on this and the trawler bands that many of the multi-stage mains operated receivers fail, due to the fact that the sensitivity available is not fully usable, and, consequently, in conjunction with the H.F., I.F. and L.F. amplification, brings up the noise level beyond permissible level, and signals are lost or partially swamped by QRM.

Tests with this receiver fully justified this point of view, as clear signals at reasonably good volume were receivable, using the A2 aerial-input coupling, whilst the noise level was extremely low.

The same remarks apply to the complete band coverage, and 'phone reception on the 40-metre band was a revelation, taking into consideration the congestion experienced on this band.

In addition to 'phone reception, a receiver of this type is well worth the consideration of the C.W. enthusiast, due to its extremely low noise level.

#### A Call from Formosa

JFO, Taihoku, the 3-kilowatt station logged on 31.15 m. (9.63 mc/s) announces itself as the short-wave station on the beautiful island of Taiwan (Formosa). The distance from London is roughly 6,000 miles. The studio possesses a woman announcer, opens and closes its transmissions with strokes on a gong, and may be heard on the air daily from B.S.T. 14.00.

#### Add to Your List

THE *Emissora Nacional de Radiodifusao*, the Portuguese State Broadcasting organisation, has inaugurated another short-wave transmission on 41.32 m.

## Leaves from a Short-wave Log

(7.26 mc/s). The call letters are CSW8. Broadcasts are only made on Saturdays, Tuesdays and Thursdays from B.S.T. 22.00-23.00.

#### Japan Assumes a Title

IN the broadcasts destined to overseas listeners the Tokio (Japan) transmitter gives out that "This is the Tokio,

the Metropolis of Japan and capital of the Land of the Rising Sun."

#### From the Land of Coffee Trees

TI4NRH, Heredia (Costa Rica), on 30.95 m. (9.69 mc/s), usually opens its broadcasts with a bugle call, followed by the announcement in Spanish and English to the effect that the transmission emanates from *La Voz del Comercio* (The Voice of Commerce), installed at Heredia, the city of flowers "in the Land of Coffee Trees" (Costa Rica). Its signals are well heard between B.S.T. 02.00-03.00, when, as a rule, a special concert is given for North American listeners. The programme closes down with the playing of the "March of the Toy Soldiers."



**VARIABLE-PITCH AUDIO OSCILLATOR**

(Continued from previous page)

For preference, the majority of the wiring should be carried out with tinned copper wire, covered with sleeving as the soldering is carried out; this provides a clean and durable job.

As the above chassis view of the wiring gives a slightly complicated aspect, it will possibly help beginners here if this is detailed as follows.

The choke wiring should be attempted first of all, the position of this component will have been checked when mounting so that the red and black leads are to the right, as shown on this page.

The coloured leads should be carefully chosen and soldered to their respective points on the pitch-control switch, this giving an increase in inductance from left to right, looking at the front of the oscillator.

**'Phone Jack and Volume Control**

With the potentiometer contacts at the top, as shown, the left-hand side contact and the centre contact only are used, these being wired directly to the two jack contacts immediately underneath the potentiometer. A wire should then be taken from the centre contact of the potentiometer to the wiper-arm contact of the five-position switch.

One side only of the key jack J2 is wired, and this is taken through hole No. 6, using flex, out through the grummet hole in the rear-chassis runner (Fig. 5), terminating in a wander plug for H.T. negative. The H.T. positive flex passes through hole No. 5 and is connected to the jack contact which is common to the potentiometer centre contact and switch wiper; the other wire from the jack (sleeve) passing through this hole goes to the screen-grid socket of the valveholder (S.G.).

The on/off toggle switch is connected to one filament socket of the valve and passed through the other grummet hole to the L.T. positive wander plug, the leads from this switch passing through No. 4 hole in the chassis.

Also from this filament socket is taken a lead through hole No. 3 to one side of the 2v. 60mA pilot bulbholder, the other side being commoned to chassis by soldering a bare copper wire to the panel-fixing bush nut. The rest of the wiring is clearly illustrated, and if care is taken in the soldering, a lasting job will result.

There is one other point concerning the wiring, and this is with regard to the red

and black leads from the choke, which pass through holes 1 and 2. To prevent these frail leads wearing against the edges of the holes, a short length of sleeving should be worked over these wires also.

A little experimenting will soon accustom the operator to the use of the instrument, and the many test purposes which can be fulfilled by this simple audio oscillator will make its construction well worth while.

For example, it may be found particularly useful as a capacity-fed oscillator adapter for measurement purposes in connection with the design or servicing of audio amplifiers, or again by the easy expedient of fitting a couple of test prods in place of the morse key, a useful continuity tester will be provided, due regard being, of course, given to the question of H.T. voltage used in this instance.

With regard to the ultimate finish of the job so far as a suitable cabinet or box is concerned, fixing holes are not included in the diagram, as this is an optional feature, but this should be determined beforehand so that the panel or chassis can be drilled appropriately before the components are mounted.

The Bulgin I.P.7 dial plate is recommended for the volume control, but as there is not available an undesignated five-position dial plate suitable for the pitch-control, it is suggested that (and as adopted by the writer) a white card disc be cut and marked off in increments of 30° for the switch location.

Finally, there is one further consideration with regard to the on/off toggle switch. If desired, the L.T. switching can be carried out through a combined potentiometer and switch movement, but as it is often desirable to leave the volume control set for test purposes, this is only possible by utilising a separate on/off switch as adopted here.

**Mains or Battery**

Many readers will, no doubt, feel that a mains version of this particular unit would be of use, but we must point out that there are many difficulties in the way of designing such a unit. One of the most important of these is the question of hum, and although hum itself can be an annoyance, the fact that the hum is caused by

a ripple in the H.T. supply will give rise to several difficulties due to the ripple setting up beats with the oscillator. Furthermore, the battery unit will be found to offer certain advantages in the average "den." We must also point out that, with this as with all designs published in these pages, we are unable to enter into correspondence regarding the use of existing or substitute parts in place of those which are specified. It is quite possible that alternatives would work, but in many cases before a definite decision can be given tests have to be carried out, and, therefore, to ensure that all results obtained are identical we must insist upon the use of the parts which have been originally used by us.

**WIRING DIAGRAM**

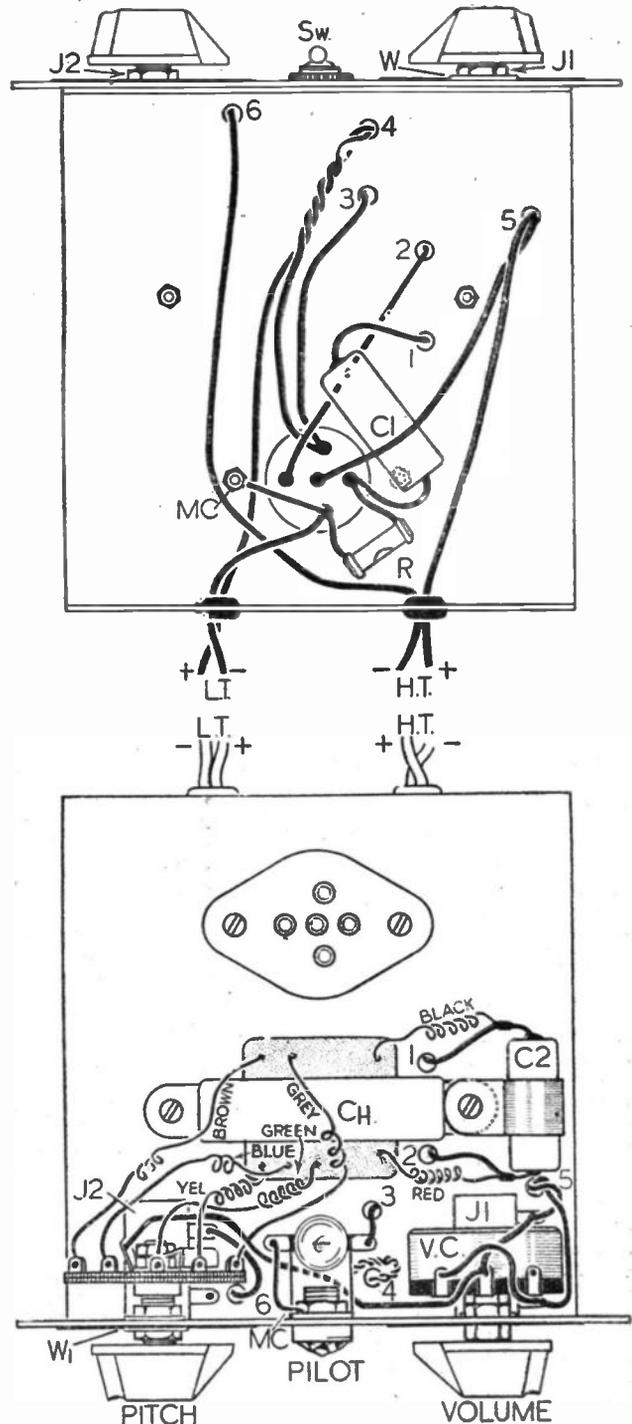


Fig. 5.—Above and below chassis wiring diagrams.

- LIST OF COMPONENTS FOR A VARIABLE-PITCH AUDIO OSCILLATOR**
- Condensers (fixed): Two type 4601 S .01 mfd. (Polar N.S.F.).
  - Resistors (fixed): One 100,000 ohm 1/2 W. (Erie).
  - Potentiometer: One type Ex. Rabidus (V.4) (Polar N.S.F.).
  - Tone-Control Choke: One type L.F. 43 (Bulgin).
  - Jacks: Two type J.2 (Bulgin).
  - Jack Plugs: Two type P.38 (Bulgin).
  - Pilot Light: One miniature signal-fitting (red), type D.19 (Bulgin).
  - Pilot Light Bulb: One type B.206 (Bulgin).
  - Rotary Stud Switch: One type S.119, with two fibre-embossed washers, type 1058 (Bulgin).
  - On/off Switch: One type S.80T toggle (Bulgin).
  - Wander Plugs and Spades: Two No. 14 spade terminals—red, black (Clix). Two No. 5 master plugs eng'd H.T.—, H.T. + (Clix).
  - Instrument Knobs: Two No. K.92 (Bulgin).
  - Dials: One type I.P.7 (Bulgin).
  - Valveholder: One type V.117 (soldering) (Clix).
  - Valve: One type P.P.2(L.F. pentode)(Tungfram).
  - Chassis: Peto-Scott.
  - Miscellaneous: 6BA.Rd.Hd. 1/4-in. brass bolts and full nuts (Bulgin). Shakeproof washers (Bulgin). 18 S.W.G. T.C. wire (Bulgin). Sleeving. Flex.

