

Practical and Amateur Wireless, July 4th, 1936.

**TESTING YOUR VALVES**—See Page 407

# Practical and Amateur Wireless



Edited by F.J. CAMM

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NEWNES  
Publication

Vol. 8. No. 198.  
July 4th, 1936.

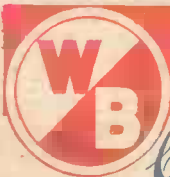
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# IMPROVING YOUR OLD SET—

SEE PAGE 409



# Practical and Amateur Wireless

Edited by F. J. CAMM

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

VOL. VIII. No. 198. July 4th, 1936.

## ROUND the WORLD of WIRELESS

### Germany's Underground Super-power Transmitter

THE new German long-wave station, which is to replace the present one at Zeesen, will have an aerial power of approximately 300 kilowatts. The entire plant will be installed underground in bomb-proof galleries and only the aerial tower will be visible.

### Radio and the Berlin Olympic Games

THE Reichsfunk, during the period July 20th-August 20th, will devote most of the transmissions from the Deutschland-sender (Zeesen long-wave station) to programmes in connection with the Olympic Games. At the same time many special concerts will be broadcast simultaneously through all German stations. On August 16th, the close of the Games will be celebrated by a special entertainment.

### Pity the Poor Announcer!

OF all languages German, probably, is the one which reveals most in the use of un-compounded words. On a recent occasion when a Swiss announcer made a reference to the activities of a steamship company operating excursion boats on the Lake of Lucerne, he was compelled to mention its full title: *Vierwaldstaedtesee-dampfschiffahrtsaktiengesellschaft*. This is almost as bad as a recent item in a Finnish programme dealing with a talk on television: *Elektrolyttisviivaine Hyperkaukol-votaus superkuuntelutelevisionilaite*. Surely a stringent test of sobriety!

### Broadcasting at 350 Miles per Hour

AT the recent R.A.F. Display at Hendon Aerodrome, Flight-Lieutenant H. Broadhurst, leading a squadron of Gauntlet Fighters, gave an exhibition of hair-raising aerobatics, and whilst diving at a speed of 350 miles per hour broadcast explanations of the exercises performed to the crowd of onlookers. The voice of the pilot was heard perfectly through all the loud-speakers installed in the aerodrome.

### What Short-wave Broadcasters Want

IN view of the steady growth in the number of short-wave broadcasting stations more allocations are needed in the respective wavebands if an unpleasant congestion is to be avoided. At the recent

Paris conference delegates demonstrated the necessity of enlarging the present 6,000-6,100 kilocycle (50-49.18 m.) section with a request to provide greater accommodation in the neighbourhood of 17,780 kc/s (16.87 m.). The matter will be further discussed at the next International Convention which is due to take place at Cairo (Egypt) in February, 1938.

### New Aerial for Langenberg

AS broadcasts of the Cologne radio programmes have never been quite satisfactory since the use of the 300ft. tem-

### Cairo Broadcasts for Europeans

THE 20-kilowatt Abu Zabal transmitter, which ensures the broadcast of the Cairo programmes on 483.9 m. (620 kc/s), opens with a five-minute tuning signal (oscillating valve) at B.S.T. 17.55 daily. Only twenty-five per cent., roughly, of the radio entertainments is devoted to items of interest to the European population. British subjects dwelling in Egyptian districts, apart from telegrams published in the local newspapers, must rely, wherever possible, on the Daventry Empire service if they wish to keep in close touch with home topics.

### The Hamburg Reveille

AS customary with most of the German studios, the Hamburg announcer is an early bird, as he sends out his station call at B.S.T. 05.45 daily. To wake up the good citizens he starts the day with a blast on the trumpet as a prelude to a gramophone record, played by bugles, of the reveille as practised in the German Navy, after which the morning weather forecast is broadcast.

### Quarterly Change-over in Holland

ON July 1st, the Dutch studios will again exchange transmitters, and the more up-to-date and entertaining A.V.R.O. and V.A.R.A. radio programmes will be heard on 1,875 m. (160 kc/s). Holland is hampered by the fact that she possesses a number of programme organisations, and only has two channels on which they may transmit.

### Lisbon's Titled Announcer

THE feminine voice which you hear giving you the details of the broadcasts from Portugal's national station (476.9 m.—629 kc/s), is that of Senhora Maria de Rezende, daughter of Baron de Rezende, a prominent official in Portuguese East Africa. Her knowledge of languages is such that she can tackle with ease, Portuguese, Spanish, French, English, and German.

### Radio Telephony with Channel Boats

DWELLERS on the south coast of England may frequently pick up telephony on 109.9 m. (2,730 kc/s), emanating from the North Foreland radio station in communication with ships crossing the Straits of Dover.

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porary telescopic aerial, which replaced the original one destroyed in a winter gale, the engineers have decided that a single pylon would not meet the case, and the station is to be endowed with a new omni-directional aerial system providing transmissions less liable to fading.

### Two High-powered Mexican Transmitters

OFFICIAL news is now forthcoming with regard to the two high-power stations which are being privately erected in Mexico. The *Cia Mexicana Radio-difusora Fronteriza* is installing a 250-kilowatt transmitter at Villa Acuna (Coahuila) to work on 357.1 m. (840 kc/s) with call-sign: XERA. At Nueva Laredo (Tamaulipas), the *Cia Industriale Universal de Mexico* is shortly opening a renovated XENT with a power of 150 kilowatts to operate on 329.7 m. (910 kc/s).



# THE PICK of the PROGRAMMES

## "Susanna's Secret"

A PERFORMANCE of "Susanna's Secret," the one-act comedy by the German-Italian composer Wolf-Ferrari, will be broadcast from the Midland Station on July 4 (Regional) under the direction of Leslie Heward. This opera was first performed in Munich in 1909, and has been a success in many European theatres. In a Mozartian frame the composer introduces modern effects, with results that have been found both pleasing and effective.

## Royal Engineers Band

THE Band of the Corps of Royal Engineers (Director of Music, Lieut. D. W. Jones) will broadcast by permission of Major-General L. V. Bond and the Officers of the Corps, from the Bandstand, Plymouth Hoe, on July 8th, in the Western programme.

## The Silver Patrol

BRUCE SLEVIER augmented his reputation considerably by his adroitness and showmanship in his programmes "Words with Music." The Musical play "The Silver Patrol," written and composed by him, is being revived on July 9th and 10th with a strong cast including Harry Welchman, the famous musical comedy star, Jay Laurier, Frank Drew, Marjery Wyn, Miriam Ferris, Philip Leaver, Sydney Lester, and Laurence Green. This broadcast will be given in the National and Regional programmes on the above dates, respectively.

## Music From the Films

THE third programme in the series "Filmusic" will be broadcast from the Western Regional on July 6th when some of the best known tunes from films of the past seven years will be heard on gramophone records.

## Cinema Organ

ON July 10th, in the Scottish programme, Kevin Buckley, at the organ of the Regal Cinema, will play "Police Patrol," by Ewing; "I feel like a Feather in the Breeze," by Gordon and Revel; "Caprice Viennois," by Kreisler; "Reconciliation" (Polka), by Drigo; "Judy" (from "Puppets" Suite), by Mayerl; and Scene du Bal (Miniature Suite), by Coates. Later in the evening the microphone travels to the Perth Pavilion for seasonable entertainment, and that will be followed by Scottish Dance Music played by the Strings of the B.B.C. Scottish Orchestra.

## Choir and Violinist

A PROGRAMME of part-time songs will be given in the Midland programme on July 15th by the Alfreton Male Voice Choir. The Choir was founded in 1905, numbers sixty voices and, under the conductorship of A. Walton, has won prizes at many Midland and North Country festivals.

## Light Entertainment from Morecambe

MORECAMBE, with the "season" in full swing, contributes another "Night's Entertainment" in the Northern

## MAKE THESE DATES WITH YOUR RADIO

programme on July 10th. This will include the "1936 Frölics" broadcasting from the

## TUNING IN ON A FERRANTI SET



This illustration shows one of the Moston Radio girls manipulating a Ferranti All-wave receiver.

Palace Theatre, dance music by Lionel Millard and his Music from the Winter Gardens Ballroom, and David Poole (ventriloquist) from the Winter Gardens Theatre.

## Variety from Midland Regional

CLAPHAM AND DWYER appeared in the Midland programme when Charles Brewer was in charge of variety at Birmingham, and are always a popular turn. On July 7th they will give one of their amusing double acts. The supporting turn is "Nom and De Plume" which is the pseudonym adopted by two well-known Midland broadcasters who have recently joined forces for light duets.

## Band Music from Llandudno

WITH the advent of summer, outside broadcasts from the North Wales coast towns begin to take a more prominent part in our programmes. On July 9th Peter Mills and the Craigsides Hotel Hydro Band will give a half an hour programme from the Craigsides Hotel Hydro, Llandudno.

## A Boat Train Thriller

IN the Midland Regional programme on July 8th Owen Reed will produce a thriller, "The 10.15 Deathbound," by Hugh McAllan. The central character is the Prince of Epaulonia, who is travelling in the boat train on his way to return to his

kingdom. Revolutionaries conspire to wreck the train and abduct him, with the aid of a beautiful spy; and opposed to them are a Government agent, a friendly motorist, a C.I.D. man, and two cockney signalmen. Hugh Morton plays the prince, Sylvia Clarke the woman spy, and A. G. Revill the chief conspirator.

## "The Charcoal Burner's Son"

MANY appreciations of the quality and entertainment value of the Children's Hour programmes are received at Broadcasting House, and this judgment is being signally upheld on July 13th and 15th, when an operetta which has been performed in the Children's Hour will be transferred to the Regional and National programmes, respectively. "The Charcoal Burner's Son" is a light-hearted fairy-tale on the traditional theme of the youngest son, who succeeds in marrying the Princess where all others have failed. Derek McCulloch, who is in charge of the Children's Hour, will produce this tuneful operetta, the book of which is by L. du Garde Peach and the music by Victor Hely-Hutchinson. The cast is a strong one, including Stuart Robertson, Sybil Evers, Malcolm McEachern, Leslie French, Richard Gooden, Reginald Purdell, and Mary O'Farrell, who will also play the leading part in "Cavalcade."

## Midland Symphony Concert

FREDERIC THE GREAT, King of Prussia, was not only a flautist and a patron of music, but a composer. He wrote portions of the opera "Il Re Pastore," songs for other operas, and symphonies. His Symphony No. 3 in D will be played by the B.B.C. Midland

Orchestra on July 10th at its afternoon concert conducted by Leslie Heward. The other works to be given are the fourth of the eight symphonies by Niels Gade, the Danish composer, and Glazounov's No. 4 in E flat.

## SOLVE THIS!

### PROBLEM No. 198.

Austin's set stopped functioning, and when tests were made it was discovered that there was a voltage drop of 75 volts across the grid leak of the output valve. What fault did this indicate? Three books will be awarded for the first three correct solutions opened. Address your letters to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 198 in the left-hand corner, and must be posted to reach this office not later than the first post Monday, July 6th, 1936.

### Solution to Problem No. 197.

Newton had omitted the load resistance and reservoir condenser which must be connected between the negative end of the Westector and the earth end of the preceding coil.

The following three readers successfully solved Problem No. 196, and books are accordingly being forwarded to them: D. Tanner, 118, Hyde Road, Denton, Manchester; H. A. Brown, 12, Stourport Road, Kidderminster, Worcestershire; Martin Ashton, 57, Thurston Road, Lewisham, S.E.13.



# TESTING YOUR VALVES

When Set Defects Occur Always Make Sure Your Valves are Above Suspicion Before Making Other Tests = By H. J. BARTON CHAPPLE, B.Sc.

EVERY amateur recognises that in the construction and adjustment of a radio receiver a certain amount of testing is required, and that in the event of a fault developing, unless it happens to be of the most obvious kind, rapid location of the trouble is greatly facilitated by undertaking systematic tests. A radio service engineer of long experience recently voiced the opinion that more than half the faults with which he is called upon to deal are due to valves. This must not be taken to mean that valves are as a rule unreliable. The standard of performance and consistency reached by modern valves is very high, and the troubles which occur are mainly the result of using old valves which are past their prime, although, of course, there are instances in which the valves are definitely faulty.

This suggests that the first stage in testing out a receiver for the elimination of faults should be to examine each valve separately, and that amateurs should be acquainted with the methods of conducting such tests. There is a quite mistaken notion that valve testing always involves the use of a large quantity of expensive equipment. While it is true that certain types of test can only be performed with the use of a considerable amount of very accurate gear, it is possible to carry out all the essential tests required by the amateur with quite simple equipment such as may be rigged up at home for a very modest expenditure of time and money.

## Two Distinct Types

It should be remembered that there are two distinct types of tests on valves. The first are on the valves outside the set, and are intended to indicate their condition and efficiency. The other tests are those conducted on the valves under the operating conditions obtaining in the receiver, and are therefore of more consequence in affording a check on the working conditions which may or may not be affected by circuit faults or valve faults. The advantage gained by carrying out the initial type of tests is that, once the valves have been proved to be in good order, any abnormalities discovered during the course of the second series of tests will indicate that the trouble, whatever it may be, is due to the circuit and not to the valves. Moreover, if the first tests reveal that one or more valves are faulty, replacement will, in most cases, effect a complete cure, and much valuable time will have been saved.