A PAGE OF PRACTICAL HINTS

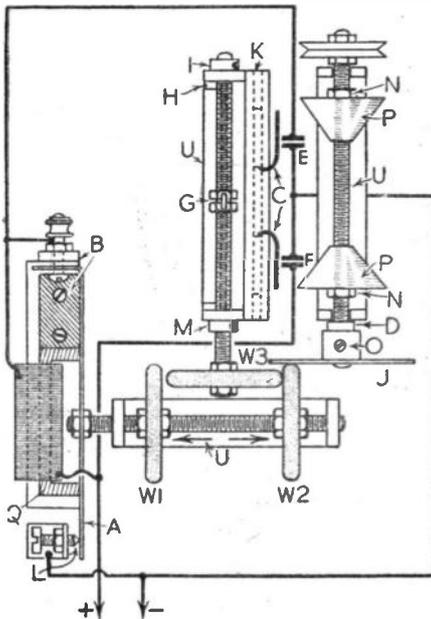
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Motor-driven Coil-winder

BECOMING tired of the slow hand winding of solenoid coils, etc., I devised an automatic winder, driven by a small electric motor, as shown in the accompanying illustration. Most of the parts were discovered in my "oddmens" box. The supports are of 7-gauge brass,



General arrangement of a small motor-driven coil-winder: A, Armature—soft springy iron. B, Magnet mounting bracket—stout brass. C, Adjustable contacts—thin brass. D, Collar—soldered to shaft. E and F, Open contacts—theoretical. G, Wire guide—screwed on shaft. H, Wire guide runner—slotted slackly in groove in guide. I and M, Collars soldered to shaft. J, Pliable disc—attached to collar—held on shaft by O. K, Contact slides—brass or copper—soldered to support. L, Keeper contact. N, Cone-nuts. O, Grub screw—in collar. P, Hardwood cones. Q, Laminated magnet core.

bent "U" shaped. The former-holder support is mounted on a plywood baseboard, together with the driving motor, the base being fixed to the baseboard proper by means of slotted holes, enabling the disc J to be moved along W2 so altering the speed of guide G to suit various gauges of wire and diameters of formers. It will be observed that in the former-holder the metal above the shaft holes is cut away so that the shaft can be lifted direct from the support. The disc J is made to press firmly on to W2 and locked there by the grub screw O; to mount a former the disc, cone-nut and cone are removed, after, of course, lifting the shaft from its support. The former is then placed over the shaft and the cone, cone-nut and disc replaced, tightening the former by means of the cone-nut. The wire-guide G consists of a piece of large gauge wire, twisted to form an eye,

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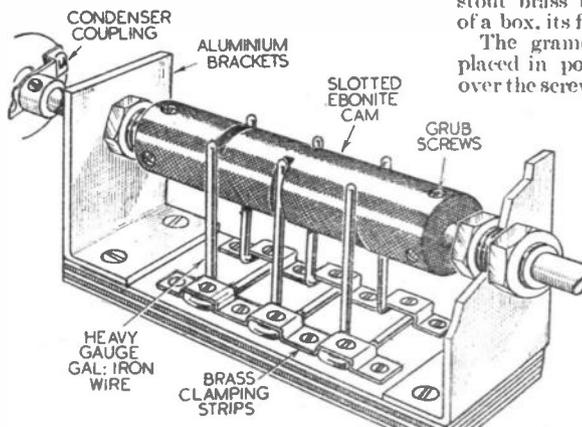
SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

soldered to a large nut. To prevent G turning with its shaft a groove is filed in the nut to take runner H (shown in dotted lines). The guide shaft support extends above the shaft holes to allow the fixing of the contacts slide, which is made up of two copper channels soldered to the support. Two pieces of ebonite are cut to slide between the channels, at a tight fit. A piece of thin springy brass is mounted on each piece of ebonite, cut and bent so that the springy brass does not touch the channels except when the wire being wound is brought against it by the movement of G. The movement of G is controlled by the electro-magnet engaging and disengaging W1 and W2, the magnet is operated by the closing of E and F.—FRANCIS MURPHY (Darlington).

Station-locating Movement

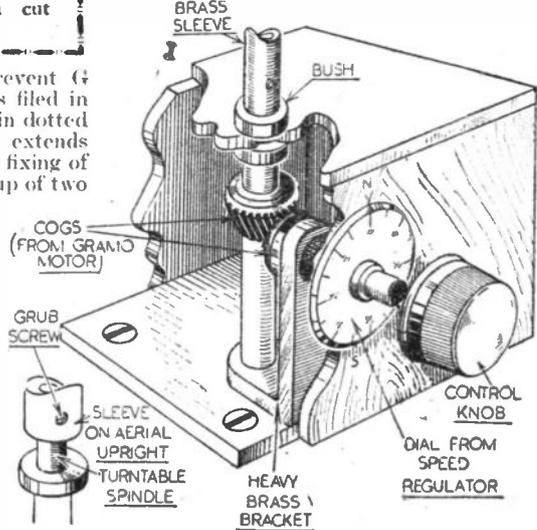
WITH a long ebonite former, or rod, obtained from an obsolete wave-change switch, and some heavy gauge galvanised iron wire I have constructed a novel station-locating movement, as shown in the accompanying illustration. The existing holes in the ends of the ebonite "cam" were first of all increased in



A simple station-locating movement.

diameter and depth, to take two short lengths of 3/16 in. shafting for the condenser and drive coupling, and end bearings.

Three positions of the tuning condenser were required, so after bending and clamping down three wire spring assemblies, with a common strip of reasonably heavy gauge brass, as shown, the exact positions of the stations received were scribed on the ebonite, indicating the correct centres for the cam slotting. After making the slots and re-assembling, each slot was taken in turn, and with a pair of strong pliers, the locating wires, or springs, were "tensioned" by adjusting near the clamping strip with the wire in each case resting fully in the slot. The rest of the assembly



A pictorial view (part broken away) of a novel aerial direction indicator.

details will be clearly seen in the illustration.—N. G. SOUTHAL (Ilkeston).

An Aerial Direction Indicator

THE calibrated direction indicator illustrated is constructed mainly from disused gramophone parts, a bracket of stout brass being attached to the bottom of a box, its front surface flush with the side. The gramophone spindle with a cog is placed in position, and a tubular support over the screw fixing the right-angle bracket, holds the whole upright section firmly. Another cog and spindle is placed at right angles, the two cogs being enmeshed, and the spindle passed through the side of the box with the speed regulator dial attached. A control knob turns the whole, and by the addition of the points of the compass a record can be kept. The aerial is attached by slipping a brass sleeve fixed to the upright over the turntable spindle and tightening a grub screw.—H. GRAHAM (Rugby).

# CAR-RADIO EXPERIMENTS

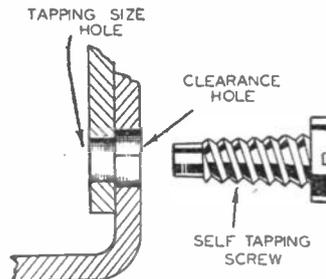
## Some Hints on the Construction of an Experimental Car-radio Receiver, as Well as Different Types of Car Aerial

By Frank Preston

**A**LTHOUGH last week some of the difficulties of making a car-radio receiver at home were explained, the article did not cause readers to lose interest and hope. In fact, it probably had the reverse effect—of “whetting the appetite” of many of those who are determined to give car-radio a trial. Consequently, I propose this week to be rather more constructive and to show how you can at least approach the subject; at the same time the difficulties mentioned cannot easily be overcome.

It is evident that many readers are not particularly anxious to have a “pukka” outfit, as long as they can take radio with them in the car. When that is the requirement, most of the difficulties are obviated. If you are prepared to build a small four-valve superhet with A.V.C. you can obtain satisfactory results while the car is stationary or when travelling along quiet, open roads. It is probably most satisfactory to employ four-volt A.C. valves—since the set will also be used in the home—and to use a battery for H.T. and G.B. supply. Low-tension can be obtained from the car battery by taking a tapping, unless the battery is of the latest type in which the inter-cell bus-bars are covered with pitch. When the set is used in the home, H.T. and L.T. can be ob-

When workshop facilities are available, it is best to build the receiver on a metal chassis and to house it in an aluminium case which will act as a complete screen. Care should be taken that the joints are



A form of self-tapping screw which is convenient when making a metal containing case.

a close fit and that they are bolted together at a number of points. For this purpose manufacturers frequently make use of self-tapping screws; to fit these it is necessary only to drill a clearance hole in one member and a tapping-size hole in the other and then to force in the screws with a big screw-driver. The screws then cut their own thread and make a sound job. Sheet aluminium of about 20-gauge is probably the most convenient, and is not very expensive when a polished surface is not required. Remember to provide holes or louvres in the containing case to permit of ample air circulation round the valves. If holes are made, screening will be more complete if they are covered with copper gauze.

In mounting the receiver chassis it is best to use rubber bushes, to allow the chassis to “float,” whilst the interior of the container should be lined with rough felt. This can be fixed with ordinary glue. It is also desirable to fit rubber washers between the speaker and the case to reduce resonance effects. The outside of the box can be finished with cellulose to look fairly respectable when used in the home, but the more expert worker might prefer to give a crackle finish, or to have the box finished in this style after finding that the receiver operates satisfactorily.

### Position of the Set

It is generally desirable to have the receiver near to the bulkhead of the car, since that is most convenient for the aerial lead-in and battery connections, but if it is found that it restricts foot-room to too great an extent the set can be mounted in the rear compartment. It is very important that the metal container should be

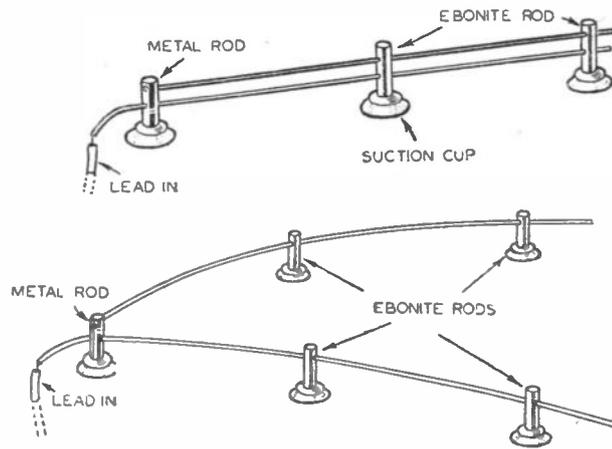
well earthed by means of heavy cable or copper braid. The earth lead should be as short as possible—seldom need it be more than a few inches—and it should make perfect contact with the container and with the earth line of the receiver. When the receiver is in front, earthing can be to the steering column or to a bolt through the bulkhead. Alternatively, it might be possible to make a good connection to a chassis bolt if the cable is passed through the floorboards; this also applies when the receiver is in the back of the car. In this case, it will often be found that there is a convenient bolt underneath the rear seat cushion.

### Earthing

The earth-return will, of course, also act as one side of the L.T. supply. Take great care, therefore, to find whether the positive or negative side of the battery is earthed. The second L.T. lead may consist of the “black glossy” cable used for the car-wiring circuits, but it is often better to use screened wire, earthing the screening braid every foot or so of the run. This connecting wire should have a low resistance, so if its length exceeds about four feet it will be better to use two twin wires in parallel. Do not omit to include a fuse in this lead, mounting it accessibly—a value of about 10 amp. will generally be as convenient as any. Most manufacturers use a fused connector for this lead, and that is the best arrangement.

### Type of Aerial

Consideration must next be given to the aerial, bearing in mind that, at best, it can be only of comparative low efficiency. Consequently, a make-shift arrangement is not likely to prove very satisfactory. As a general rule, a roof or fishing-rod type is most satisfactory, although under-car and running-board aerials are often surprisingly effective if accurately proportioned.

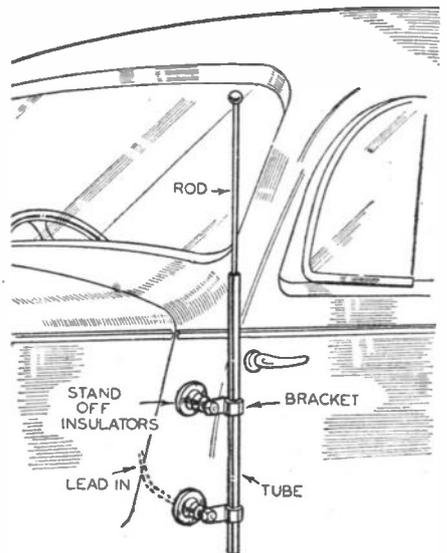


Two types of roof aerial which can be bought ready-made or can be built by the practical man.

tained in the usual manner from a mains unit. Two-volt battery valves can be used, but they are rather less robust mechanically, and do not give as high a degree of magnification. Nevertheless, if the house is not wired with A.C. the large amount of current required from an L.T. accumulator is prohibitive.