In examining valves independently of the receiver, there are two alternatives. One is to conduct a complete series of tests which approximate to those adopted by valve makers during and after manufacture, and the other is the application of a simpler series of tests calculated to determine whether the valves are in reasonable serviceable condition.

The simpler testing technique to be described is quite adequate for the amateur and, indeed, for the service departments of dealers.

## Inter-electrode Insulation

The first test, and one which incidentally is usually overlooked by the amateur,

is a check on inter-electrode insulation. Sub-normal insulation between electrodes is one of the most common defects found in valves, and a source of many troubles which, without some means of checking, may appear very obscure. For example, low insulation between the heater and the cathode of an indirectly-heated valve is a frequent source of hum, and is more likely to occur in valves of the "universal" type although by no means unknown in A.C. valves. Grid-to-cathode shorts or partial shorts are also not infrequent and, in general, the risk of poor insulation between electrodes is more likely to occur in the more complex types of valves, such as frequency-changers, and the various types of multi-function valves such as double-diode-triodes.

The second essential test is on the emission of the valve, and will show whether a valve which will pass the first test is serviceable or whether, by reason of age or mishandling, it has lost its emission and requires to be replaced. There are several ways in which such tests can be conducted, and numerous types of suitable equipment, both of commercial make or made by the amateur, but only home constructed apparatus can be dealt with in this article. For the tests on insulation between electrodes quite simple apparatus will suffice. The simplest is to connect a suitable voltage and a neon lamp in series between each pair of electrodes in turn. A high tension battery or the output of a mains unit, a neon tube of the type used

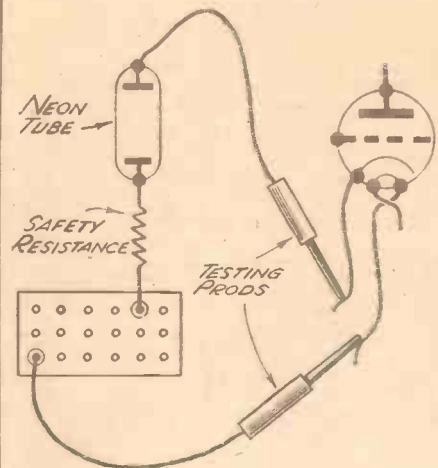


Fig. 1.—A general method for testing inter-electrode insulation.

in tuning indicators with a suitable series resistance, and a pair of test prods are all that are really essential (see Fig. 1) and will suffice when only very occasional tests are required. But for those who are likely to be doing a fairly large amount of testing, or who take a pride in the appearance of their equipment, it may be worth while constructing a more impressive apparatus consisting of a panel with a line of valveholders of different types—4 and 5-pin, 7-pin, 9-pin, and side contact—with the neon lamp fitted behind a neat escutcheon, and a switching device to permit the various pairs of electrodes to be selected for testing.

## A Suggested Tester

It will be found that two rotary switches connected in accordance with the diagram shown in Fig. 2 will achieve this object, and if ten-way switches, which are standard products, are used, any combinations of two electrodes in any standard type of valve can be tested. It is advisable to number the switch positions from 1 to 10 consecutively, and to connect them to the sockets of the valveholders bearing the same numbers according to the standard B.V.A. convention, reserving No. 10 for the top cap. A list of the (Continued overleaf)

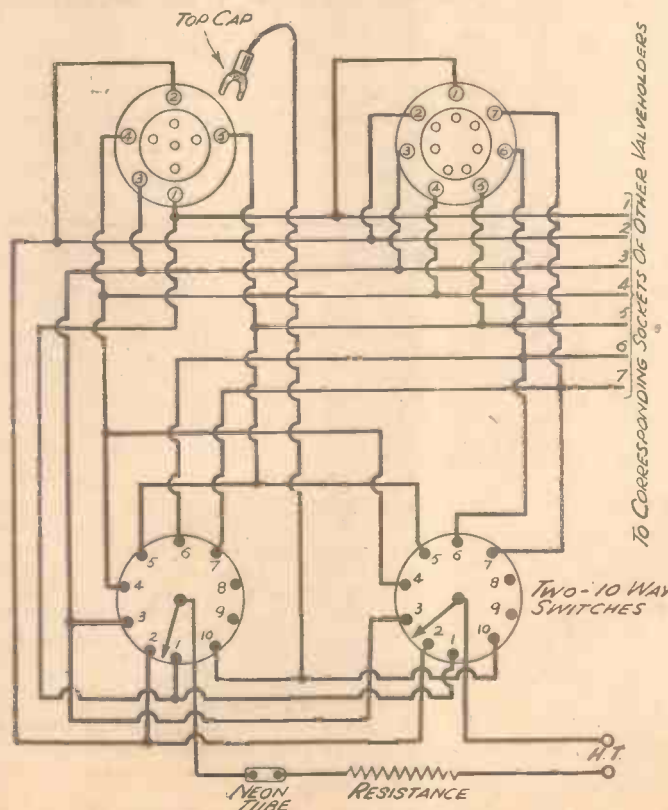


Fig. 2.—A layout for a tester of inter-electrode insulation.

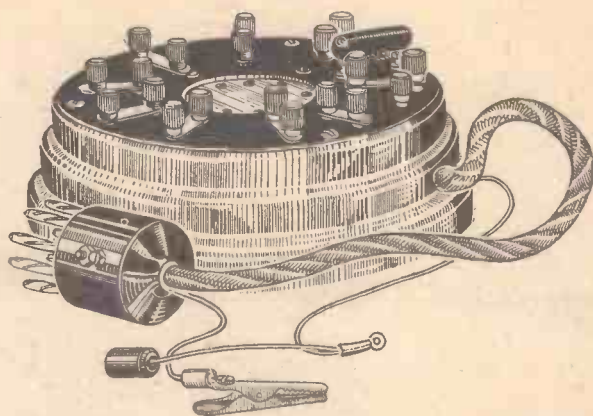


### TESTING YOUR VALVES

(Continued from previous page)

standard connections for various types of valves should also be obtained, and mounted on a card for ready reference.

As an alternative to using two switches, an arrangement of numbered sockets may be used, and for this purpose a single 9-pin valve-holder of the chassis-mounting type is particularly handy, each socket being connected permanently to the socket bearing the same number in every other holder, and the test connections being made by means of two plugs attached to short flexible leads. In this test low in-



An interesting commercial all-valve test panel. This is the new Belgian instrument and is a most useful accessory for the keen experimenter and service engineer.

insulation is, of course, indicated by full illumination of the neon tube, and it will be necessary first to adjust the value of the safety resistance to a value suitable for the test voltage used. Valves should be tested when hot, *i.e.*, after the heater or filament has been in circuit for some time, as poor insulation is often the result of expansion, and is only revealed after the valve has warmed up.

#### Checking Emission

Next for consideration is the means for

taking the emission test. The simplest, and possibly the most convenient, is to test the anode current when the valve is operated at its correct filament or heater voltage, and the voltages at the other electrodes are maintained at some standard values such as anode volts 100, and grid volts zero, or such other values as are indicated in the maker's catalogue or characteristic curves. Care should be taken that if the test conditions are such that the anode current is likely to be substantially greater than the normal anode current under working conditions, the valve is not in circuit for longer than is necessary to take the readings. In the case of output valves it is generally advisable to select testing conditions in which the anode voltage is less than the normal rated anode voltage of the valve, or in which a negative bias is applied to the grid to limit the anode current to a safe value, otherwise there is a risk that even in testing the emission of the valve will be impaired. But whatever the test conditions are, they should be values for which adequate data as to the approximate anode current for a normal valve is available. Even so, it

should be remembered that valve makers allow a fairly wide margin of working "tolerances," that is to say a valve may be passed as satisfactory if the anode current is somewhat less or greater than the average value. If, therefore, a variation from the expected test value to as much as 50 per cent. is observed, it does not necessarily signify that the valve is unfit for service, more particularly if it is a fairly old valve. The normal emission of modern valves is on a very generous scale, and quite good

results may often be obtained in practice with valves which appear to be considerably sub-normal with respect to emission. Nevertheless, if a valve is found to be of low emission it should be deemed a possible suspect if other tests on the receiver as a whole reveal no other faults.

Test equipment for checking emission can vary between the most simple, and the very elaborate. A panel with a range of valve-holders and a selection of split-circuit adaptors is adequate for occasional testing, or for still less frequent use a row of different valve-holders of the baseboard type with short leads and wander plugs connected to each terminal can be used in conjunction with a row of sockets connected to sources of high tension, low tension, and grid bias. There are, of course, many ingenious adaptors of the universal type which permit every type of valve to be tested in this way, or the ingenious amateur may like to spend an hour or two devising switching arrangements which will simplify operation, and minimise the number of loose leads and connections.

If tests on inter-electrode insulation and emission indicate that the valve is in reasonably good condition, no further tests on the valve, as a valve, are necessary. It is, of course, quite an easy matter to check the mutual conductance of the valve by noting the anode current under two different conditions of grid voltage (the difference should be small, say  $1\frac{1}{2}$  volts), and then dividing the change of anode current by the difference in grid voltage, but the value of such a determination, being the "static" characteristic and not the "slope" under working conditions, is very problematic.

But when the valves have proved to be good or reasonably good, it is advisable to make further tests of the valves in position in the set, checking voltages to each electrode and currents in each circuit. Since the valves are above suspicion, any abnormalities must be due to circuit defects, and the nature of the irregularities usually furnishes some clue to the actual defect.

#### The King's Cup Air Race

R. ASHLEY HALL will sign the West Country Visitors' Book on July 8th when he will tell Western listeners about the King's Cup Air Race on July 10th. This year Bristol is one of the control points in the race.

#### The Newbridge Male Voice Choir

THE Newbridge (Bath) Male Voice Choir conducted by Frank Pickering will broadcast from the Western studio on July 7th. This Choir has taken a very prominent part in Bath musical activities, this year giving their Ninth Annual Concert at the Pump Room in March and assisting at the Empire Day Celebrations at Bath Pavilion. The soloist at the concert will be Joan Allen (violin).

#### B.B.C. Scottish Orchestra

AN interesting feature of the concert on July 11th by the B.B.C. Scottish Orchestra, conducted by Guy Warrack, will be the playing of "Old English," from Suite No. 8, by Josef Holbrooke. Solo bassoons are Gwydion Holbrooke and Edward F. Worsley. Gwydion Holbrooke, son of the composer and a member of the B.B.C. Scottish Orchestra, was with the London Philharmonic Orchestra for three years and has played in other important London orchestras. Mr. Worsley was for a

### PROGRAMME NOTES

time bassoon player in the Empire Theatre, Edinburgh, and after the war at the Lyceum. He has been a member of the Reid Orchestra since its inception and has played a considerable amount of chamber music in association with Professor Sir Donald F. Tovey and Dr. Mary Grierson. The orchestra will also play the Suite "Language of the Flowers," by Cowen.

#### "Radio Times" on the Air

ROBERT TREDINNICK'S "Radio Times" will be "Up North" on July 6th, and they are taking the opportunity of broadcasting from the Manchester studios in the evening. The fame of Mr. Tredinnick's gramophone recitals is not confined to the Midlands. His "troupe" includes the inimitable Mabel Constanduros, as well as Angela Parselles, Louis Almaer and the Krakajax.

#### Ian Whyte at the Piano

IAN WHYTE, Music Director in the Scottish Region, will make one of his few appearances as an artist on July 9th. With orchestra he will play Concerto No. 20 in D minor for Pianoforte, by Mozart. the

movements being Allegro, Romanze, and Rondo. The orchestra will also play the tuneful "Eine kleine Nachtmusik," by Mozart, under the conductorship of Guy Warrack.

#### "Western Salon"

THE first of a series of Chamber Music Concerts by well-known artists will be broadcast from Dartington Hall on July 11th under the title "Western Salon" when the artists will be The Griller Quartet. These concerts will, in every case, be given with an audience sitting round the players so that the conditions of the hired hall will be absent and a happy and informal atmosphere will present this attractive type of music at its best.

#### Music of the Sea

THE sea, which has played so large a part in the shaping of British character, has also inspired some of our finest music. On July 7th, the B.B.C. Northern Ireland Chorus and Orchestra will give a concert of music—chiefly by British composers—which has its inspiration in the sea. The programme begins with the opening movement of "A Sea Symphony" by Vaughan Williams for chorus and orchestra, with Anna Reid (soprano) and Stuart Robertson (baritone) in the solo parts. This will be followed by "The Flying Dutchman."



# Improving Your Old Set

How it Can Be Converted for Local Station or DX Reception

By W. S. FLINT

Of the thousands of home-constructed wireless receiving sets now in service, it is probable that the majority are of the screen-grid, detector, pentode type. This type of receiver is capable of giving enjoyable reception from quite a number of stations, but, for the DX enthusiast, or the one who wants real quality from the local station, it falls far short of the ideal.

By sacrificing some of the sensitivity, such a set may be made to give very good quality from the local station (and even in these days of 100-station sets, how often are they used but for reception of the local?). On the other hand, by increasing the sensitivity and selectivity—at some expense of quality however—the simple set may conveniently be made to receive all

the H.F. and output circuits, and confine our attention to the detector and L.F. coupling. Fig. 2 shows the result, from which it will be seen that a

Westector is used as the detector (the characteristics of which are truly linear and introduce no distortion); no reaction is employed, and while the transformer has been removed, and resistance-capacity coupling employed in its stead, the values of condensers and resistances for the latter have been chosen to allow of a 90 per cent. amplification right down to 50 cycles. The triode valve formerly used as the detector now becomes the

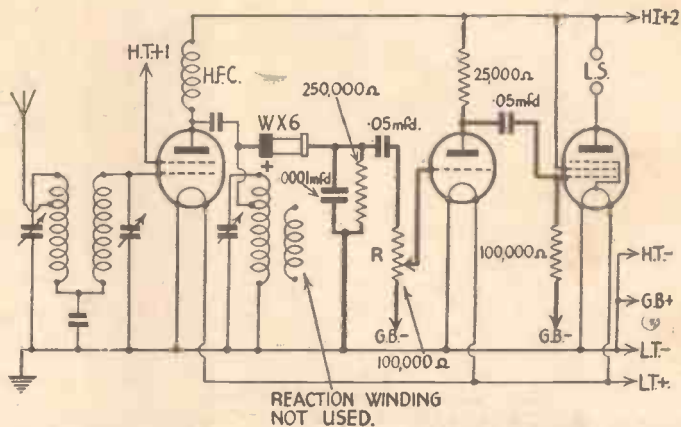


Fig. 2.—Showing how the set represented by the circuit diagram of Fig. 1 is converted to a quality receiver for the reception of local stations only, the additions and alterations being indicated in heavy lines.

first L.F. amplifier, and volume is controlled by means of the variable grid leak R. If the screen-grid valve has variable- $\mu$  characteristics, and volume was previously controlled by increasing or decreasing the bias applied to this valve, the volume control should be set to its maximum position, or else removed, so that the screen-grid valve now works always at its full capacity in order to feed as large an H.F. voltage as possible to the Westector.

## Quality Reproduction

We now have a receiver which by virtue of the use of a Westector is less sensitive than previously, but which has the great advantage, however, of giving almost perfect fidelity of reproduction, and the drain on the accumulator and H.T. battery has been in no manner increased. Unfortunately, we still have a pentode in the output stage and, while in no way wishing to detract from the usefulness of this very efficient output valve, it has been proved that a triode, while being less sensitive, introduces far less distortion and, since we are aiming at perfect quality, a triode in the output stage seems necessary. We have an additional L.F. stage, so that we are able to feed quite strong signals into the output stage, and it is desirable, therefore, to substitute a valve of the 230 XP class for the 220 HPT pentode. This can only be done where an H.T. supply is available either from an eliminator or

(Continued overleaf)

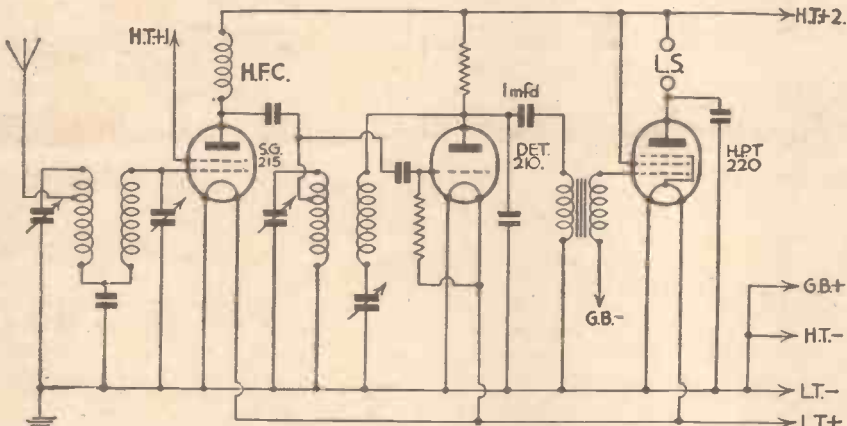


Fig. 1.—Circuit diagram of a typical 3-valve battery set with band-pass H.F. stage, tuned-grid coupling to leaky-grid detector, and parallel-fed transformer feeding a pentode output valve.

the worth-while continental programmes at a slight extra cost.

## A Typical Three-valver

In Fig. 1 is shown a typical set of the type referred to. The set is shown only in its essentials, and no attempt has been made to give values to the various condensers and resistances. It will be seen that the circuit consists of a band-pass arrangement in front of a screen-grid valve, which is choke-capacity coupled to the tuned-grid coil feeding the detector valve. Reaction is employed and a parallel-fed transformer couples the detector to the pentode output valve. In such a circuit, selectivity and sensitivity are fair, but the quality of the reproduction is marred by the inclusion of a non-linear detector, reaction, and a coupling (i.e. the transformer) between the detector and output valves which will not amplify all frequencies at the same strength. In this way distortion is introduced, and the receiver is deficient in either bass or treble, depending upon the characteristics of the transformer. We may, therefore, retain

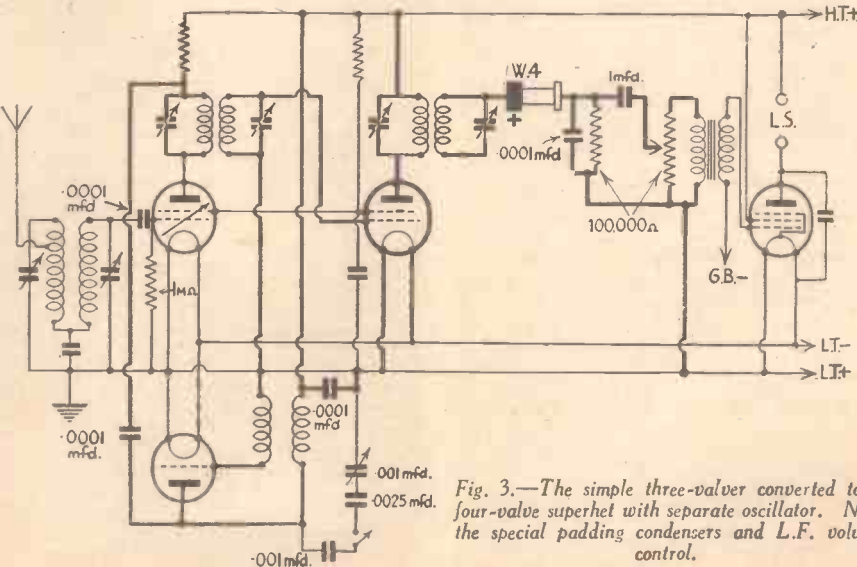


Fig. 3.—The simple three-valver converted to a four-valve superhet with separate oscillator. Note the special padding condensers and L.F. volume control.

### IMPROVING YOUR OLD SET

(Continued from previous page)

H.T. accumulators. The 230 XP valve itself consumes 20mA, so that it is not practicable to work it from dry batteries.

Whatever valve is used in the output stage, however, it is necessary that a volume control be included where marked at R, as otherwise there will be a serious danger of overloading the output stage on loud passages.

Having shown how it is possible to convert the simple set to give really excellent quality from one or two stations only, we will now turn our attention to the DX enthusiast. The obvious improvement for increasing the sensitivity of a receiver seems to be to add another H.F. stage, but, unless the change-over is carried out with very great care, there is a serious danger of running into H.F. instability of a kind that is very hard to cure. Probably the simplest method, and one which has been carried out recently by the writer with a screen-grid, detector, pentode mains receiver, is to convert it to a superhet. Few modifications are necessary, and the extra parts required cost somewhat in the region of thirty shillings, including a new valve, oscillator coil, and two I.F. transformers.

### Converting to a Superhet

Fig. 3 shows a suggested circuit. The S.G. valve now becomes the first detector, the triode detector is now acting as a separate oscillator, a variable-mu screen-grid valve is introduced as an I.F. amplifier, a W4 Westector is used as the second detector, and is in turn coupled to the pentode output valve by means of the existing transformer. Such a set will give good reception from all the worth-while continental programmes. There is no need to use a separate condenser for the oscillator. The former tuned-grid coil is removed, the oscillator coil added, and the portion of the ganged condenser which previously tuned the grid coil is arranged so that the oscillator frequency always remains the same number of kilocycles away from the incoming signals, by means of padding condensers. In other words, there is no need to obtain a special superhet-type condenser, the existing straight type being retained. Provided the inductances of the band-pass coils conform to the now accepted standard, i.e. 157 mH for medium waves, and 1,900 mH for long waves, a standard oscillator coil with inductances of 126.8 mH for medium waves, and 1056 mH for long waves should be used. In the case of difficulty, the makers of the coils should be consulted. As far as the padding condensers are concerned, this again may be a matter for the coil manufacturers, but it is probable that values of about .0025 for medium waves and .001 for long waves will suffice.

### Fixed Tuning for I.F. Stages

Apart from the use of a separate oscillator the circuit is identical in every way with modern superhet circuits, and no difficulty should be encountered in the conversion. The whole advantage of such a conversion is that the tuning of each I.F. stage is fixed, and hence it can be accurately ganged once and for all, and will provide the same accuracy of tuning, and the same degree of selectivity over the whole of both broadcasting wave-bands. Its sensitivity will also be greater than could be obtained with two H.F. stages and, if considered desirable, it is a simple matter to control the set by means of A.V.C.

# New Marconi Phase-Corrected Sound Projector

Some Interesting Details of a New Type of Loud-speaker which has been Developed for Public Address Work

THE problem of reproducing speech and music to an extremely large gathering of people has been tackled by various makers of public address equipment, and at some large meetings which are held in this country some interesting loud-speakers have been seen and remarkable results claimed. The Royal Air Force Pageant, which was held last Saturday, is an event which attracts a considerable crowd—generally estimated by the authorities at half a million—and the problem of conveying announcements to such a vast congregation of people, and of relaying speech broadcast by airmen flying above the crowds has been dealt with in previous years by the Marconiphone Public Address department with great success. It has been felt by them, however, that an even better type of loud-speaker could be produced, and just before the Pageant we had the pleasure of visiting Hendon Aerodrome and witnessing a demonstration of the latest loud-speaker or sound projector, as the Marconiphone people prefer to call it. They feel that this title more clearly conveys the function of the instrument than the term loud-speaker which, as we have pointed out before, is a misnomer.

### Features of Design

The two chief points about this sound projector are its extreme range and its faithful reproduction. An idea of its capabilities may be gained from the fact that one of these sound projectors will perform the duties of three of the ordinary type. The saving in transport and labour, therefore, will be apparent.

So recent is this introduction that it was impossible fully to equip the aerodrome with these sound projectors. Six of them, however, were mounted on the hangars and performed the main job of covering the huge crowd which was present. They were not worked at anything like full pressure, and were augmented by a series of the now famous Marconiphone "short horn" loud-speakers placed at other vantage points.

The new loud-speaker itself is unique in many ways. It was designed with one object in view—to project sound of first-class quality over as big a range with as wide a spread as possible, and two years have been spent in achieving this end. At the commencement of experiments it was at once realised that a suitably designed horn was the best means of ensuring this, in conjunction with a high-efficiency moving-coil unit.

### Diaphragm Design

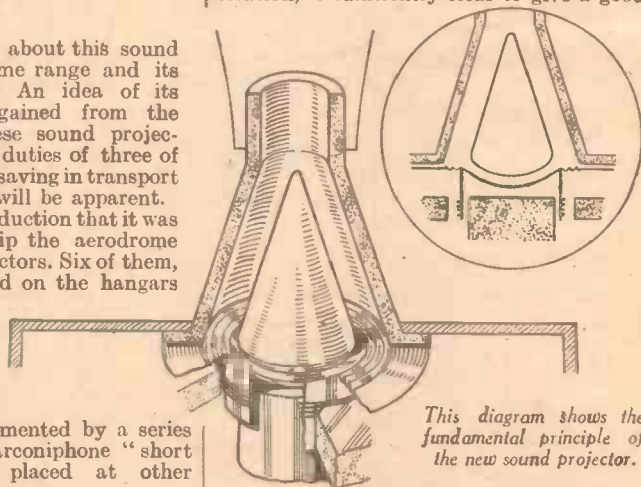
The unit itself presented certain difficulties which were easily overcome, but the diaphragm which was to work with it appeared for a long time to be an almost insurmountable obstacle. Dozens of different materials were tried, but none of them could stand up to the tremendous strain imposed by the volume which was handled by the loud-speaker unit. One and all they cracked under the strain, until at

last a special composition was discovered which is absolutely impervious to the strain imposed by vibration.

Various tests have been carried out with these diaphragms; they have been boiled for hours at a stretch; they have been subjected to intense heat in an oven; they have been suspended in cold water for months, and from each of these drastic tests they emerged quite fit to do their job in the manner for which they were designed.

An idea which is not new, but which was originally conceived by the Marconiphone Company for sound projection, is the smoke-ring effect. Everyone knows how smoke-rings extend as they travel outwards, until finally lost by their attenuation in the atmosphere. An exactly similar effect is used in the new Marconiphone Sound Projector, the "sound-rings" in this case being obtained by the use of a suitable tongue inserted in the loud-speaker unit. Quite naturally, the speed of travel of the "sound-rings" is many thousands of times greater than that of the smoke-rings.