### Receiver Details

It would not be possible to give full constructional details of the receiver itself in the space of this article, but the more advanced constructor will not find great difficulty in adapting one of the many circuits which have previously been given in these pages. For the benefit of those few who still fight shy of the superhet it can be mentioned that a good four-valve “straight” circuit with two H.F. stages, A.V.C. and pentode output will behave fairly well in good conditions.



The fishing-rod type of aerial shown here is becoming increasingly popular.

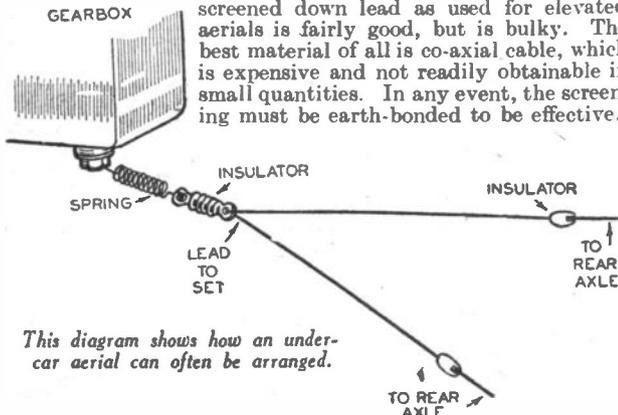
**CAR-RADIO EXPERIMENTS**

*(Continued from previous page)*

The aerial can be bought ready-made, and many of the roof-type now available are provided with rubber suction cups which can be securely attached to the roof by using liquid glue and pressing the cups tightly against the metal roof. Details of two common patterns are given in an accompanying illustration, and from this readers can probably devise a form of construction which is within their capabilities.

*Bear in mind that some of these aerials are covered by various patents, and that anyone making similar ones for sale would be liable to prosecution for infringement!* It is not likely that any trouble of this kind will be experienced if you make an aerial for your private experimental use.

Plated copper rod or a white-metal alloy is most suitable since it will not discolour, but bare copper wire or small-diameter tube can be used experimentally. It will be seen that both types of aerial shown are virtually of doublet type, although in one case the two arms are so close together that they probably act as a single lead of large area. Large suction cups are required, and the rods or tubes are carried in insulators except at the front, where they are both connected together.



*This diagram shows how an under-car aerial can often be arranged.*

**The Lead-in**

The lead-in can be passed through a small hole bored through the front edge of the roof above the screen or, when there is a sliding roof, it can be wedged between the forward edge of the sliding portion and the fixed part. In many cases it is found that ordinary flex can be used for the down lead—although this is likely to pick up interference from the ignition system—but screened material is better. The capacity of ordinary screened wire, however, is too great. A length of special screened down lead as used for elevated aerials is fairly good, but is bulky. The best material of all is co-axial cable, which is expensive and not readily obtainable in small quantities. In any event, the screening must be earth-bonded to be effective.

some instances there are two concentric tubes in addition to the extensible rod, and metal workers will not find very much difficulty in devising a suitable device. The rod is carried in a couple of insulators with suction cups or bolts and attached to the rear side of the scuttle, between the rear edge of the bonnet and the front of the door. A small hole must be bored to take the lead-in. There is on the market at least one fishing-rod type aerial which can be fitted to the door hinge, where this is at the forward edge of the door, and it is not difficult to devise simple brackets to fit the hinge pins (or new, longer pins) and to support the insulators which carry the aerial rod. When the car is not new there might not be any objection to drilling the bodywork to take a couple of ordinary stand-off insulators, which will give excellent support to the aerial.

Whether using a roof or rod aerial it will probably be necessary to remove the interior trimming to thread the lead-in through the body panel. In the case of a roof aerial it will generally be found that the roof cloth can be loosened by prising off the cloth beading which runs round the edge; the lead can then be taken from the centre to the side of the roof underneath the cloth. When using a rod aerial the fibre board on the inside of the scuttle can be moved sufficiently by prising under one edge, where it is fixed with small tacks.

**Rod Aerials**

The fishing-rod type of aerial is becoming increasingly popular and proves very effective. Essentially, it consists of a small-diameter tube in which a length of thin rod fits fairly tightly. The rod can be extended or closed according to the required sensitiveness of the aerial. In

**PRACTICAL WIRELESS SERVICE MANUAL**

By F. J. CAMM.

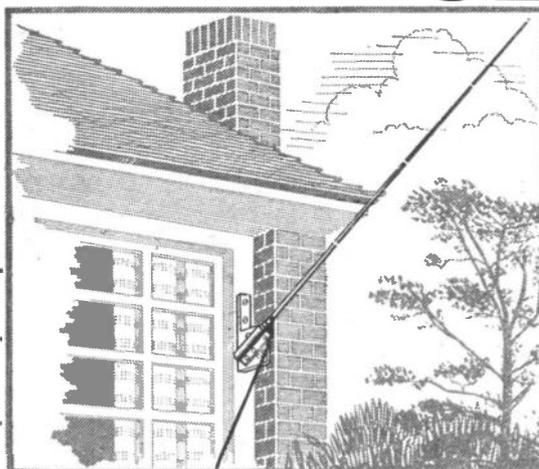
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# Practical Television

July 1st, 1939. Vol. 4. No. 158.

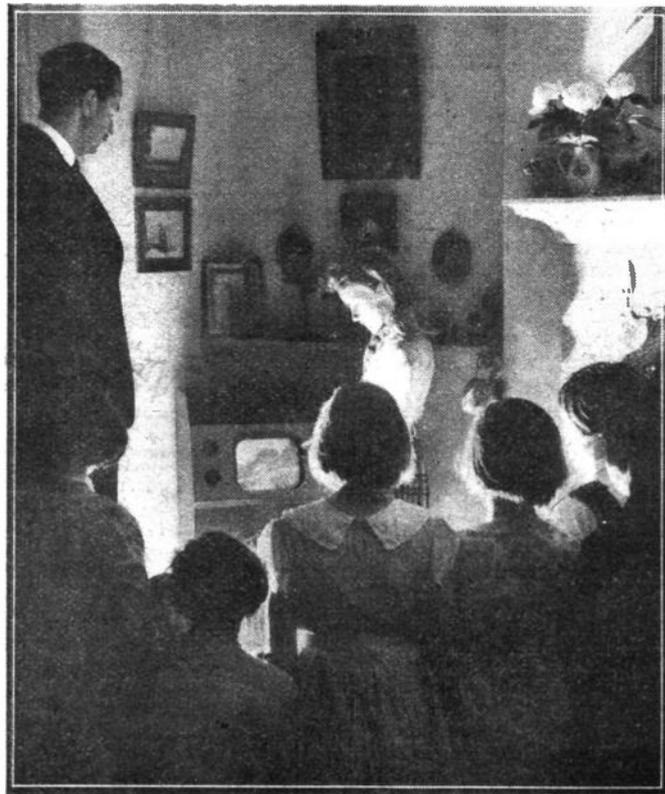
## Who Has the Lead?

THERE has been a certain amount of newspaper comment lately on the question of who is entitled to claim the lead in television. One reason for reopening the discussion was the fact that the French Minister of Posts and Telegraphs stated that the new television transmitter operating in conjunction with the ultra-short-wave aerials of the Eiffel Tower was the most powerful in the world. This was included in his reply to criticisms in the French Senate when he was pressed to make improvements in both the number and power of French radio stations, and also in the quality of their programmes. Admitting that the British radio budget was higher than the French, M. J. Julien insisted that France was not behind Britain in television. With America now definitely "on the air"; Germany anticipating a real start to synchronise with its radio exhibition which opens in a few weeks' time; Japan conducting transmissions in spite of war activities; Russia radiating signals and so on, it is as well to review what constitutes a lead in television. Surely this is dependent on two important factors, namely, the quality of the programmes, coupled with the duration of the public service. In these two important categories no one can take from this country a two-and-a-half-years' lead. When consideration is given to the standard of picture definition, the rated power of the ultra-short-wave transmitters, and the number of stations radiating programmes, then Britain is behind. While the slight differences in the line standards do not affect the issue to any great extent, there is no doubt that the B.B.C. must be given powers to erect provincial stations, and also add to the power of the transmitter. This is the only way in which this country can maintain her television pre-eminence and build for herself an export market for receiving sets and so avoid repeating what happened in the early days of aural radio's development. In every important provincial centre the campaigns for urging on the P.M.G. the necessity for extending the television service are being pursued with undiminished vigour, and the only way to remove the embarrassing position in which he has placed himself is for Major Tryon to adopt a bold policy, and start building not one provincial station, but two or three.

## Good Big Screen Results

THE recent televising of the Trooping of the Colour, with its rediffusion to cinemas, proved to be a very high quality transmission. From the programmatic angle it lacked the excitement of an event where an unknown result was to be portrayed to viewers, but none of the glorious pageantry of the occasion was lost on those privileged to see the pictures. The technical quality of the images was very high, far in advance of the Derby, for example, but this may have been due to better camera positioning

and the use of a line feed instead of a radio link to transmit the signals from their point of origin to Alexandra Palace. There was an unexpected visitor at the New Victoria Cinema in the person of Gerald Cock, the Director of Television. He was there, no doubt, to secure first hand knowledge of the quality of big screen rediffusion,



Village children from 5 to 14 in one of the quietest parts of the Weald of Kent are given lessons by television. This is the Hurst House School, Staplehurst, and the pupils are almost all farmers' children. Citizenship and general knowledge are taught them through the study of news reels and the presentation of historic events, such as the departure of the King and Queen for Canada. Our illustration shows a lesson by television in progress at the school.

and he could not have chosen a better event for picture quality. Each item was portrayed with clarity, even to the unrehearsed fainting of the unfortunate drummer boy overcome by the heat, and his subsequent removal from the parade ground on a stretcher by first-aid men. There was a welcome absence of tilt and bend, a feature which can so easily ruin a transmission if not watched carefully and suitable steps taken to correct it.

## More Big Screen Systems

FOR a very long time the Baird and Scophony companies were the only ones who had developed big screen equipment for use in cinemas and theatres and

had installed their apparatus for actual public demonstrations. On the occasion of the Derby the E.M.I. Company showed their equipment at Hayes. According to those who witnessed the results the picture gave about 3-foot candles in the high lights, and used front projection cathode-ray tubes in which the picture passed right through the fluorescent screen to be projected on to the silver screen by means of a Taylor Hobson 14in. f-1.8 lens. The tube and lens are fixed to a pivoted housing so that they can be tilted to suit the rake of the screen. Three racks (in duplicate) are associated with the apparatus, the first containing the radio receiver, the second the picture and sound amplifiers, and the third a monitor tube and amplifiers with, of course, a remote E.H.T. unit providing the 50,000 volts necessary to feed the C.R. tube's high potential anode. It has now been established that there are at least three other radio companies who

are experimenting with big screen television systems, all of which employ the projection C.R. tube principle. Cossons are working on equipment which they state, however, will not reach a commercial stage for some months. B.T.H. are carrying out experiments at their research laboratories in Rugby, while Philips are also making progress on similar lines. How soon results will be demonstrated is a moot point, but what is established is the fact that the film industry must face up to the knowledge that they would be adopting a wrong policy to oppose big screen development, now that so many other interests are involved.