The accompanying sketch (which is not technically exact, as it was roughly sketched from the unit exhibited at the demonstration) is sufficiently clear to give a good



idea of the arrangement employed. The diaphragm itself is extremely small, measuring only 1½ in. in diameter. The speech coil is cemented to this and is wound with aluminium wire, and the total weight of diaphragm, surround and speech coil is only 1½ grams.

It will be seen that the diaphragm is "dished" slightly and supported immediately above it is the phase corrector, a metal unit which causes the sound waves to be emitted in the form of a ring, as previously mentioned. The exact positioning of the diaphragm and phase corrector, as well as the spacing between these units, is extremely critical and very accurate workmanship is required.

During the demonstration we crossed the aerodrome to a distance of 600 yards and speech and musical items were heard with perfect clarity, the attack and high-note response being most remarkable for an out-of-doors demonstration.



A PAGE OF PRACTICAL HINTS

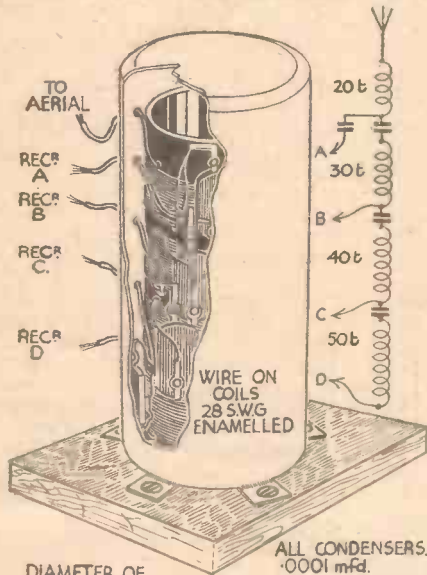
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Multiple Aerial System

THE accompanying diagram shows an inexpensive multiple aerial system which I recently built and fitted in a new block of flats. The condensers are all

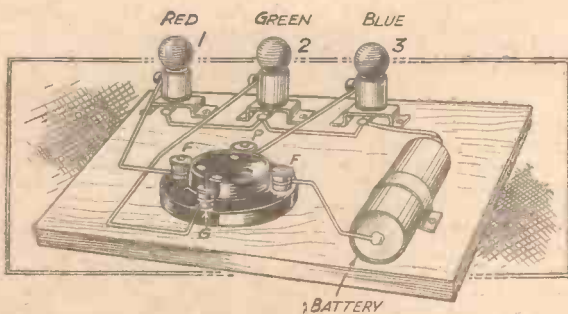


Sectional view of screened coils used for a multiple aerial system.

.0001 mfd, and are of the tag-end type, the wire used being No. 28 enamelled for each coil. The coils are wound in the same direction, on a paxolin former, 2 1/2 ins. diameter. To improve the appearance and for protection against weather, the coil and condensers should be encased in a metal can, as shown. The completed unit can be mounted directly at the aerial lead in, or on the window frame adjacent to the first receiver.—M. ASHTON (Lewisham).

A Simple Valve Tester

IN this simple valve tester three coloured bulbs, a valve holder, and a single flash lamp battery are connected as shown. The valve to be tested is plugged in and if the filament is in good order the red



General view of a simple valve tester.

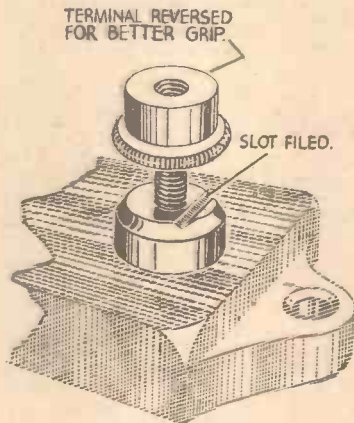
THAT DODGE OF YOURS!

Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkle.

lamp lights up. If the grid and filament are shorting, the green lamp lights up, and if the anode and filament are shorting, the blue lamp glows. If more than one lamp lights it indicates that there is more than one short, or that the filament is in order and other parts are shorting.—J. R. DAVIES (Swansea).

A Terminal Hint

BY filing a V-shaped slot in the collar of a condenser or any other terminal, the time spent in making loops is saved, as the wire has only to be bared from insulation and laid in the slot. It also looks



An improved method of clamping connecting wires under terminal heads.

neater than a looped wire. It is a good plan to reverse the terminal, as shown, to give a firmer grip.—J. REID (Junn.) (Findon).

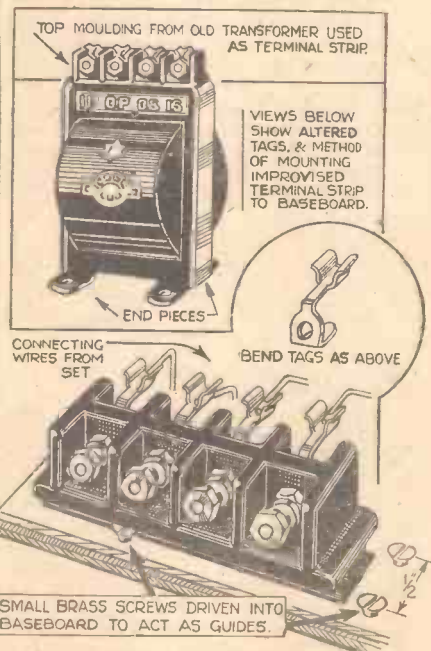
A Soldering Tip

YOU recently published a wrinkle for simplifying soldering by connecting a weight to the lead to the iron so that it kept out of the way of articles on the bench. I have tried out this scheme and it is certainly useful, but I think this addition makes it even more useful. Firstly, the cord should be passed through a hole in the bench top as in the previous case, and a weight should be tied to the most

convenient place on the cord so that it will always draw the surplus down when the iron is placed upon the stand. Have two stands, one nearer to the hole than the other, and arrange the weight so that it is heavy enough to pull up a simple make-and-break switch. Wire this in the circuit to the iron so that the following may be worked. Switch on the iron and stand it on the stand farthest from the hole. In this position it heats up and may be lifted from here and used as in the previous case. When work is completed the iron is placed on the other stand, and the extra length of lead so provided will permit the weight to drop still further and switch off the electric supply. By suitably arranging the weight and separate pulleys it may even be found possible to make the weight switch on the supply when the iron is removed from one stand to the other, so making all the soldering work automatic. (E. Watts, N.W.9.)

An Improved Terminal Strip

REQUIRING a terminal strip, and having by me a broken-down transformer of the type shown in sketch, I utilized the top moulding for this purpose. This moulding is easily removed by sliding off the end pieces. A simple method of fixing the terminal strip is readily seen in the accompanying sketch, which is self explanatory. It is hardly necessary to remark that a sound transformer should not be dismantled for the above purpose.—R. L. GRAPER (Gillingham).



Utilising parts of an old transformer moulding for a terminal strip.



# Practical Television

July 4th, 1936. Vol. 3. No. 9.

## New Television Inventors

SOME sections of the Press have been describing what are claimed to be new inventions in connection with television. In one case it was "television in colour," shown in a London garage. It is stated that the three people present saw a perfectly synchronised and a brilliantly coloured figure of a girl on a six-foot screen. Some very crude colour television pictures were shown eight years ago, but this is the first time that such sweeping claims have been made. Comment cannot be made until the inventor's apparatus has been examined by our experts, and, in the meantime, effort must be concentrated on perfect monochromatic television before complicating matters with the addition of colours, together with the long promised stereoscopic effects. In addition to this development it has been stated that a very youthful inventor has been experimenting with a new form of television receiver using treated arc carbons. Nearly five years ago the modulated arc receiver was shown to the British Association in London, the low-definition images being projected on to a large screen and shown in full brilliance to assembled audiences. Since that date, however, nothing more has been heard of the equipment and it is assumed that for big screen working the project has been abandoned in favour of more modern methods which give a much higher degree of picture definition, yet retain the same degree of brilliance.

## An American Estimate

According to a recent published statement American television experts estimate that the total value to the American electrical industry of the world market in television will be a sum exceeding one and a half thousand million pounds. The same statement went on to say that they are allowing Europe to carry out all the initial experimental public work for the electrical industry which is still recovering millions of pounds by replacing out-of-date sound equipment.

## A New Angle on U.-S. Waves

For some time controversy has raged round the subject of the range which can be expected from any ultra-short-wave transmitter. The real issue has been lost frequently by confusing what happens when these waves are modulated by telegraphy or telephony signals, and the new conditions which hold when the modulation is of the special character required by combining picture and synchronising signals for television purposes. Again, wrong comparisons have been made as a result of ignoring whether the aerial system is of the directional type meant solely for point-to-point communication, or whether the signals had to provide equal radiation in every direction for the purpose of a broadcast service. In every case, however, it has been accepted that the ultra-short waves which have gone into the upper layers of the atmosphere have either been absorbed or passed right through and, in consequence, did not return to the

earth and provide reflected signals as is the case with the short, medium and long waves.

Now comes the news of a most important discovery by the British Government's Radio Research Board under the Department of Scientific Industrial Research. Briefly, it is to the effect that provided the ultra-short-wave radio transmitters themselves are sufficiently powerful, there is no limit *theoretically* to the range over which these high-frequency carrier waves may extend. If such is the case, then trans-Continental, and later trans-Atlantic transmission and reception may prove to be possible. One of the greatest difficulties is associated with the design and building of these radio transmitters so that they are capable of working at very high powers—a few hundred kilowatts may be necessary. Up to the present this has not been possible; the installation at the Alexandra Palace is rated at a peak power of 17 kilowatts. Owing to the enormously high carrier frequencies involved—over forty million cycles per second—the valves, condensers,

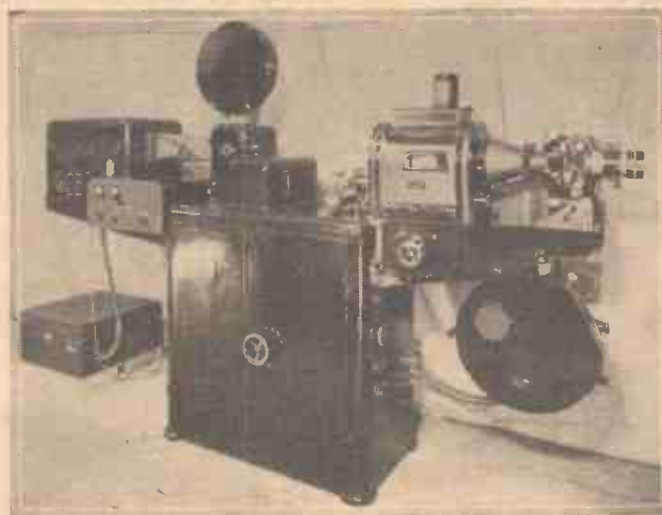
the Alexandra Palace television transmissions will reach much beyond the scheduled service area of approximately thirty-five miles radius. Questions of aerial height, nature of aerial and power to be employed are all matters which will have to be investigated with extreme care if the full value of this new British discovery is to be felt. What is important, however, is the hope which is held out that every new television service may in time embrace wider and wider areas, and so increase very materially the potential number of those persons who can look in with suitably-designed receiving equipment.

## Televising Horse Races

In some quarters regret was expressed that no attempt was made this year to televise the Derby horse race. This was done as a single-zone and three-zone experiment in the years 1931 and 1932, but now that electronic scanners built in the form of cameras are being developed it seems certain that next year's race will be televised on quite ambitious lines. In any case the B.B.C. are in an excellent position to acquire experience of this nature, for near the television headquarters is the Alexandra Park racecourse where quite a lot of horse racing is undertaken. It will be interesting to see how soon sections of a race will be broadcast in this way, for items of this nature will lend increased value to the programmes.

## Television and Space Demands

It is impossible to conjecture correctly



The Fernseh A.G.'s intermediate film television projection receiver which produces pictures of the size of a cinema screen.

inductances, coils, etc., have to be specially made, while phenomena not found on the medium and long-wave transmitters evidence themselves and make the work and design of a far more exacting character. No problem, however, is incapable of solution, and ether congestion, coupled with the advent of high definition, has stimulated work in this region.

The Heaviside, Appleton and Kennelly layers in the upper atmosphere at varying distances from the earth's surface have all played their part in reflecting back the electro magnetic waves which provide the medium for carrying signals over long distances round the earth. The Radio Research Board now report that they have proved the existence of a series of additional reflecting layers which vary in height above the earth from four to thirty-seven miles. It is these new layers which are concerned with the reflection of the ultra-short waves. This does not mean that we are immediately going to find that

what space demands will be made in the future by television. For that reason it is to be hoped that the B.B.C. have an option on more floor area at the Alexandra Palace should such a course prove necessary when the service is in full swing and shows every possibility of extending and developing with the same rapidity as broadcasting did a few years ago. It is known that the B.B.C. have already taken over another section of the Palace. This comprises the theatre and north tower, being separated from the main section by the public hall. It is intended to use this theatre for rehearsals, as at the moment there is only one studio proper for the use of each of the two television companies responsible for the signals. With a new service the rehearsals will have to be of a very exacting character to fit in the new medium of appealing to the eye as well as the ear, and the more time and space given over to this purpose the better will be the actual transmitted programmes.