## A Projectionist's Course

AS more and more of London's cinemas have big screen receivers installed it is obvious that the men who will be called

upon to operate the equipment for each rediffused programme will be the cinema projectionists themselves. It is for this reason that the Baird Company have started a school for projectionists at their factory at Lower Sydenham. Each "student" will be given a two-weeks' intensive training, as mentioned on page 361.

## PATENTS AND TRADE MARKS

Any of our readers requiring information and advice respecting Patents, Trade Marks or Designs, should apply to Messrs. Rayner and Co., Patent Agents, of Bank Chambers, 29, Southampton Buildings, London, W.C.2, who will give free advice to readers mentioning this paper.

# Radio Clubs and Societies

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

## EDGWARE SHORT-WAVE SOCIETY

Headquarters: Constitutional Club, Edgware.  
Secretary: F. Bell, 118, Collin Crescent, Hendon, N.W.9.

ARRANGEMENTS are now well in hand for the society's first 5-metre field day, to be held on July 2nd. Ten entries are now competing, and G2QYP will be in charge of the transmitter, which will radiate each hour for five minutes. This station is also working on July 9th in the R.S.G.B. 5-metre field day. The R.S.G.B. field day was a great success, and nearly 60 people visited the camp, including a reporter from the *Daily Mail* and all continents excepting VK were contacted.

Future meetings include a lecture by Voigt Speakers, Ltd., with discussion on Practice and Theory, and 5-metre field day apparatus. Three new members joined during June.

## INTERNATIONAL SHORT-WAVE CLUB (LONDON)

Headquarters: R.A.C.S. Hall, Cavendish Grove, Wandsworth Road, S.W.8.  
European and Colonial Representative: Arthur E. Bear, 100, Adams Gardens Estate, London, S.E.16.

At the meeting of the London Chapter of this organisation held on Friday evening, June 16th, a lecture on Radio Components was given by Mr. H. T. Stott, A.M.I.E.E. (2COT). Mr. Stott dealt with the type of components generally used by radio amateurs and dealt at length with the subject of meters. Members followed the illustrations on the blackboard with much interest. Mr. Stott also gave some interesting information on vibrators, and described the construction of power packs for use with portable equipment on field days, etc.

The International Short-wave Club extends a special invitation to all readers of PRACTICAL AND AMATEUR WIRELESS to attend a special demonstration and lecture on "Hi-Frequencies" to be given on Friday evening, June 30th, at 8.30 in the R.A.C.S. Hall, Cavendish Grove, Wandsworth Road, S.W.8 (nr. Vauxhall Station).

## ROMFORD AND DISTRICT AMATEUR RADIO SOCIETY

Headquarters: Red Triangle Club, North Street, Romford, Essex.  
Hon. Sec.: Rowland C. E. Beardow (G3FT), 3, Geneva Gardens, Chadwell Heath.  
Meetings: Every Tuesday evening at 8.30.

THE last month has seen great activity at Romford in direction-finding. The first joint field day was organised by the Southend Society, the results being Southend 1st, Ilford 2nd, and Brentwood 3rd. The second, organised by Romford, was attended by 59 members in 12 cars. The start was from Shenfield, and the transmitter was located near Aveley; only one car found the TX, namely, 2CWF, of Romford; he received a prize, as also did the driver. The club has been issued a licence for a Society's transmitter, the call being G4KF, for portable operation. Peter Scott's representative (G2HK) kindly brought a Trophy receiver along for demonstration at a recent meeting. The accompanying illustration shows the Romford team who entered for the May 14th event.

## EASTBOURNE AND DISTRICT RADIO SOCIETY

Hon. Sec.: T. G. R. Dowsett, 48, Grove Road, Eastbourne, Sussex.

MR. A. ACHURCH (G2PA) gave a lecture entitled "Television Transmission and Reception" at the last meeting. He started by saying that when selenium was discovered to give out a current when affected by light many people thought of ideas to transmit a picture by wires from one site to another. He then told of different scanning systems which were used: Nipkow's scanning disc, which was used in Baird's early experiments, oscillating mirrors, Jenkin's specially ground mirror plates, the mirror drum, and finally the cathode-ray tube which is used to-day. Campbell Swindon thought of the idea of using a cathode-ray tube as a scanning device as far back as 1903.

He briefly spoke on film transmission, the band width necessary for television transmission, and aerial systems. Lastly he dealt with interlaced scanning, D.C. modulation, and time base circuits.

## CLAYESMORE RADIO CLUB

Hon. Sec.: J. H. Gordon, Clayesmore School, Iwerne Minster, Dorset.

At the beginning of this term the club-rooms were completely redecorated inside and out. The listening-room was refurnished with a carpet and attractive wall lights. Decorating having finished, preparation then went ahead for the school Speech Day on June 10th. First a mobile truck was built for the carriage of the equipment. The main amplifiers for the P.A. work consisted of two 6L6's in push-pull fed by a 6C5, the output being fed into a Stentorian speaker with a plywood flare. Also on the truck was an electrical re-ordering unit consisting of a powerful battery amplifier, to avoid mains hum; an electric synchronous recording motor, tracking and cutting gear. The blanks were "Simplat" glass base 10 and



A group of members of the Romford and District Amateur Radio Society who entered for the direction-finding contest on May 14th.

12in., cut by a sapphire stylus. The mikes were Siemens ex G.P.O.

Here is a report of the proceedings of June 10th, 11 o'clock to 1: sports announcements, Durgo the guests' lunch, at 1.15 to 2.30, the truck was moved 1 mile to the main school building and placed in position overlooking the lawn where the speeches were to take place. The speeches were heard through the large speakers and they were recorded. At about 3 o'clock Earl de la Warr, President of the Board of Education, arrived. The recordings were very successful. We should like to thank Mr. Swain, of Western Union Telegraphs, who is presenting the club with a microphone for its success with the recording; and also we thank the school for the equipment which made it possible.

Should other clubs be trying recording, we should like to get in contact with them.

## BIRSTALL SHORT-WAVE RADIO CLUB

Secretary: Miss B. Jevon, 29, Went Road, Birstall, nr. Leicester.

THE above club has just been formed for transmitting and receiving in Birstall (Leics) and district. No special knowledge of radio is required, and new members will be very welcome. Will those interested please communicate with the secretary, who will be very glad to impart further information.

## SALE AND DISTRICT RADIO SOCIETY

Secretary: S. C. O. Allen (2PCQ), 31, Emmerdale Drive, Sale, nr. Manchester.  
Meetings: Weekly, on Thursday evenings, at St. Mary's Schools, Barkers Lane, Sale.

MR. ROBINSON (G5UT) lectured at the last meeting and dealt with various types of aerial systems suitable for amateur transmission on 1.7 mc s.w. and 14 mc/s, including a special indoor transmitting aerial on which he had carried out a number of experiments. At the close of his lecture Mr. Robinson answered a number of questions.

New members will be welcomed at any of the society meetings. Subscriptions, sixpence per week, with an entrance fee of 1s.

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BATTERY MODEL. 14-2,000 metres. Amazingly sensitive S.G3 Pentode output circuit. Station names. Screened coils. Steel chassis. Low H.T. consumption. A really modern replacement chassis. Complete with all valves. Matched speaker FREE! List value £5/19/6. BARGAIN 77/- or 5/- down and 18 monthly payments of 5/6.  
A.C. MODEL. Unbeatable N.T.S. offer. All-world reception on 18-2,000 metres. 4 valve S.G. bandpass circuit, providing 3 watts output. Station-name scale. Pick-up sockets. Fully tested. Complete with 4 valves and FREE matched energized-type speaker. List value £8/16/6. BARGAIN 89/6 or 5/- down and 18 monthly payments of 6/9.  
A.C. SUPERBET OFFER. Brand new chassis, 18-2,000 metres. Powerful 4-valve model, giving 3 watts output. Modern station scale. Fully tested, complete with all valves and FREE matched speaker. List value 7 gns. BARGAIN £4/12/6 or 5/- down and 18 monthly payments of 7/-.

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### SECOND LIST OF BARGAIN PRICES.

For first list, see last week's issue.

Switches for Switching Anything. Snap 250 v. 5 amp., indicating 1 2; 10 amps. 1/6; 20 amps. 1/10. Light duty switches for wave change. Semi-rotary, 6/1. Yaxley and Rex Wavechange D.P. 3-way roll contact. 1-. Buign 3-point wave change, 9d. Tune well S.P. on-off, 8d.

Stud Switches 7-way. Box panel by R.I. for meter ranges, etc., 3/6. Larger type G.P.O., 4 sets of 10-way studs, 2 arms and rings on panel, 5/6.

R.A.F. Switchboxes. 3-way rocker type, 1/-. 6-way rocker toggle, 2/-. 8-way ditto, 3/6.

7-Stub Panel Switch, 2 1/2 ins. sq., 3/6. 4-plus sockets, 1/9. 10-way D.P. ebonite mount, 8 amps., 5/6.

12-way D.P., 5 amps., 4/-. 20-Stub Panel Switches, contact arm and rings for 10 amps., 6/6. Ditto, on iron box fitted 300 ohm. 1 amp., 20 tap resis., 10/6. 5-Stub 50 amp. slate panels, new, 25/-.

Remote Switches. Delay Switches, 250 v., 15 amps. mercury tube operated 12-volt coil, 30 secs. delay, 35/-. Mercury Switches for remote control, 6 or 12 volts coil for 5 amps., 230 volts, 16/-. Double-pole, 22/- S.P., 15 amps., 20/-. D.P., 15 amps., 25/-. Mercury Tubes, S.P., 5 amps., 4/-; 10 amps., 5/-. Trans. Valves, 30 watt triodes AT40, 4/6. T250 £2 10 0. AT40 10 watts, 4/6.

100 A.R.P. Crystal Sets with plug-in coils, 2 tuning condensers, semi-perm. detector, 7/6. New Government Hospital Surplus, 7in. dia. bulb. Big solid Tungsten electrodes, Emission guaranteed. COST 25. SALE 10/-. Packing, 2/6 extra. With 12-volt spark coil, 2/3.

200 Spark Coils. Fine adj. Trembler, 10/6. Medical Spool Coils, 2/-. Short-wave Spark Transmitters with tuner for distant control of robots or models by radio, 19/6.

300 Spark Ignition Coils 6 or 12 volts, 3/6. With vibrator, 4/6. 250 Neon Lamps, Minis, 2/6. Special Bargain Standard size better Neon bulbs with holder, 200/240 v., 1/6.

2,000 Fixed Condenser Bargains, 1 mfd. condensers 250 volts, 3 for 1/-; 2 mfd. 2 for 1/-. 4,000 volts 1 mfd. 10/-. All tested O.K.

Coils. S.W. coils plug-in, 1/6. Ribbed formers, 9d. Long-wave and 3-2-7. 3- at 4-pin coils, 1-. Reaction tuners, 9d. H.P. twin chokes, mains, 9d. Rugby coils 4,000 turns Long-Wave, 3/6. All wave-lengths in 2-pin. 1/3. M.I.C. 2-pin coils, set of 4, 2/8; aerial, react., long, short and multiple, 1/6. S/W Formers ribbed and slotted, 4d.

Panels. Polished aluminium, 18 and 16 gauge bright or enamelled, 12in. x 12in., 3/-. 18in. x 18in., 5/6. Ebonite 1in. panels 24in. x 24in., for 8/6. Carr. paid.

Oak Cabinets for A.R.P. Battery Receivers, 2 or 3 valve, polished Jacobean, 13 1/2 in. x 7 1/2 in. x 6 1/2 in. deep, oval, black aluminium panel fitted geared, .0005 mfd. condenser, with sunk dial, 3-way range switch and a single plate condenser. Sliding back 10 terminal Strip, new. Model F, brand new, 12/6.

The Superseder makes H.T. from your L.T. 2-volt battery, rectified and smoothed. Three tappings. List £3 15s. New, sale price, 35/-.

Motors. Motors, Motors, Motors. Tiny, Small and Medium. A large stock of really fractional horse-power motors have been released at

bargain prices. 300 at 2/6 for immediate delivery. HOME SOUND RECORDING at low cost.

The FEIGH RECORDER fits any Radiogram, positive drive, worm gear and rack. Complete ready for use, only 37/6. Super Feigh Fidelity Set, 42/6. Tracking Gear only 21/-. Either 4-dozen metal blanks can be used or the glass-coated simpils, 10in., 3/- each. Pre-amplifiers and Recording

Mikes, 1-valve Battery Model in cabinet, 25/-. A.C. Mains pre-amplifiers, with valve rectifier, steel-cased model, 60/-.

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Fixed Condensers for odd smoothing jobs, 5,000 Mansbridge 1 mfd. Condensers to clear at 2/-doz., 20/-gross.

Parcels of experimental odd coils, magnets, wire, chokes, switches, terminals, etc., post free: 10 lbs., 7/-; 7 lbs., 5/-.

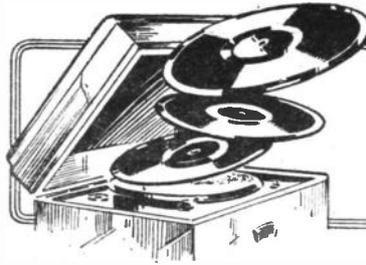
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## Impressions on the Wax

### A REVIEW OF THE LATEST GRAMOPHONE RECORDS

A FEATURE of the Parlophone releases for this month is a new and remarkable record by the sensational pianist, Claudio Arrau. He has recorded "Ballade in A Flat Major" on both sides of *Parlophone R 20443*. Owing to numerous requests, Richard Tauber sings, this month, "Heidenröslein" and "Die Lorelei," both of which are sung in German on *Parlophone RO 20442*.

In the 12in. Classic Series we have another pianoforte solo, this time by Eileen Joyce, who plays four short pieces, "Solitary Traveller," "Brooklet," "Butterfly" and "Melodie," on *Parlophone E 11411*. Also in this series are the Berlin State Opera Orchestra, with a recording of "Eugin Onegin" polonaise and waltz on *Parlophone E 11414* and "Il Re" and Marcella played by the E.I.A.R. Symphony Orchestra, Turin, on *Parlophone E 11413*. The orchestra is conducted by the composer.

George Gershwin's famous "Rhapsody in Blue" (two parts) appears in the 10in. Classic Series, played by Orchestra Georges Tzipine, accompanied by the Grand Organ of the Gaumont Palace, Paris, on *Parlophone R 2666*. Ivor Novello's last play, "The Dancing Years," is also featured in this section with a two-part selection played by the Theatre Orchestra on *Parlophone R 2667*.

### Variety

THAT "low highbrow humorist," Ronald Frankau, deals out some more sophisticated humour with recordings of "In the Bush and on the Prairie and the Veldt" and "That's How I'd Write a Love Song"—*Parlophone 2667*. He is accompanied by Monte Crick at the piano.

Harry Roy and his Orchestra have made four up-to-the-minute numbers with "Beer Barrel Polka" and "Goosey Goosey"—*Parlophone F 1452*—and "Begin the Beguine" coupled with "Little Sir Echo" on *Parlophone F 1451*. Harry Roy also makes a vocal recording of "Small Town" and "Apple Blossom Time," on *Parlophone F 1453*.

Another popular band, Nat Gonella and his Georgians, have recorded four popular numbers—"Chopsticks" and "Patty Cake, Patty Cake" on *Parlophone F 1435*, and "Always" coupled with "One O'Clock Jump" on *Parlophone F 1436*.

Leslie A. Hutchinson ("Hutch") chooses songs from films for one of his latest records—"A Mist is Over the Moon" from the film "The Lady Objects," and "This Night," from the film "Honolulu"—*Parlophone F 1444*. For his other record, *Parlophone F 1443*, he sings two popular songs of the moment, "I Paid for the Lie I Told You" and "Begin the Beguine."

Patricia Rossborough's piano medley which she calls "My Favourites" introduces "Blue Room," "Smoke Gets in

Your Eyes," "These Foolish Things," "Just One More Chance," "There's a Small Hotel," and "Thanks for the Memory"—*Parlophone F 1448*.

Victor Sylvester and his Ballroom Orchestra caters for dance enthusiasts with strict dance tempo recordings of "Apple Blossom Time" (quick-step) and "A Mist is Over the Moon" (slow foxtrot) on *Parlophone F 1437* and "Angels Never Leave Heaven" (quick-step) and "Waltz of my Heart" (waltz) on *Parlophone F 1438*.

### Decca and Brunswick

DECCA present, this month, the first recording of the Piano Quartet of William Walton, written by the composer in 1918-9, when he was 16 years of age. It features the Reginald Paul Piano Quartet, and the composer was present at the recording session—*Decca X 239-41*.

Of the foreign records now issued, three more of the Liszt Hungarian Rhapsodies, played by Borowsky, are published—*Decca LY 6152, LY 6153, and PO 5136*.

No month would be complete for records without a new disc from Bing Crosby, so he obliges this month with three. First comes "Sweethearts," coupled with "Ah! Sweet Mystery of Life," by the ever popular Victor Herbert, on *Brunswick 02761*. "Deep Purple," another of to-day's loveliest songs, is coupled with George Gershwin's "Summertime," which comes from the opera "Porgy and Bess" and is regarded as the most beautiful—and the most difficult—song that Gershwin ever wrote—*Brunswick 02746*. Finally, there is a tune which promises to be the hit song of the month, "Little Sir Echo." This is coupled with the favourite "That Lonesome Road"—*Brunswick 02753*.

A negro who makes a hit this month is Tela Sowande, who was musical director of the "Blackbirds" shows and now holds a similar position for the floor show, "Dark Sophistication," at a London night club. Starring in the same show is Adelaide Hall, another famous Blackbird.

Sowande's first recording engagement is as the accompanist on Adelaide Hall's record of "I Have Eyes" and "I Promise You," on *Decca F 7049*. Playing on the first cinema organ ever to be installed in a British recording studio, he shows complete mastery of the instrument both as a straight and swing player. He also accompanies Constance Impey on her record of "Sweethearts" and "One Day When We Were Young"—*Decca F 7064*. But his most striking contribution to the June record list is as the leader of The Sowande Trio. Here for the first time we have real swing on a large organ. Accompanied by piano and drums he provides the jazz fiends with a real kick in "St. Louis Blues" and "Hold Tight," on *Decca F 7061*.

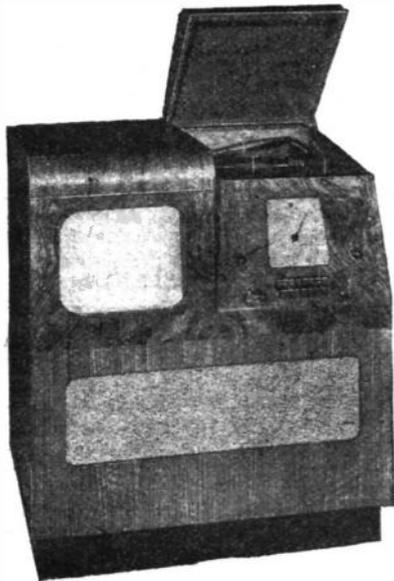
## NOTES FROM THE TRADE

### Tungram Change of Address

**B** RITISH TUNGSRAM RADIO WORKS have recently acquired extensive new premises immediately adjacent to the existing Tunggram valve factory, and accordingly all departments of the organisation have been centralised at that address. All inquiries and communications should, therefore, now be made to British Tunggram Radio Works, Ltd., West Road, Tottenham, N.17 (phone: Tottenham 4884, 4885 and 4886) and not to Theobalds Road.

### New G.E.C. Television Model

**T** HE General Electric Company announce a new luxury addition to the television market in an all-wave auto-radiogram for A.C. operation. The model, BT.0124, is presented in a superb hand-finished



G.E.C. television-auto-radiogram, model BT.0124.

walnut cabinet of modern design and is operated almost entirely by automatic press-button control. The picture size is 10ins. by 8ins., and occupies half of the upper section of the cabinet front, as shown by the accompanying illustration. The control panel is sloped and the gramophone desk occupies the minimum of space above the controls. There are eight buttons for station selection and seven additional buttons for control purposes. The first brings complete television entertainment; the second television sound only for special high-fidelity sound broadcasts; the third brings into action the gramophone equipment, and the fourth, fifth and sixth cover the short, medium and long sound broadcast wavebands. No matter which of these buttons is pressed first, it will automatically switch on the set, leaving the seventh and last button to switch it off.

The radio chassis is a 5-valve superheterodyne, embodying A.V.C. and tone compensation, and the gramophone section will play batches of eight 10in. or 12in. records consecutively. The television chassis is an 18-valve combination. The price is 72 guineas.

### Servicing Handbook

**A** VALUABLE booklet entitled "True Dynamic and Functional Servicing," explaining in detail how the Rider Chanalyst may be used for servicing modern apparatus, may be obtained from Messrs. Holiday and Hemmerdinger, Ltd., of 74-78, Hardman Street, Deansgate, Manchester, 3, for 1s. 6d. Profusely illustrated, this shows in detail the circuit embodied in the Chanalyst, and the appropriate sections of modern receivers to which it may be applied and, therefore, even if you do not intend to use one of these testers the principles of testing and fault-finding are clearly illustrated.

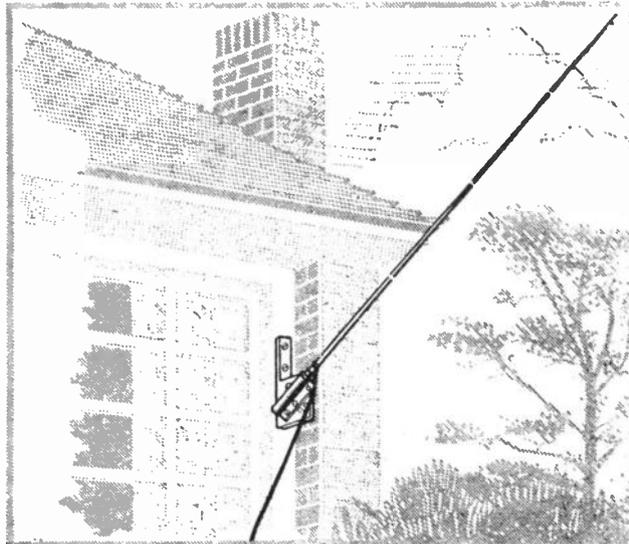
### Morse Practice Records

**M** R. C. E. MASTERS, supplier of the Morse records which were recently reviewed in these columns, has changed his address, and the discs may now be obtained from Orchard House, Finchampstead Road, Wokingham. The price is 2s. 6d. each, or a series of three records for 7s., including postage. Details of a correspondence course, used in conjunction with the records, may be obtained from Mr. Masters, and the fee for this course is 3½ guineas, the fee including operating key, buzzer and 10 gramophone records.