# On Your Wavelength

## Car Radio

I HAPPENED to be driving along, the other day, in a queue of cars more than two miles long, which, in spite of modern methods of controlling traffic, seems to suggest that the traffic muddle gets worse. As an aside, may I say that the Minister of Transport ought to be compelled to drive in some of these traffic jams, when he may perhaps learn the error of his ways and curse the traffic signals and all of the other failures which he has introduced. This queue of cars proceeded in a series of two-yard jerks, and it took thirty-five minutes to cover a mile. At each jerk you could hear the painful strains of car radio, and however tempted I might



"Foundations" are to end.

have been to have installed such a receiver in my car this experience cured me of it. The reproduction was terrible, and was badly interfered with by the ignition systems of other cars. It would seem from this that we have a long way to go along the road of noise suppression. One of these days it will be an offence to sell or to use an electrical device which interferes with radio, and it is just as well for car designers to get down to the problem now as to wait until they are compelled to do so. As a race we are always slow to move; we prefer the old to the new, but other times, other manners. My friends on the *Practical Motorist* tell me that my experience was an unusual one, and that they have tried cars fitted with almost perfect radio. They mentioned Philco particularly, and the Melody Minx. I must seek an opportunity for testing them.

## The Foundations

PARDON my frivolity, but I have just heard that the foundations of music are to end in the autumn.

## By Jhermion

The hours from 6.30 to 8 p.m. are to be filled with bright programmes, and not a long succession of talks. The foundation was an excellent idea in the first place, but they have been going on for so long that they have erected a skyscraper and must have put the roof on several times. Very few people, unfortunately, are interested nowadays in learning music, for this is a mechanical age in which they prefer to take it from a disc or from a machine by pressing a button. The piano remains the most perfect musical instrument, for it is the only one upon which you can obtain orchestral effects. Learning music is pure drudgery, and learning the piano even worse. There have been many attempts to simplify the crazy system known as the old notation. When the tonic sol-fa system came in you were able to read the notes off direct and the time consisted of a system of dashes. Similarly, the piano keyboard is the same nowadays as when the instrument was first introduced, in spite of the fact that many inventors have produced excellent simplified keyboards. I learned the other day that an old-established periodical which deals with the piano trade went out of existence for want of support. The piano industry must not complain. As with motor-cars, it has concentrated its attention upon producing ornate exteriors and does not concern itself with the instrument. One or two firms are producing small pianos which do not require a room to themselves, but I understand that they are not too well received. The wireless programmes, as I think, should be used absolutely for entertainment and not for education. If, as a fact, the foundations of music are to go, I for one shall welcome it. I have quite enough of the foundations from the girl next door, who commences her lessons in Czerni's Five-finger Exercises early in the morning and has now graduated to playing "Home, Sweet Home." That is one of the causes of the unpopularity of the piano—the annoyance its acquisi-

tion causes to neighbours. It takes about five years to learn to play the piano. How many people after that time can play really well? We all know, nowadays, how it should be played. Is the piano, therefore, an archaic instrument which in future will only be seen in museums?

## Their Own Sound Engineers

VISITING a music-hall, the other evening, I was surprised to see a famous radio star who had taken about eight "curtains" bring forward a little, nervous man in shirt-sleeves and headphones. I investigated, and discovered that all these big stars take with them, in addition to their own conductor, their own sound amplifier and engineer who understands them and knows exactly how to get the best effect. It is quite a profession, and some of these men get as much as the "stars." Clarence Allen has been with the Mills Brothers for five years, and is said to be the highest paid in his profession.

## The Tattoo Broadcasts

THE B.B.C. like to have a "mike" right in the centre of the arena of the Tattoo broadcasts, but this, for obvious reasons, cannot be fixed and has to be carried by an engineer, who in order not to spoil the effect of the display has to be disguised as a soldier. Theirs is a varied life.



The crooner has her own sound engineer.

## Spoiling the Outlook?

IT has been suggested that the high masts of the B.B.C. are becoming so numerous that they are in danger of spoiling the beauties of the wide open spaces, and that they should be painted silver or gold. A better suggestion would be to encourage the engineers to while away the lonely hours on the moors with a bit of gardening, and train creeper up the



masts. Then the B.B.C. could award prizes for the best-kept masts like the railways do for stations.

### Italian Broadcasts

I WAS listening in the other evening to an Italian Station when a friend arrived to help deplete the stocks in my wine cellar. He has a pretty taste in Port, and is not to be fobbed off with some of the cheap stuff which I keep for such as he. Having grimaced at the first dose and suggested that I had made a mistake with the bottle (a mistake which perforce I had to remedy) I noticed a startled look suffuse his physiognomy. The look was one of pitying surprise and hatred. My enquiry elicited the fact that he was astonished to think that I should be listening to programmes emanating from a country guilty of going to war with Abyssinia, flouting the League of Nations, and literally placing its thumb urto its nose and stretching its fingers out as a symbol of what it thought of Great Britain, the League and all its works. When I gently pointed out that art knows no nationality he merely said "Pah!" He seemed to have no regard at all for the bombastic blacksmith who rules the destinies of Italy and apparently wants to rule the destinies of the world. "Why should we be afraid of an exotic race like the Italians,"



Disguised as a soldier.

he asked. I don't know, and I care less. I am quite helpless in the matter; I voted for a Government which is supposed to wrestle with these problems, and whatever I say, do or think cannot alter the matter. This may be a defeatist attitude, and if we have a weak-kneed Government, a feeble Premier, and an inexperienced Minister of Foreign Affairs, that is a matter which only the electorate can put right. I am going to listen to Italian programmes when the music appeals to me, and no suitable alternative is available at home.

It is amusing to notice the national attitude on this problem. After toying with Sanctions our restaurants and grocers have decided that in future Gorgonzola must not be known as Gorgonzola, and Italian linings



### Lightning Arresters

AS most of the modern receivers operate satisfactorily when used in conjunction with a very short length of indoor aerial, lightning arresters are seldom used nowadays. There are still many outside aeriels in use however, and many of these are not fitted with a lightning arrester. When an efficient outside aerial is being used it is very desirable to provide a path to earth for static charges due to thunderstorms. It is possible to employ the simple expedient of connecting the aerial lead to the earth tube when a storm is approaching, of course, but most people do not care to go to this trouble. The simplest alternative is the connection of a spark gap across the aerial and earth leads at the point where they enter the house. There are many of these lightning gaps, usually with a switch attached, available, and it is only necessary to connect the earth lead to one side of the gap and the aerial lead to the other side. Static charges on the aerial spark across this gap and damage to the receiver is thereby avoided.

### Leaking Condensers

WHEN it is found that the H.T. battery is running down too quickly the first thing to examine is the grid bias battery and its associated leads. It is often found that high H.T. current consumption is due to a leaking condenser in the receiver, however. Most of the present-day three-valve battery receivers are of the S.G., Det., Pentode type, and a condenser is almost invariably connected between the screening grid of the first valve and H.T.—. A slight leakage across this condenser will not materially affect reception, but it will greatly affect the life of the H.T. battery as a constant leakage of only .5 mA will, in most cases, be equivalent to using the receiver for approximately 2 hours extra every day.

### All-wave Receivers

MANY of the all-wave receivers in past have used a tuned H.F. stage for medium and long-wave reception with an untuned aerial circuit on the short-wave band. Although the loss of volume due to the use of an untuned stage is not great on the short-wave bands, there is, nevertheless, a loss of efficiency. By tuning the aerial circuit on all wave-bands a better all-round performance is obtained, and selectivity is improved. An easy method of providing a tuned aerial stage on the short-wave band, without complicating the wave-change switching, is to connect the primary winding of the short-wave coil in series with the primary winding of the medium-long-wave coil. The short-wave winding will not choke the medium-long-wave signals, and there will be sufficient stray capacity across the medium-wave primary winding to provide an earth path for the short-wave signals.

Newnes' New Weekly!

# THE CYCLIST

2d. Every Wednesday.

for clothes (made in England) must no longer be known as Italian linings. I am sure the bombastic blacksmith must be amused at these efforts.

### Staff Representation at B.B.C.

THE B.B.C. announces that all members of its Staff have been informed that the question of staff representation is still being considered, and that any practical suggestions that arise will be laid before them in due course for discussion, and for an expression of their views.

The question was first considered in 1930, when the B.B.C. Chairman, the late Mr. J. H. Whitley, who had been responsible for the formation of the Whitley Councils in the Civil Service, examined the matter very carefully and came to the conclusion that, owing to the great variety of staff employed, any kind of staff association would be ineffective.

The Broadcasting Committee of 1935, under the chairmanship of Lord Ullswater, stated in its Report that it did not think it possible to solve the problem of staff representation on trade union lines, but thought that it might be solved by "the constitution of one or more internal associations." The Report also said, "we think that the Corporation should make it clear that it will pro-



Train creeper up the mast.

vide all necessary facilities for any representative organisation of appropriate groups which its employees may wish to set up."

Immediately after the publication of the Report, the Corporation took preliminary steps to carry out these recommendations, and meetings of the staff were held in London and the Regions. The result of the voting was as follows:—

Against staff representation	76.5%
In favour of it	8.5%
Doubtful	10.8%
Absent	4.2%

The Corporation, after considering the reports and reservations forwarded by Heads of Departments, has decided that the matter shall be further investigated.

The new Director of Staff Administration, Mr. W. St. John Pym, has therefore been asked to inquire into the matter.





### A.C./D.C. MAINS SET POINTERS

In this Article the Peculiarities of the A.C./D.C. Receiver as Compared with the A.C. Receiver are Discussed. By IDRIS EVANS.

UNTIL about three years ago mains receivers were of two classes, A.C. operated and D.C. operated. The A.C./D.C. receiver, commonly known as the universal type, was practically unheard of at that time. Owing to the gradual changing over of D.C. supplies to A.C., however, the demand for receivers that will work equally well when supplied from either A.C. or D.C. mains has increased, and this has compelled the valve manufacturers to concentrate on the design of reliable A.C./D.C. valves. There is no doubt that they have met with a great measure of success, and have over-

come the difficulties which were experienced with this type of valve when it was first introduced.

30 volts between points A and B—the cathode and the heater. In some cases the potential difference between these two points can be much higher, and therefore it will be readily realised that a breakdown can occur at this point unless the insulation between cathode and heater is effective. It is in this respect that modern A.C./D.C. valves are greatly superior to the earlier models.

#### Consumption

The consumption of an A.C./D.C. receiver is higher than that of an A.C.

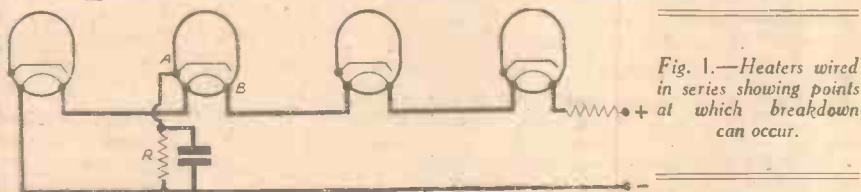


Fig. 1.—Heaters wired in series showing points at which breakdown can occur.

#### A.C./D.C. Valves

A transformer cannot be used on a D.C. supply to step the mains voltage down to the value required by the valve heaters, and the current passed through the heater circuit must be taken direct from the mains through a dropping resistance or lamp. In the interests of economy this current must be kept low, and therefore valve-heater resistance is made reasonably high—the actual value differs with different makes of valve, but 60 ohms is about the average. The average A.C. type of valve, on the other hand, has a resistance of only 4 ohms, and therefore the A.C. valve should be more robust than the A.C./D.C. type. In practice, however, there is little to choose between the two types in this respect nowadays—an A.C./D.C. valve can be relied upon to give a useful life of about eighteen months.

#### Insulation Breakdown

A more common trouble than a heater burn-out is a breakdown of the insulation between the heater and the cathode. This sometimes happens in A.C. valves, but is more commonly experienced with the A.C./D.C. type, owing to the greater potential difference which exists between cathode and heater in the latter. Referring to Fig. 1, and assuming that the valves are of the 16-volt type, there will be a potential difference of 32 volts between the positive end of the heater of the centre valve and the negative line. Again, assuming that the bias voltage obtained by means of the resistance R is 2 volts, there will be a potential difference of

receiver having a similar undistorted wattage output at the speaker. This is due to the higher heater circuit consumption of the A.C./D.C. set. The average three-valve A.C. set has a heater circuit consumption of 12 to 16 watts,

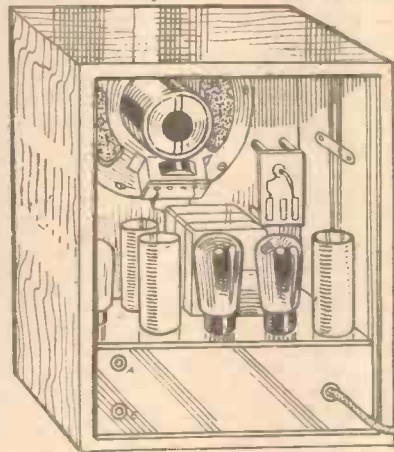


Fig. 2.—Showing method of checking heater circuit continuity of A.C./D.C. set.

whereas in a three-valve A.C./D.C. type using .2 amp. valves, with a supply voltage of 240 volts, the consumption is 48 watts. The H.T. consumption of the two receivers will be somewhat similar—approximately 30 watts for a table model—and therefore the total consumption of the A.C./D.C. receiver will be more than one and a half times that of the A.C. set. This does not materially affect the lighting bill, however, as the difference is less than the consumption of one lamp of normal wattage.