### Sky-pilot Aerial

**P** ILOT RADIO, LTD., are supplying a neat aerial which will be found of the greatest value to flat-dwellers and others with restricted garden space, as well as to those who wish to obtain improved short-wave reception. The aerial may be attached to a chimney stack or other suitable position, or even fitted to the side of a window, as shown in the accompanying illustration. The aerial is sent out neatly boxed, and consists of a stout drilled sector mounting plate, stout screws and Rawl-plugs, and galvanised bolts, spring washers and nuts. The aerial proper is in four tapering sections, fitted together in the same manner as a fishing rod, the lower section being ¼in. in diameter and the top section approximately ½in. in diameter. A neat cap is provided to make it weatherproof. Suf-

ficient lead-in wire is also supplied (40ft.) to enable the aerial to be connected to the receiver under almost any normal conditions, and to facilitate installation of the aerial a booklet of instructions is supplied showing several different mounting systems. The fact that the aerial may be placed outside a window gives to the flat-dweller many advantages over the normal type of indoor aerial, and furthermore by mounting it as nearly vertical as possible, directional troubles are overcome and improved signal strength may be obtained in certain circumstances. The price of the aerial kit is 21s.



The sky-pilot "fishing-rod" aerial shown in one form of mounting. This aerial is supplied in kit form at 21s.

### Addition to Pertrix "All-Dry" Battery Range

**M** ESSRS. HOLSUN BATTERIES, LTD., announce a further Pertrix battery for use in the new all-dry battery portable radio sets. This is a 90-volt H.T. battery consisting of two 45-volt units in one block, measuring 4½ins. by 3½ins. by 5ins., and is fitted with a socket for 3-pin plug. The type number is 1485 and the list price is 9s.

### Hanrad Wholesale List

**H** AMRAD RADIO, whose slogan is "Hams for Hams," have prepared a list of the many amateur components and accessories which they handle, and copies may be obtained on application to 32, St. Lawrence Terrace, London, W.10. The list includes practically everything required by the transmitter, including sundries such as black-crackle paint at 2s., 3s. 6d., and 4s. 6d. per tin; crystals; valves; panels; relays; cabinets; racks, etc. Full details are also given of the Super Communications Receiver which was reviewed in our recent article on this type of receiver. It will be remembered that this is a 12-valve receiver selling at £27 10s., and incorporating all those features which are desirable in a receiver of this type. We hope shortly to publish a complete test report of the model.

### New McMichael Models

**M** ESSRS. McMICHAEL announce two new models in their 1939-40 range, both all-wave superhets. One is for A.C. mains and is priced at £9 7s. 6d., and the other is a battery model at £8 15s. Both models are identical in appearance and

similar in electrical characteristics and performance. Both employ three wave-band superhet circuits covering from 18.5 metres upwards with high peak constant performance aerial couplings. The battery-operated model is fitted with an extra L.F. stage before the pentode output, giving an overall amplification quite comparable to that of the A.C. model. On both models the illuminated tuning scale is an entirely new design, sub-divided into separate sections for each waveband, fitted with an extra pointer, ganged to the wave-change switch, thus indicating the actual scale division which is in use.

## RADIO BIOGRAPHY

### PHIL CARDEW

**I**NSTEAD of being a famous orchestrator and band-leader, as he is to-day, Phil Cardew, athletic fellow of thirty-five, might well have been doomed to wear a leg-brace, his promising career wrecked.

Indeed, had it not been for his own initiative, his leg, which had since his school days given him trouble, would probably have withered, giving him cause to regret ever having listened to the advice of innumerable doctors.

He was born early in the twentieth century, at Wimbledon (Surrey), son of a classical-musician father, who, as soon as Phil could hold and play a fiddle, put him in the Cardew Family Quartet, a small string orchestra well known in the district. To further his progress, Phil secretly made off to the opera after school, then had to sit up in bed when he got home, spending the early hours of the morning coping with his neglected studies!

He rightly considered opera to be an essential part of his training, but he could only afford the gallery at the Old Vic.

Still, it did him a whole heap of good, for at 20 he was playing in an amateur symphony orchestra, and naturally feeling very proud of himself. It was fifteen years later before he entered these sacred ranks again, when he became for a time a clarinetist in the Ernest Read Symphony Orchestra.

At the architectural college which he attended after his schooling, he heard one of the most successful student dance-bands of the day, and persuaded the leader to allow him to sit-in with the saxophone section, this being his introduction to jazz, which did anything but please his father!

Still, what could his Dad say when, urged by his new interest, Phil matriculated at the Royal Academy of Music, getting his coveted L.R.A.M., which comprised Theatrical Conducting and involved a certain rudimentary knowledge of scoring and harmony.

Let it be said here and now, though, that this clever orchestrator has never had an orchestrating lesson, for his ability to arrange so vividly is purely the result of his own swotting at the subject.

It seems that his inauguration to dance music proved the turning-point in his career, for he bought a saxophone ("what a horrible instrument it was!") with which to "inflict himself upon some innocent band leader or another."

He never really mastered it, and has always regretted the day he failed to take "sax" lessons, which he feels certain would have provided a short-cut to the achievements which have instead taken many years of his life to attain.

In 1924-6 he was greatly enjoying life playing at country dances, hunt-balls and the like, at a remuneration musicians can only dream about nowadays.

His first professional job worth talking about was with Jack Hylton's famous "Piccadilly Revels," at the Piccadilly Hotel, secured on the recommendation of Jack's tenor saxophonist and comedian, Johnny Raitz.

When, after a pleasant run, the Revels broke-up, Phil had to resort to odd engagements for a time, but soon had the good fortune to gain a place in Fred Elizalde's Orchestra, at the Savoy Hotel, thanks to the spade-work of Fred's guitar-player, Len Fillis, who is now in Australia and watches Phil's career with considerable affection.

Famous American orchestrators whom Phil met while with Fred Elizalde, imbued him with the ambition to retire from saxophone playing, and devote his entire energy to the use of a manuscript pen.

Phil's association with Fred came unexpectedly to an end when Fred's always superb band

crumbled after two theatre tours following its departure from the Savoy Hotel.

It was about this time that his leg gave him cause for concern. As a child he had met with a bicycle accident which set up the growth



A recent portrait of Phil Cardew.

of a mysterious disease. The limb was encased in a plaster cast, and it recovered.

But suddenly in 1926—at the height of his

career—the old trouble recurred, developing alarming symptoms. A whole army of doctors examined him and each pronounced that it looked like a case of tuberculosis and would require prolonged treatment in Switzerland to prevent the leg withering away.

But Phil just wouldn't believe it. Something prompted him to throw off the plaster cast to test whether the disease grew any worse. Instead, it miraculously recuperated and he has never experienced any further bother with it!

To revert to his unwilling break with Elizalde, Phil was not workless for long. Jack Hylton engaged him. Then came yet another triumph when Jack Payne, starting his long run at the B.B.C., made Phil his arranger-in-chief.

When Jack went on the halls, Henry Hall succeeded him and retained the services of his orchestrator. Another few years of very enjoyable work ensued, until Henry also gave up radio for variety.

Phil, however, found plenty of opportunities for his arranging and had, in fact, practically forgotten that he could do anything else when John Watt approached him to form a band for a new radio feature, entitled "Band Waggon," which could be expected to run for about six weeks.

Six weeks, indeed! The pretty-well immortal "Band Waggon" exceeded forty performances in all . . . and, writing of this intimate show, Phil explains that his "Band Waggoners," which outfit he personally conducted throughout, varied quite a bit in size and personnel during the series, only two musicians being on absolutely every session; George Hurley (violin), and Alan Ferguson (guitar). Not that this marvellous orchestra ever sounded any different, thanks to the man in front.

At the moment, Phil is awaiting a new series of broadcasts which are due to start in July, and be on the air every fortnight thereafter.

## TRANSMITTING TOPICS

(Continued from page 363)

when the grid is *not* excited by an input signal.

If, however, a signal is applied, anode current starts to flow at each *positive* half-cycle of G. This will be appreciated as soon as it is observed that the negative half-cycle will only drive the operating point more negative and, likewise, cuts off the anode current completely.

The resultant effect is shown in the output curves depicted on the right of the diagram, and as these take the form of pulsations they would not be suited to L.F. work in that form. For P.A. circuits, however, the effect is quite permissible, as will be explained later.

The outstanding characteristics of Class B amplification can be summed up in the following details. Practically no anode current flows when the valve is idling. High current peaks are only produced when large signal inputs are applied to the grid, or, in other words, the power output of a valve operating under Class B conditions is proportional to the square of the input signal voltage.

Owing to the fact that the anode current is usually driven past the saturation point on the anode current curve, the grid invariably becomes positive with respect to the filament and, consequently, grid-current will flow. This introduces losses in the grid circuit and these have to be made good by the stage feeding the Class B valve, therefore, it is often necessary to use a small power valve in the preceding stage if maximum results are required.

### Class C

The operation of a valve under Class C conditions is shown in Fig. 3. In this method, the valve is biased with a negative

grid voltage of such a value that it takes the operating point well past the anode current "cut-off" point. An average value for a grid-bias is twice that required to reach the "cut-off" position. This over-biasing produces such conditions that anode current only flows during a *very small* period of the *positive* half-cycle of the input signal and this, combined with other operating conditions, results in a somewhat distorted output wave-form, as shown by the curves on the right of the diagram.

The anode current is driven further into the saturation region than with Class B operation, and this necessitates the input signal being of sufficient amplitude or strength to make good the high grid losses. The trough in the output wave-forms is due to the fact that the grid becomes so positive, through the above requirements, that an appreciable portion of the electrons which would normally reach the anode are attracted to the grid, thus reducing the anode current value during a fractional part of the input signal cycle.

To sum up Class C, it can be said that the output power is proportional to the square of the anode voltage; that this form of amplification has little application to low-frequency work, and that large driving-power is required for efficient operation.

Next week the writer will deal with these three forms of amplification as applied to P.A. stages and modulation.

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# LATEST PATENT NEWS

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume or in bound volumes price 2s. each.

## Abstracts Published.

**REPRODUCING MUSIC.**—Baird Television, Ltd., and Johnstone, D. M. No. 500217.

A method of improving the reproduction of electrical signals comprises applying the signals to the input of an amplifier 1 (Fig. 1) which feeds a converting device 2, such as a loudspeaker, arranging an appropriate detecting device 3, such as a microphone, so that it is influenced by the energy

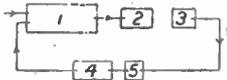


Fig. 1.

emitted by the converting device, and feeding the electrical energy produced by the detecting device back to the input of the amplifier so that the signals fed back are in opposite phase to the initial signals, the feed back being made through a network 4 the frequency characteristic of which is such that the overall characteristic of the reproduction is improved by the feed back. As shown, an amplifier 5 is interposed between the detecting device and the network 4.

**SWITCH CONTACTS ; SPARK PREVENTING.**—Schaub Apparatebauges, G.—No. 500321.

A high frequency switch for radio circuits has one or both of its contacts made of a

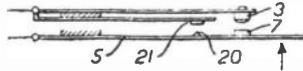


Fig. 2.

material such as carbon, the resistance of which decreases on an increase of pressure, so that the actual make or break occurs at a low current value, thus reducing undesirable noise in a radio receiver. As shown in Fig. 2, the contact 3 is made of carbon and is engaged by a metal contact 7 on a spring 5, the contact resistance being greatly reduced when full pressure is applied, the circuit being finally completed through a pair of metal contacts 20, 21 to cut out the residual resistance of contact 3. Fig. 3 shows a method of mounting a carbon

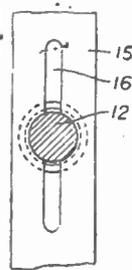


Fig. 3.

contact 12. The non-contacting surfaces are coated with copper and an annular groove in the contact is snapped into a hole in the spring blade 15 which is slotted at 16 to allow for yielding engagement.

## ADJUSTING WIRELESS APPARATUS.

—Plessey Co., Ltd., Packman, P. J., and Morrison, P. H. No. 501273.

In a push-button motor-control system for adjusting a

tuning condenser, provision is made for manual tuning by a knob 97 (Fig. 4) mounted on the shaft of the motor 94 which is geared to the condenser through wheels 98, 99, and a friction drive comprising a wheel 101 which engages between two spring discs 102.

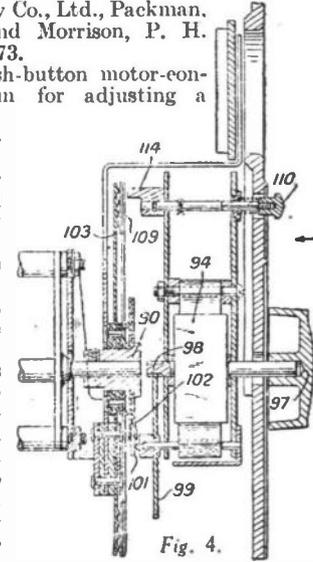


Fig. 4.

## NEW PATENTS

These particulars of New Patents of interest to readers have been selected from the Official Journal of Patents and are published by permission of the Controller of H.M. Stationery Office. The Official Journal of Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. weekly (annual subscription £2 10s.).

### Latest Patent Applications

- 16557.—Baird Television, Ltd., and Baird, J. L.—Methods of scanning cinematographic film in a television etc. system. June 6.
- 16556.—Baird Television, Ltd., Graham, G. E. G.—Electron multipliers. June 6.
- 16749.—British Thomson-Houston Co., Ltd.—Radio receivers. June 7.
- 16372.—Bullers, Ltd., and Nickless, J. E.—Wireless aeriels. June 3.
- 16239.—Farnsworth Television and Radio Corporation.—Shielded anode electron multiplier. June 2.
- 16549.—Grenfell, A. R.—Deflecting circuits for cathode-ray tubes. June 6.
- 16204.—Philips Lamps, Ltd.—Mechanical transmission system. June 1.

- 16482.—Philips Lamps, Ltd.—Radio-receiving sets. June 5.
- 16603.—Standard Telephones and Cables, Ltd., and Smyth, C. N.—Focusing, etc., means for cathode-ray tubes. June 6.

### Specifications Published

- 506502.—Johnson, G. W. (Phileo Radio and Television Corporation).—Tuning arrangements for superheterodyne radio receivers.
- 506639.—Telephone Manufacturing Co., Ltd., Paddle, L. H., and Whitehead, C. C.—Ultra-short-wave thermionic systems.
- 506732.—British Thomson-Houston Co., Ltd., and Kinman, T. H.—Suppression of radio interference from portable domestic appliances. (Cognate Application, 35707.)
- 506542.—Marconi's Wireless Telegraph Co., Ltd.—Thermionic amplifiers.
- 506543.—Marconi's Wireless Telegraph Co., Ltd.—Indicators particularly for radio receivers.

- 506658.—Marconi's Wireless Telegraph Co., Ltd., and Wassell, H. J. H.—Keying circuit arrangements for radio and like transmitters.
- 506798.—Marconi's Wireless Telegraph Co., Ltd., and Myers, L. M.—Cathode-ray tubes and method of manufacturing the same.
- 506659.—Marconi's Wireless Telegraph Co., Ltd., and Oliver, A. L.—Remote-control systems for volume or gain control of electron-discharge device amplifiers.
- 506691.—Radioakt.-Ges. D. S. Loewe.—Television scanning disc.
- 506454.—Farnsworth Television, Inc.—Cathode-ray tubes.
- 506621.—Telefunken Ges. Fur Drahtlose Telegraphie.—Circuit arrangements for phase comparison and bearing-finding radio receivers incorporating the same.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at the uniform price of 1s. each.

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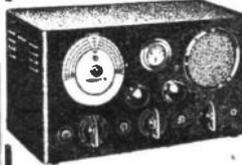


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# LETTERS FROM READERS

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).

### Station K6PLZ

**SIR.**—Last week I received a card from Norman Thompson (K6PLZ), and on it he asks me to inform B.L.D.L.C. members that in future he will QSL only reports accompanied by an International Reply Coupon, or 3c. U.S. postage stamps.—E. CROUCH (Burton-on-Trent).

### A Prizewinner's Thanks

**SIR.**—I should like to take this opportunity of thanking you for the book, "Sixty Tested Wireless Circuits," sent to me in connection with Problem No. 351, and also to tender my congratulation for the high standard of the articles appearing in PRACTICAL AND AMATEUR WIRELESS.

I am very much inclined to agree with "Radio Engineer," in the S.W. section, and realise now that the major cause of my failure some nine months ago when I first started on short-wave work was due to incorrect choice of components and the use of ancient triodes in every stage!

I have recently purchased an Eddystone All World Two, and am exceptionally pleased with its performance. On a recent Sunday night (23.00 G.M.T.) 7 PY's, 4 CO's, 15 W's, and 6 VE's were logged.

My next achievement will, I hope, be the logging of a VK, but I never seem to get up early enough.—G. D. BRITAIN (Hendon).

### Correspondent Wanted

**SIR.**—I have been a regular reader of your popular journal for the past two years. Being a short-wave enthusiast, I should like to get in touch with a reader residing in either district of Alum Rock or Bordesley Green, Birmingham.—KEN TWIST (77, Caldwell Road, Alum Rock, Birmingham, 9).

### A Suggestion for Radiolympia

**SIR.**—The forthcoming Radiolympia Exhibition will probably prove to be the most successful ever held, and it is to be hoped that this will be the ultimate result.

Television will undoubtedly command a bigger share of attention than hitherto, especially now the public has experienced viewing in several cinemas. In this connection, I sincerely trust that amateurs will not suffer, and would like to point out that a welcome innovation at the exhibition would be an amateurs' advice bureau where experimenters could seek guidance on the kindred problems with which they find themselves confronted. A bureau on the lines indicated could be run in co-operation with the exhibiting manufacturers, and would do much to further the friendly rivalry which has always been a pronounced feature at each year's Radiolympia.

I am not trying to hint that television should take a back seat; it is a modern instrument, and must go from strength to

strength, but on the other hand, sound reception is still in the majority, and as such must be treated with the respect which its position thus demands.—ERIC L. ADLEM (Notting Hill, W.11).

### Tokio S.W. Transmissions

**SIR.**—In a recent issue of PRACTICAL AND AMATEUR WIRELESS it was stated that Tokio broadcasts at 06.30-07.30 and at 13.00-15.30 on JZK.

I would point out that I have been receiving these programmes every night for the last five weeks, and the times of transmission are 19.30-21.00 G.M.T. on JZK, and JZJ 25 metres. Anyone reporting these stations receives a large form from Japan, which they are asked to fill in every night and then send back to Tokio. Have any other readers had this experience?—THOS. H. PLATER (Leicester).

### Cape Town Broadcasts

**SIR.**—I am sure that many readers of your fine paper would be interested in our Cape Town transmissions. The Cape Town station broadcasts on 49.2 m., 31.23 m., 341 m., and 500 m., and is experimenting on 110 metres.

Each Wednesday an English programme

### CUT THIS OUT EACH WEEK

## Do you know

- THAT a metal mast used with a transmitting aerial may affect radiation and reduce efficiency.
- THAT oil-dielectric or similar condensers should be used in L.F. coupling circuits.
- THAT the reason for the above is to prevent H.T. from being applied to the grid.
- THAT the capacity of the bias by-pass resistor in an L.F. stage affects the bass response.
- THAT interaction between stages can be effected by coil fields which cut through a metal chassis.
- THAT high-resistance between switch contacts is a common cause of trouble, and particular care is therefore necessary when choosing switches for H.F. circuits.
- THAT ordinary pocket-lamp bulbs are not suitable for dial lights in battery-operated receivers unless switched off when a station has been tuned-in.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL AND AMATEUR WIRELESS, George Newton, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

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is arranged for overseas listeners. One item especially is very enjoyable: it is called "Snook-town Calling," and is classed as one of the finest comical transmissions in the world. Reports on these transmissions, I understand, would be gladly received, and such reports should be sent to: S.A.B.C., Cape Town Station, Riebeeck Street, Cape Town, U. of S.A.—JACK LEVIN (Cape Town, S.A.).

### A 14 mc/s Log From Worktop, Notts

**SIR.**—May I forward my log for 14 mc/s. This time it covers as from June 8th to June 17th. Before doing so I would like to express my appreciation to you for an excellent weekly. The article I like best is "Leaves From a Short-wave Log," and the author of that deserves my thanks for the interesting "snips" he has given in that column.

Recently you published an article on "Mastering the Morse Code": the log below will, I hope, prove that code is far better than 'phone! In my opinion all genuine S.W.L.s should have a working knowledge of the code.

I have just finished checking up my log and I find I have considerably increased it since it was last published. The total up to date—June 18th—is 7,053 and covers the 28 mc/s, 14 mc/s, 7 mc/s, 3.5 mc/s, and 1.7 mc/s bands. On 14 mc/s alone I have logged 3,699 amateurs.

In my log you will notice a W7FDV—this station is (or was) a portable operating in its own district. The complete call was "W7FDV 7." XU9UX is situated at Ishang on the Yangtse-Kaing river.

Here is my log:

14 mc/s 'phone: W4BAH, W5BEK, W6AHP, BEY, EOU, GRL, PDB, SE; W7BVO, DC, FAQ; W8ANC, W9MM, K6OQE, DA4AW, HP1A, YV1AP, ZS2AV, ZE1AJZ, C.W.: W1.2,3,4, W5ADO, EGY; W6ANN, AZO, DEC, DL, FKG, FMY, KAN, KEV, KVJ, LHN, LUR, MAK, MCB, MRB, PFI; W7ADA, AWD, AYO, DSZ, ENW, FDV, FHW, FMK, FZP (of Wyoming), GMV, WWQ; W8AEK, MEL, MJF; W9AZT, QWZ, VDX, ZVT; PAOKW, VK2ADE, AES, AJU, VA; VK3CX, GZ, NF, RC, VZ; VK5KO, VK6KW, VK7GJ, K4ESH, K6BAZ, PHD; ZL2QY, ZL4CS, GY; VE5AAD, ACN, AET, KC; XU9UX, and CT3AN.

The above log shows what it is possible to receive when you have a "working" knowledge of the code! On Thursday, June 8th, all W districts (apart from W3), were logged on 'phone, and on Saturday, June 10th, all W districts on CW; also VK2,3,5,6,7. Not bad going for a 1-v-1.

Incidentally, I would be pleased to hear from anyone whether abroad or at home.—R. W. IBALL, 1, Riddell Avenue, Langolds, Worktop, Notts).

### Correspondents in U.S.A.

**SIR.**—I have noticed often in PRACTICAL AND AMATEUR WIRELESS that some of your readers want to correspond with other short-wave listeners in foreign countries. I have several correspondents in U.S.A., and some of these want other S.W.L.s to write to them.

King Fountain, 905, 14th Street, Orange, Texas, will send an attractive S.W.L. card to any reader who sends him one; he will also correspond.

Arthur Woods, 401, Yankee Street, Wellsburg, W. Virginia, will exchange cards, etc.