#### Dropping Resistance

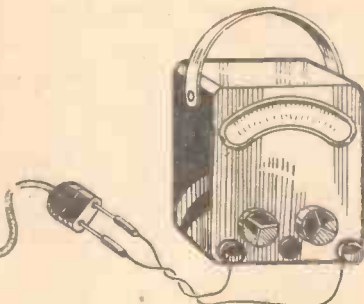
When constructing an A.C./D.C. set, a reliable component should be used for limiting the current passed through the heater circuit. Some manufacturers use a special lamp known as a barretter, whereas others use an ordinary resistor. Most home constructors will probably use a resistance, and therefore great care should be taken to choose the correct type. It should have the correct resistance value and must also be capable of carrying the required current without becoming overheated. For example, if the valves used are of the .2 amp. type, the current must be limited to this value and therefore if the mains voltage is 240 volts the total resistance in the heater circuit must be 1,200 ohms. Assuming that five .2 amp. valves are used their total resistance will be 500 ohms, and therefore the dropping resistance must have a value of 1,200 ohms less 500 ohms, i.e., 700 ohms.

#### Pick-up and A-E Connections

As the H.T.—line of the A.C./D.C. set is in direct connection with one of the mains leads, it is necessary to connect a condenser between H.T.— and the earth socket, otherwise there is the possibility of the mains being short-circuited when the earth lead is joined to the set. It is also advisable to adopt the same precaution with the aerial, as the aerial socket is generally connected direct to H.T.— through the aerial coil, and therefore if the aerial is not well insulated a short-circuit can occur as in the case of the earth lead. When a pick-up is used, it is advisable to connect the leads to the grid circuit of the first valve of the amplifier *via* fixed condensers, otherwise a shock can be obtained when the pick-up is handled.

#### Troubles

The most common trouble with A.C./D.C. receivers is a burnt-out valve or dropping resistance. If no signals are obtainable, and the receiver seems quite dead, the first test should be that shown in Fig. 2. The multi-meter should be set for measuring ohms, and its two leads should be connected across the mains



plug. If a valve or the dropping resistance is burnt out no reading will be obtained; in most sets a reading of between 500 and 1,000 ohms is obtained across these two points, but the value varies slightly with the valve types used, of course. H.T. and H.F. tests should be conducted in the same manner as in A.C. mains sets.

#### Everyman's Wireless Book

2nd Edition  
3/6, by post 3/10 from George Newnes, Ltd.,  
8-11 Southampton Street, London, W.C.2.



**M**OST constructors experience the desire to use their set or amplifier for Public Address work, either for amplifying speech or reproducing gramophone records.

At this time of year many opportunities are provided by local sports meetings, garden parties and fêtes, as the organisers are usually keen to make use of suitable gear to give out announcements, and as a source of musical entertainment.

Before proceeding farther, it must be clearly understood that it is not within the scope of the average constructor to tackle large P.A. jobs involving the use of several speakers and, possibly, many hundred yards of cable. Such work necessitates the use of very expensive apparatus and a considerable amount of experience; therefore, it should be left in the hands of the firms who specialise on such matters.

It is, however, quite feasible that small meetings may be catered for and carried out with every degree of success, providing that particular attention is given to the whole installation, the conditions and the placing of the speaker or speakers.

**What Power is Required**

The extent of the amateur's activities will be governed by the gear at his disposal,



**P.A.**  
for the

so the first thing to be considered is the number and type of amplifying stages, and the output circuit.

One L.F. stage, such as that usually embodied in a three-valve S.G. receiver, is out of the question, but a "straight" three, of the Det. and 2 L.F. type, can be of some use if a power pentode, large "Class B," Q.P.P., or two super power valves in push-pull are used in the output stage.

With mains-operated receivers or amplifiers, a wider choice of valves is permitted as one is not tied down by H.T. current consumption, as in the case of battery receivers; therefore, it is very advisable for anyone interested in amateur P.A. work to build some form of mains-operated apparatus.

An undistorted output of 2 watts is of no practical use for outside work, and it is only barely sufficient for record reproduction in a very small hall. Three watts undistorted output is getting nearer the mark, but, if possible, a minimum of 5 to 6 watts should be available.

When mains are out of the question, accumulator H.T. supply is about the only satisfactory method unless, of course, one is lucky enough to possess a rotary converter. The use of dry batteries is likely to become a very expensive proposition, apart from an uncertain voltage supply if a heavy current is being drawn. Various amplifier circuits, suitable for battery or mains, are shown in Figs. 1, 2, 5, 6 and 7, and these have been designed to give the highest output with the minimum H.T. consumption combined with satisfactory quality.

**Speakers**

Cone speakers of the moving iron or balanced armature types, are not really suitable for P.A. work, however good they may seem for domestic purposes. In the

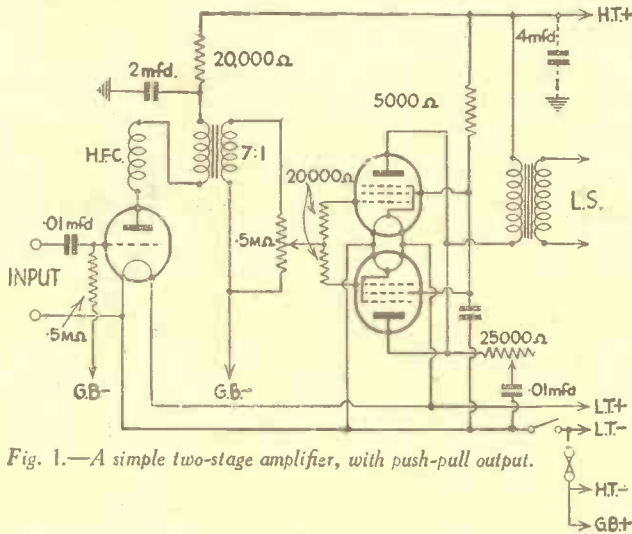


Fig. 1.—A simple two-stage amplifier, with push-pull output.

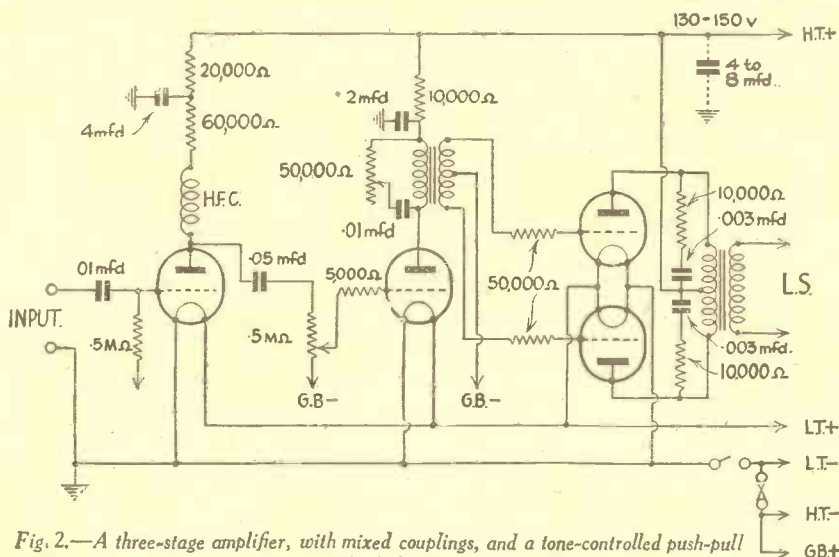


Fig. 2.—A three-stage amplifier, with mixed couplings, and a tone-controlled push-pull output stage.

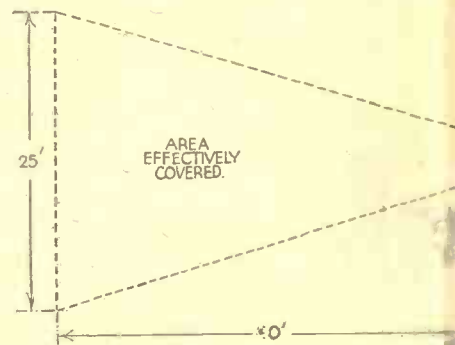


Fig. 3.—Details of the covering area of a loudspeaker.

first place, their effective area of radiation is not ideal and, secondly, it is doubtful if they would handle the output required without some form of appreciable distortion.

Horn types can be quite good, or pretty awful, so no hard and fast rule can be laid down about these. Those employing large units, such as some of the older models of S. G. Brown and Amplion, can often be utilised, as they are only expected to handle a reasonable input. These remarks apply, of course, to the diaphragm types, and



# Systems

## Amateur

A Practical Article Giving Particulars of Various Circuits and Describing the Construction of Suitable Equipment

By  
**L. Ormond**  
**Sparks**

but such placing often requires much more power, and is more likely to be affected by high winds.

To overcome these defects, P.A. engineers now use the "short" horn or "flare" baffle, as shown in Fig. 4, while a further improvement is obtained by the "horizontal" or "mono-planer" flare which, while allowing ample horizontal spread greatly reduces the unwanted radiation skywards.

**Moving-coil Units**  
These are divided

into two classes, permanent magnet and energised fields. The one most widely used is the former, owing to its simplicity and lightness, and the fact that no energising current is required.

Any reliable make of speaker will do, providing it is fitted with a 7in. or 9in. cone and a suitable matching transformer. The W.B. Stentorians are ideal, and it will be found that they are easy to match up, owing to the switching device embodied, and that they will stand up to a most useful input.

If mains-operated apparatus is being used, it is usually possible to have one of the speakers energised, the field acting as the smoothing choke of the mains unit. It is, of course, necessary to select a field winding suitable for the mains unit output, and for the H.T. current requirements of the amplifier, while the speaker must be so arranged that excessively long leads are not required. The use of one mains energised speaker, acting as the chief supply and erected close to the amplifier, is usually an advantage as slightly greater power is obtained, thus leaving the P.M.'s to be

(Continued overleaf)

not the more modern moving-coil instruments.

The chief trouble with any type of "long" horn speaker is, that they are very

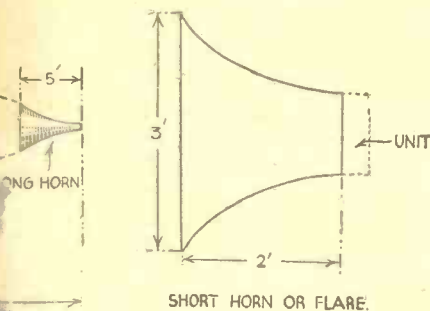


Fig. 4. A short-horn type speaker, giving suitable dimensions.

directional, and while this may be an advantage in some instances it is not generally a desirable feature. For inside work, the "long" horn is practically useless as its effective area is too remote, and "weak or dead" spots are likely to be very pronounced. This will be appreciated if Fig. 3 is examined, which shows a horn of this type, the dotted lines representing the approximate maximum area of sound distribution. It is obvious that if the speakers can be placed well away or above the area to be covered, the horn type will be all right,

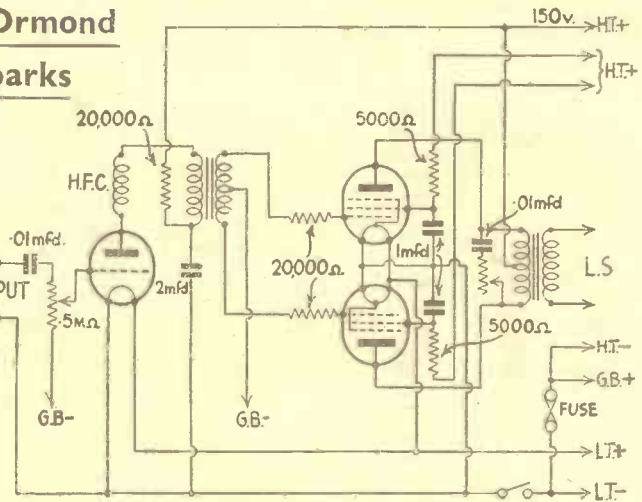


Fig. 5.—The use of two pentodes in push-pull will provide a much greater volume, and therefore this two-stage amplifier will appeal to many constructors.