Billy Epps, Mincola, Texas, runs a S.W.L. card club; it is free to anyone who sends his card.—S. G. BURRAOE (Forest Gate).



# QUERIES and ENQUIRIES

seem all right in the 'phones. What is the most likely cause of the trouble, and how can I locate it?"—V. Y. McD. (Belfast).

## Screen Voltage

"In constructing an A.C. receiver with an S.G. or H.F. pentode valve, I propose to use a potential-dividing circuit for the H.T. to the screen. How can you work out the exact voltage on the screen so that the two arms of the divider are of the correct value?"—S. L. (Doncaster).

THERE are several methods of arriving at the value, although the exact voltage is not always critical and some variation in voltage is permissible. For maximum performance, it is preferable to use a variable arm on the potentiometer, and this enables the screen voltage to be varied and the maximum output thereby obtained. The divider will consist primarily of two resistances in series, and there will therefore be a current flowing through this dependent upon its value and the H.T. across the ends. In addition, however, there is the screen current which flows through the upper part of the divider, and this must be added to the potentiometer current. The best plan is to work on a rule of thumb basis, making the value of the divider such, that at the voltage in use, the current is 1 mA. The proportions can then more easily be worked out, but much calculation is saved if you use a variable element as previously mentioned.

## Screened Leads

"I am making up a communications type receiver, something on the lines of your Air Hawk. I find, however, that leads from the H.F. stage must pass some way across the chassis to enable the bias and screen to be fed, and this means that the associated leads must pass either through or near other stages. Will screening these leads be satisfactory to prevent interference or instability, or is it necessary to re-design the receiver and modify the layout?"—O. W. N. (Stoke).

NORMALLY no trouble should arise from the two leads mentioned by you. These points should be adequately bypassed, the condensers being joined direct between earth and the screen and cathode on the valveholder. However, in a receiver of the type mentioned, it is desirable to avoid all risks of interaction and, therefore, where a lead from one stage passes through a section belonging to another stage (assuming that each stage is properly screened), the lead should be properly screened with the screening covering cathode. It is, of course, desirable in this type of receiver to endeavour to keep each section entirely self-contained, using metal partitions and screens to keep everything in its proper place.

## Output Stage Defects

"I have an A.C. receiver in which a peculiar fault has arisen, and I wonder if you could help me to trace it. The quality is very poor indeed, and there is a prominent hum. Previously the set has worked quite well. I have a 'phone plug in the L.F. stage which cuts out the output stage and things

IN an A.C. receiver the usual cause of such a trouble will be defective biasing. This would cause increased anode current giving rise to hum, but will not generally affect earlier stages. The bias is generally obtained by a resistor and condenser in the cathode lead, and either a short-circuited condenser or an open-circuited resistor should be looked for. A milliammeter in the anode circuit is the most certain way of finding the trouble, and if the above is confirmed, then replacements of the components will soon decide which is at fault.

## D.C. Receiver from A.C. Mains

"I have a D.C. receiver and the mains are shortly to be changed over to A.C. I understand that I can operate the set from a small unit joined to the mains plug, but

### RULES

We wish to draw the reader's attention to the fact that the Queries Service is intended only for the solution of problems or difficulties arising from the construction of receivers described in our pages, from articles appearing in our pages, or on general wireless matters. We regret that we cannot, for obvious reasons—

- (1) Supply circuit diagrams of complete multi-valve receivers.
- (2) Suggest alterations or modifications of receivers described in our contemporaries.
- (3) Suggest alterations or modifications to commercial receivers.
- (4) Answer queries over the telephone.
- (5) Grant interviews to querists.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

The Coupon must be enclosed with every query.

have no details as to what apparatus is required. Could you give me any details as to what I should need?"—K. L. (N.W.5).

WE assume that the receiver is a standard model designed for an input between 200 and 250 volts, and having a load of 100 mA or so. In that case the simplest conversion is effected with a mains transformer and two H.T. 17 type metal rectifiers, plus one 8 mfd. smoothing condenser. The transformer should have a secondary winding delivering 310 volts at 350 mA, and the two rectifiers should be connected in bridge formation. The 8 mfd. condenser should be joined across the output. A circuit will be found on page 135 of our issue dated April 22nd last.

## Connecting Sets Together

"I have a short-wave set and get very good results, but should like louder signals. Can I connect the set to our commercial radiogram so that I can get louder signals, on the speaker for preference?"—G. R. (Coventry).

IT is possible to make use of the broadcast receiver, but some care is necessary when joining them together. If you use

pick-up sockets on the set you will have to employ a transformer to couple the sets together. It may be possible to convert the short-wave set into a converter or adapter, but probably the use of the L.F. stages alone, by means of the pick-up sockets, is most satisfactory. See the article in our issue dated May 20th last on this subject.

## Mains Smoothing

"I have modified my set which is an A.C. model. There is a rather small choke in the H.T. lead which was previously suitable, but I have modified the output stage with much greater current. The rectifier will supply the extra, but the problem will be smoothing. I do not want to alter the dropping resistances in previous stages and wonder what is the best plan for me in this case."—W. F. S. (Portsmouth).

THE best plan would no doubt be to obtain a new choke and use this for smoothing only the output stage. In this way you would not need a very substantial component (compared with substituting your present choke for all stages) and, furthermore, additional smoothing will be provided for the stage owing to the smaller current which will flow through it. Thus there will be two chokes in your circuit, the smaller feeding the early stages, and the other taking only the output stage. A 4 mfd. condenser should, of course, be joined across the receiver side of the choke in the usual manner.

## REPLIES IN BRIEF

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

**G. G. S. (Belfast).** At the moment we cannot give any address as the set is of American origin.

**J. E. (West Melton).** Could you give us some working voltages, current, or other details so that we could help you to obtain satisfaction? There is no other receiver in which you could use these particular parts.

**E. R. (c/o G.P.O.).** We cannot supply blueprints of the sets mentioned as they were described in a periodical no longer on the market.

**E. W. (Stockton-on-Tees).** You can use a transformer in place of the unit, or a similar unit may be obtained from Messrs. Bulgin, type L.F.10. Morse may be recorded by any standard home-recording method.

**K. P. B. (Edgware).** The disc visor is not suitable for modern television reception and therefore we are unable to recommend any receiver for the purpose mentioned.

**E. S. (Doncaster).** Messrs. Peto-Scott can supply the coil and any other parts. The transformer may have any ratio from 3 to 5 to 1.

**H. P. (York).** The G.B. battery should be replaced or tested when you renew the H.T. battery.

**L. P. (Margate).** A dipole would undoubtedly be desirable and a reflector will be of great use in reducing the noise level.

**C. F. R. (S.E.5).** A standard 1 stage L.F. amplifier should be quite satisfactory. A transformer of 5 to 1 is suitable.

**F. W. (Hythe).** Three L.F. stages could be used, but preferably a crystal gate should be included. The crystal should be 465 kc/s.

**A. B. (Datchet).** Push-pull would be desirable and the H.T. is adequate for the two valves. Use the special push-pull input transformer. Your output transformer is suitable, but use the correct tapplings for the load required by the valves.

**B. R. (Penge).** The emission is definitely low. Modern valves will be desirable as replacements and one of the HL types is recommended.

**L. A. (Southall).** An aperiodic H.F. stage would be useful and a good all-wave choke should be used in place of the coil. This will remove all of the difficulties mentioned by you.

**M. D. H. (N.W.4).** The type of apparatus will depend upon the charger circuit. Write to Messrs. Belling Lee for details of suitable suppressors.

The coupon on page iii of cover must be attached to every query.

# Practical and Amateur Wireless BLUEPRINT SERVICE

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*Date of Issue.* *No. of Blueprint.*

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Summit Three (HF Pen, D, Pen) .. .. PW37  
All Pentode Three (HF Pen, D (Pen), Pen) .. 29.5.37 PW39

Hall-mark Three (SG, D, Pow) .. 12.6.37 PW41  
Hall-mark Cadet (D, LF, Pen (RC)) .. 16.3.35 PW48  
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-Wave Three) .. 13.4.35 PW10

Genet Midget (D, 2 LF (Trans)) .. June '35 PM1  
Cameo Midget Three (D, 2 LF (Trans)) .. 8.6.35 PW51  
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen) .. .. PW53

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The Monitor (HF Pen, D, Pen) .. .. PW61  
The Tutor Three (HF Pen, D, Pen) .. 21.3.36 PW62

The Centaur Three (SG, D, P) .. 14.8.37 PW64  
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) .. 21.10.35 PW59

The "Colt" All-Wave Three (D, 2 LF (RC & Trans)) .. 18.2.39 PW72  
The "Rapid" Straight 3 (D, 2 LF (RC & Trans)) .. 4.12.37 PW82

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1938 "Triband" All-Wave Three (HF Pen, D, Pen) .. 22.1.38 PW81

F. J. Camm's "Sprite" Three (HF Pen, D, Tet) .. 26.3.38 PWS7  
The "Hurricane" All-Wave Three (SG, D (Pen), Pen) .. 30.4.38 PWS9

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Nucleon Class B Four (SG, D (SG), LF, Cl, B) .. 6.1.34 PW34B

Fury Four Super (SG, SG, D, Pen) .. PW34C  
Battery Hall-Mark 4 (HF Pen, D, Push-Pull) .. .. PW43

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"Acme" All-Wave 4 (HF Pen, D (Pen), LF, CLB) .. 12.2.38 PW83  
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**Mains Operated.**  
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Ubique (HF Pen, D (Pen), Pen) .. 28.7.34 PW36A

Armada Mains Three (HF Pen, D, Pen) .. .. PW38  
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen) (All-Wave "A.C. Three (D, 2 LF (RC)) .. 1.11.35 PW56

A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen) .. .. PW36  
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Lucerne Ranger (SG, D, Trans) .. .. AW422  
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Send (preferably) a postal order to cover the cost of the blueprint and the issue (stamps over 8d. unacceptable) to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

**Mains Operated.**

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**MISCELLANEOUS.**

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58 .. .. .	4/3	6V6 .. .. .	4/3
2A5 .. .. .	4/9	83 .. .. .	4/3
6A6 .. .. .	4/9	5Z3 .. .. .	3/6
6D6 .. .. .	3/6	6I37 .. .. .	4/9
6I6 .. .. .	6/6	6I5 .. .. .	4/3
6Q7 .. .. .	5/3	6J7 .. .. .	4/3
46 .. .. .	5/3	41 .. .. .	3/6
2A6 .. .. .	4/9	56 .. .. .	3/6
6A7 .. .. .	4/3	6C5 .. .. .	3/6
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**MISCELLANEOUS**

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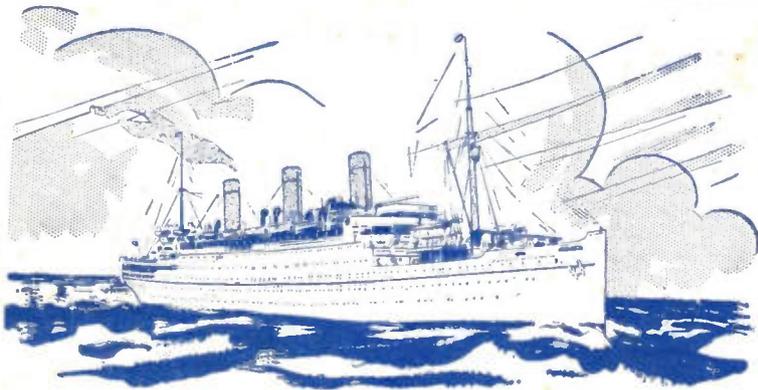
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