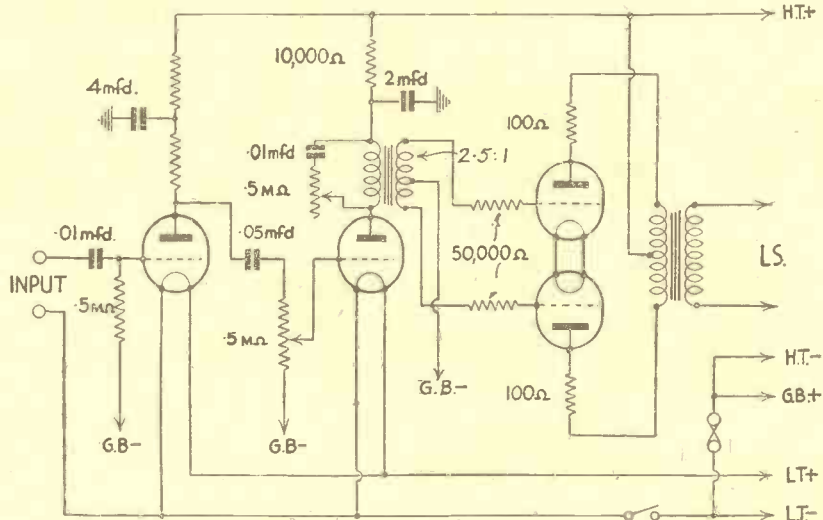


Fig. 6.—An improvement on the circuit shown in Fig. 2.



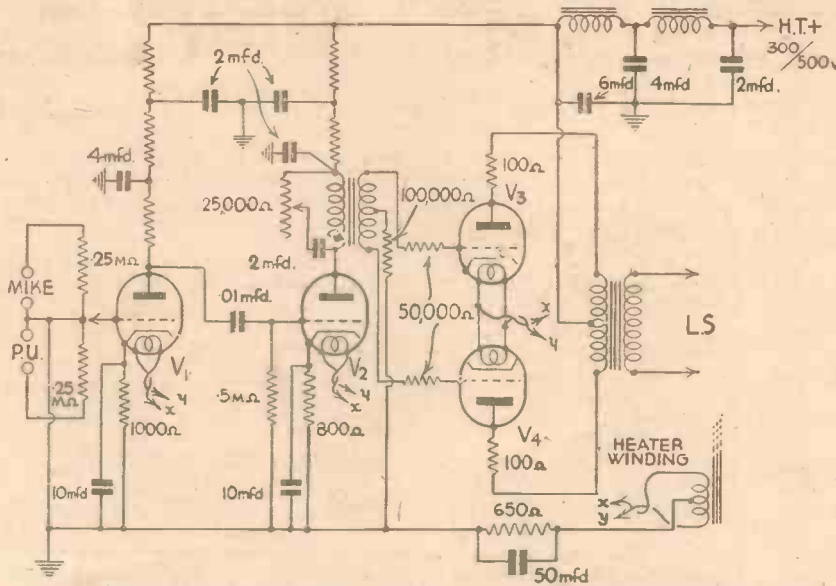


Fig. 7.—An ambitious mains amplifier with mixer input arrangement, volume and tone controls.

(Continued from previous page)

placed to cover the fringes, or out-of-way spots.

In the placing of the speakers, a great deal of consideration is necessary. The whole performance can be ruined or, on the other hand, the utmost satisfaction can be obtained with the minimum of power. It is no use putting one here and another there; one must consider the total area, the acoustic properties of the building, or the absorption of nearby objects out of doors, where the maximum crowds are likely to assemble, and the effect of the speakers on the microphone.

**How to Make a Flare**

As most constructors possess one or more moving-coil loud-speakers, and may desire to use them for small P.A. work, the constructional details of one of the latest "horizontal" baffle horns are given, as these units play a very important part in the game. They are, however, rather expensive to buy.

The one described has been used on quite large jobs with every success, and it is so designed that any type of moving-coil speaker, up to a 9in. cone, can be easily and quickly fitted.

All the details are shown in Fig. 8, from which it will be seen that it has an overall length of 3ft., tapering from 1ft. at the rear, to 3ft. at the mouth. The horizontal mouth is 3ft. by 1½ft., thus giving a very reasonable coverage angle.

Two sheets of good three-ply, each 3ft. square, two sheets 3ft. by 18in., and about 25ft. of ½in. or ⅝in. square batten will be required.

Mark and cut out the large triangular pieces from the square sheets, then cut out a sheet of paper to act as a pattern for the

curved side-pieces. When these are cut out of the 3ft. by 18in. sheets, screw batten along all edges, starting at the 12in. end, and gradually bending the batten to the shape of the ply. If pine is used, no

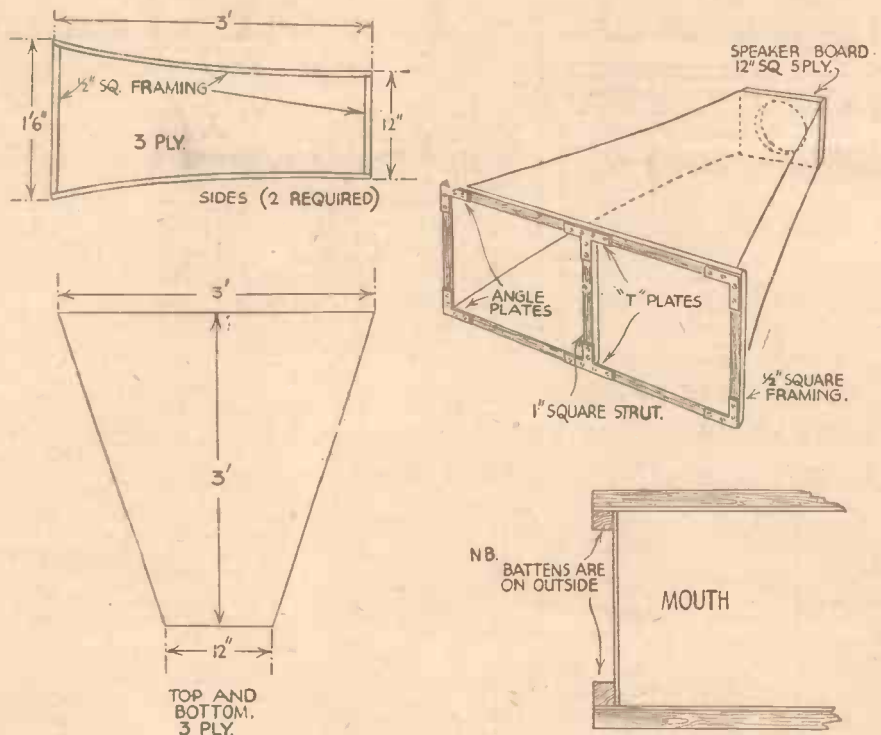


Fig. 8.—Details of construction of loud-speaker horns for open air work.

difficulty will be experienced, especially if the pieces have long grain.

Pieces of battening should now be fastened to the front and rear edges of the large triangular pieces, after which they can be screwed to the sides.

This is rather awkward to do single-handed, so if help is not available, the sides should be propped up the correct distance apart, and a start made on one end. Bend the ply to meet the lines of the sides, and see that all screws are driven right home. On no account use brads or nails.

When the four pieces are secured, square up the mouth and fit the right-angle metal brackets or plates at each corner to prevent any possible distortion of the opening. The centre lin. square strut can then be fitted, this being held by the "T"-plates shown.

After a final clean up with sandpaper, paint can be applied, the colour being according to individual fancy, but flat black is preferable. The speaker board should be of 5-ply, having an opening to suit the speaker to be used.

In concluding, a word or two of advice to would-be P.A. engineers. Don't tackle a large job to start with and don't force power at the expense of quality; remember quality counts every time. Don't be too ambitious; if you are new to P.A. work, you have a lot to learn, so do some small jobs first, and keep your ears and eyes open.

**"Bestiary for Bristol"**

THIS year is the centenary year of the Clifton Zoo, and Patrick Beech is preparing a programme to celebrate it to be broadcast on July 10th in the Western programme. Under the title "Bestiary for Bristol" he will present a variety of items, including poetry, limericks, nursery rhymes and music, both grave and gay. Some of the keepers will speak of their charges, including elephants, lions; bears, tigers and monkeys.

**ITEMS OF INTEREST**

**A Restless Ghost**

CONTINUING the third series of "Beckside Chronicles," Zachariah Briggus will tell Northern listeners the story of "Percy Perturbed" on July 4th. This "Weird and Wonderful" tale is about the perambulation of a ghost in a house taken by Briggus and his wife. After

suffering an intensive campaign of ghost-walking episodes, Briggus decides to see the landlord, and discovers that the ghost in question is that of the landlord's brother. How Briggus gets rid of the ghost—and, incidentally, the landlord—should make amusing, if rather eerie, listening.

**Scottish Dance Music**

THE Scottish Studio Orchestra will provide Scottish dance music on July 8th.



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## SPECIAL SUMMER OFFER—1 MONTH ONLY

**NEW TIMES SALES Co.** offer the following kits and components at an extremely low price. Each is entirely brand new or shop soiled only. We guarantee that every component is a genuine constructor's component and must not be confused with the multitude of manufacturers' surplus or rejects which are at present on the market. N.T.S. were established in 1924—12 years of successful radio-by-mail trading is your guarantee of satisfaction and value-for-money. **POST COUPON BELOW FOR FULL DETAILS OF ANY OF THESE OFFERS. Orders over 5/- Carriage Paid.**

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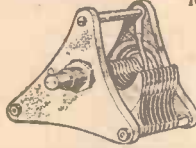
Interchangeable plug-in coils. Low-loss material ribbed formers. N.T.S. Coils are expertly wound with high-grade copper wire, to ensure accurate distributed self capacity, on ribbed formers. 100% efficient. 4-pin; 9-14, 12-26, 22-47, 41-94, 76-170 metres 1/9 each. 6-pin wavelengths as for 4-pin types, 2/- each. *Diagrams of circuits with which N.T.S. Coils are suitable sent free with every order.*



**1/9**  
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### N.T.S. SHORT WAVE CONDENSERS

**For modern short-wave circuits.** A neat, strong condenser of the highest efficiency. Tunes with minimum of losses ensured by special construction. Available in 2 capacities: .0002 and .00016 mfd.



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### N.T.S. 100:1 and 8:1 SLOW MOTION DIAL



An ideal illuminated slow-motion dial with smooth, dual ratio (100 : 1, 8 : 1) drive. Positive action enabling minute accuracy in tuning, and functioning entirely without backlash. Provided with lamp holder, attractive escutcheon and adjustable bracket for mounting to base-board or chassis.

**6/-**

### N.T.S. COIL FORMERS

Best quality 8-ribbed formers, moulded from special low loss material. Outsize diameter 1 1/2 ins. with wiring space of 2 1/2 ins. supplied in 4 and 6-pin types, either plain or threaded.



**1/-**

### N.T.S. ALL WAVE S.G.3 KIT

SUBMITTED TO AND ENTHUSIASTICALLY APPROVED AND RECOMMENDED by Mr. F. J. CAMM.

This Kit will enable you to build a set that will receive the whole wide world direct, for a very small outlay. Circuit comprises many outstanding features, but is exceedingly simple to build, with the help of the blue print supplied with every kit. Complicated switching gear is excluded by the use of really efficient and well-made plug-in coils. Includes everything for immediate assembly, with 3 6-pin coils, 12/26, 260/510, and 1,000 to 2,000 metres.



12-2,000 METRES

**KIT COMPRISES:** 1 Slow Motion Dial; 3 6-pin Coils, 12/26, 260/510, and 1,000/2,000 metres; 1 6-pin coil base; 3 4-pin base-board mounting valve-holders; 1 short-wave H/F Choke; 3 variable condensers, .0001, .0002, and .00016 MFD; 2 Terminal mounts; 4 terminals; 2 L.F. Transformers; 2 fixed resistances; 3 fixed condensers; 4 component brackets; 1 metal sprayed baseboard; 1 coil connecting wire; 1 wiring diagram.

CASH or C.O.D. Carriage Paid. **37/6**

Set of 3 recommended British valves, 10/-, Recommended full-size permanent magnet M/C speaker, 10/-. Extra coils for intermediate wavelengths, as follows: 9/14, 22/27, 41/94, 76/170 metres, 2/- each. 150/325, 490/1,000 metres, 2/3 each.

### N.T.S. HEADPHONES

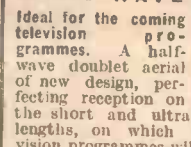
A New Standard in Lightness Plus Efficiency. Weight only 4ozs. complete, these new design N.T.S. Headphones are finished in attractive black crystalline. Efficiency guaranteed. Resistance 2,000 ohms.



**7/6**

### N.T.S. SHORT WAVE AERIAL

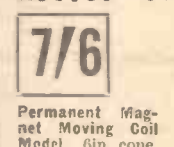
Ideal for the coming television programmes. A half-wave doublet aerial of new design, perfecting reception on the short and ultra-short wavelengths, on which coming television programmes will be radiated. Supplied ready for instant erection absolutely complete, with instructions. Current Feed or Voltage Feed Type (state which).



**17/6**

### N.T.S. SPEAKER

Permanent Magnet Moving Coil Model. 6in. cone. Large magnet. Complete with input transformer, suitable for power, super power or pentode. (Original price £1 7s. 6d.)



**7/6**

### N.T.S. SHORT WAVE ADAPTOR KIT

A Purchaser writes: "Received Kit in good condition, and after checking components over, I am satisfied that your Kit represents the very best value obtainable. Assembling the Kit proved very simple and interesting, and in a very short time I had the adaptor connected to my receiver, and was tuning in entertaining short-wave programmes. It has since given me hours of trouble-free pleasure, listening to stations thousands of miles away. On the whole, a very satisfactory purchase, that I am recommending to my friends."



Mr. F. W. C. Hendon.

### COVERS 12-94 METRES

Complete kit of parts to build a reliable short-wave adaptor for use with any BATTERY set. Listen to America and all the World DIRECT for only 15/-. Kit comprises all parts for instant assembly, including metal-sprayed baseboard, 2 variable condensers, .00016, .0001 MFD, 2 baseboard mounted 4-pin holders, short-wave H.F. choke, grid leak, fixed condenser, adaptor plug, terminal mount, two terminals, 3-4 pin plug-in coils, 12/26, 22/47, and 41/94 metres, 2 component brackets, connecting wire and wiring diagram. Built in one evening.

CASH or C.O.D. Carriage Paid **15/-**

### COVERS 12-94 METRES

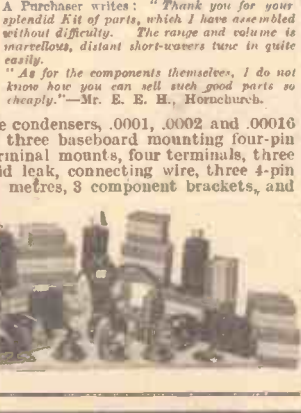
Two-Valve Short-Wave Set of remarkable range that will give you hours of entertainment on the fascinating short-wave Bands. Easy to build, and efficient tuning condensers make station finding simple. Kit comprises all necessary components, including metal-sprayed baseboard, three variable condensers, .0001, .0002 and .00016 MFD., on/off switch, L.F. Transformer, three baseboard mounting four-pin holders, short-wave H.F. choke, two terminal mounts, four terminals, three fixed condensers, slow-motion drive, grid leak, connecting wire, three 4-pin short-wave coils, 12/26, 22/47, and 41/94 metres, 3 component brackets, and wiring diagram.

CASH or C.O.D. Carriage Paid **25/-**

Two British valves 9/3 extra. Recommended permanent magnet M/C Speaker, 10/- Pair N.T.S. Headphones 7/6.

### N.T.S. SHORT WAVE 2-VALVE KIT

A Purchaser writes: "Thank you for your splendid Kit of parts, which I have assembled without difficulty. The range and volume is marvellous, distant short-waves true in quite easily. As for the components themselves, I do not know how you can sell such good parts so cheaply."—Mr. E. E. H., Hornchurch.



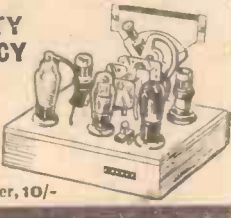
### N.T.S. MARVEL S.G.3. KIT

Your opportunity to build cheaply a really efficient Screened Grid 3-valve set. Comprises a newly-developed circuit, modern to the minute and using tested and matched components, each specially selected for efficient performance. The Kit includes 2-gang air-spaced condenser of advanced design; slow-motion dial; wave wound coils on bakelised formers; super L.F. Transformer; solid dielectric reaction condenser; complete with ready-drilled chassis and all necessary valve-holders, small condensers and resistances. (Blue-print showing How to Build the Marvel S.G.3 supplied FREE with each Kit.)

Set of three British valves, 20/9. Recommended full-size permanent magnet M/C Speaker, 10/-

### SIMPLICITY EFFICIENCY

**27/6**  
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EST. 1924





By JACE

### Spot Welding Valve Electrodes

AN interesting piece of machinery is put into frequent use in the manufacture of valves at the Cossor works at Highbury. The girl-worker shown in the illustration on this page is performing one of the last spot-welding operations, the final mounting of the electrode assembly (the anode, grid mica bridge assembly) on to the foot wires.

The operator fits the assembly in position on the valve stem, places it on the bottom electrode of the spot welder and, depressing a lever, releases a current of over 100 amps., which welds the two metals together. It is interesting to note that although less than 2 volts are used, a current of more than 100 amps. flows, owing to the low resistance due to the cleanliness of the metal.

The operator, like all other workers in the Cossor valve factories, wears white gloves, to prevent moisture or dirt from the hands being left on the valve parts.



A spot-welding machine in use at the Cossor Works at Highbury.

### "H.M.V." Queen Mary Competition

ALAN Earl Rowe, of Stoke, Devonport, has won the first prize—an "H.M.V." Model 545 Radiogram, value 22 gns.—in the widely publicised competition for schoolchildren, organized by "His Master's Voice" in connection with the maiden voyage of the *Queen Mary*.

The competition required each entrant to answer ten questions concerning the *Queen Mary*, one of them being to determine the time taken by the great liner on the initial trip.

The official figure of the Cunard White Star Company for the maiden voyage of the *Queen Mary* was 5 days, 3 hours, 29 minutes, the distance being from Southampton Dock to New York Harbour. Master Rowe estimated the voyage at 5 days, 3 hours, 30 minutes, but actually obtained the prize through his clever answer to the question: "Why is the *Queen Mary* like 'His Master's Voice' radio and records?" This is what he said:—

"The *Queen Mary* is Queen of the Sea,  
The Queen of the Home is 'H.M.V.'"

Six entrants were within one minute of the official time.

The second prize—an "H.M.V." New

"Station Selector Ray" radio receiver, value 13 gns.—has been awarded to Pauline Hurst, aged thirteen, of Worcester Park, Surrey. She is a pupil of St. Helier No. 6 Girls' Central School, which will receive the equivalent "Schools" model receiver.

The winner of the third prize—an "H.M.V." Table Gramophone and records to the value of £1 10s. 0d.—is P. H. D. Rattle, aged twelve, of Wimbledon Park, S.W.9. He attends Rutlish School, Merton Park, S.W.9.

A special staff of twenty-five was required to deal with the entries from 400,000 schoolchildren in Great Britain.

In addition to the three prizes referred to, 100 schoolchildren have received consolation prizes of an "H.M.V." record, and for his or her school, a record of the Empire Message of King Edward VIII, and a further 100 a miniature of the famous "H.M.V." trade-mark.

A novel feature of the competition is that all the entry forms giving the actual marks obtained for the questions are being returned to the dealers who issued them, and will eventually reach each entrant.

separate studios, thus giving the men of the control panel an excellent lesson in the art of "mixing" the various sound sources to achieve unity of effect.

### Talks on the Fishing Industry

AN interesting series of talks on the subject of one of Britain's largest industries will be broadcast from July 24 to October 2. The aim of the series is to familiarise the general public with the nature of the problems peculiar to fishing and to draw attention to the highly developed state of the industry at present. The whole ground will be thoroughly covered: the talks being designed to work up from the simpler divisions of the industry, such as inshore fishing in England and Scotland, which remain very much what they always have been, to heavier and highly organised sections such as trawling in the Arctic Circle and off the coast of Greenland. The talks will suggest constructive proposals for the solution of current problems and for the future, and will be presented in such a manner as to appeal to landlubbers in addition to the multitude of persons connected directly or indirectly with the fishing industry. The speakers will include a member of the Ministry of Agriculture, a trawler owner and a sea-captain.

### "Café Colette"

WALFORD HYDEN'S famous "Café Colette" Orchestra is now spending most of its time at the Wembley Film Studios. It provides a background and atmosphere for the spy story of that name which Walford Hyden, Eric Maschwitz and Val Gielgud have written, and which is being filmed by the Garrick Film Company.

Hyden has dressed the boys in braided scarlet jackets, white shirts and braided blue trousers. He himself wears a white silk shirt, multi-coloured sash and dark trousers of Eastern cut. The mysterious Café which deceived listeners so long has been conceived as a gay and exotic place, decorated in white and gold, with a stage for the band, a bar, and various alcoves and salons surrounding a dance floor. The tables, flowing with imitation champagne, seat 100 extras.

Many "Café Colette" features known to listeners are being reproduced in the film. One of them is the character dancing of Cleo Nordi, who was originally with Pavlova. People will at last be able to see the strange dancing which has been invaluable in the broadcasts, because, Hyden says, "It rouses the boys, gets the right atmosphere and makes them forget the microphone." The leading parts in "Café Colette" are played by Paul Cavanagh, Greta Nissen, Donald Calthrop, Sally Gray, while Paul Stein is directing.

### Biggest Public Address Installation

AN order for what is believed to be the largest public address installation in the Home Counties has just been placed with Philips Industrial. The equipment is to be fitted at the head offices in Queen's Gate, S.W., of Messrs. A. Wander, Ltd., manufacturers of Ovaltine, the world-famous food beverage, and at their King's Langley works.

The exceptional installation in Queen's Gate will not only be available for broadcasting messages throughout the building, but also for the transmission of music when required.

The King's Langley factory, adjoining the unique Ovaltine farms and gardens, will be fitted with a large system which will include no less than eight loudspeakers in the welfare section alone.

### Olympic Games

WE understand that the Outside Broadcast Director of the B.B.C. is making arrangements for relays from the Olympic Games to be held this year in Berlin. He will visit Germany shortly for a preliminary survey and hopes to be able to arrange with specialists in various games among the British contingent to broadcast eyewitness comments. The times and methods of treatment are not yet settled.

### Television Staff Activities

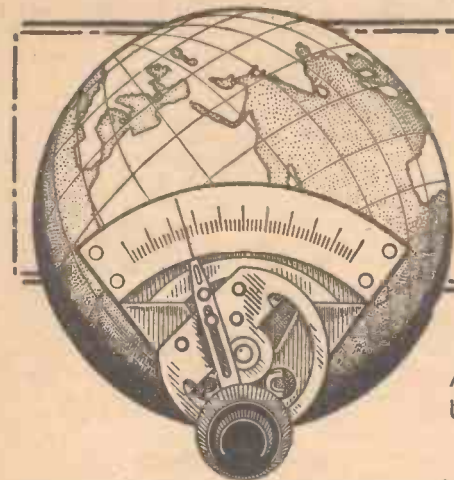
NOW that the new television staff has been initiated into the mysteries of sound broadcasting, its course of training at Portland Place has reached a more interesting stage when members are allowed a certain amount of independence. For example, television producers, stage managers and the hostess announcers have just combined in their own "closed circuit" version of "The Green Goddess"—William Archer's famous play which was produced in a radio version some months ago. While the producers took turns at the dramatic control panel, other members of the television productions staff played parts in



# SHORT WAVE SECTION

## 10 METRES AND BELOW

A Different Technique is Required for the Reception of Signals on the Ultra-short Wavelengths and Some of the Important Features are Dealt With Here  
By W. J. DELANEY



A CONSIDERABLE amount of space has been devoted to the construction and operation of receivers on the short waves. It is now generally considered that the short-waves are those wavelengths from 10 metres to 100 metres, and it has been shown that as one approaches the 10-metre point various difficulties are introduced which render

are about 3 or 4 ins. long, and there will be one from each terminal on the condenser, thus introducing very nearly as much wire as is used in the coil! Obviously, therefore, with such an arrangement it will be practically impossible to operate on a wavelength of 10 metres, and even more so when going down still further in the wavelength scale.

### Special Coils

One large turn of wire will provide a certain value of inductance, but a reduction

may be employed and a satisfactory tuning inductance employed. To use such a small coil without increasing the effective wavelength by means of long leads, the most satisfactory scheme is to mount the coil direct on the tuning condenser, and for this purpose certain commercial coils are provided with extended loops at the end of the coil and no mount becomes necessary. For experimental purposes the constructor may make up a set of such coils, using the best possible material for the former, or dispensing with it altogether by utilising a thick wire and winding this over a solid former, slipping it off when the required number of turns have been wound, when the wire will open out to a satisfactory position.

### Coil Data

For general use in experimental circuits I suggest a set of coils commencing with one having only two turns (with an overall diameter of 1 in.) and each coil having an additional turn, so that a set of seven coils would be made up with two, three, four, five, six, seven and eight turns. The length of lead to retain at each end for connection will depend upon the condenser with which the coils are to be used, but they should not exceed about 1 1/2 ins. Use tinned copper wire of 14 S.W.G. or the nearest obtainable equivalent, and for tuning use a special low-loss tuning condenser with a capacity not greater than .00005 mfd. If you are out for the last ounce of efficiency, thoroughly clean the tinned copper wire and lacquer it with the ordinary type of clear lacquer made by dissolving clean celluloid in amyl acetate. If you can obtain silver-plated copper wire, so much the better.

(Continued overleaf)

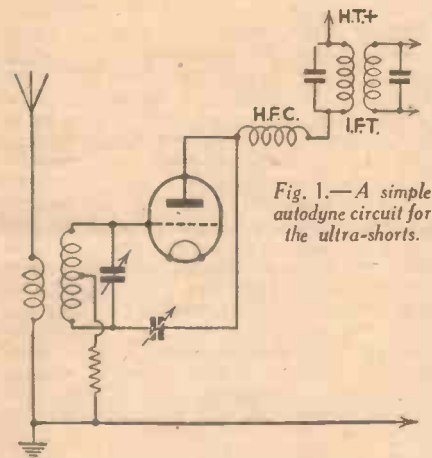


Fig. 1.—A simple autodyne circuit for the ultra-shorts.

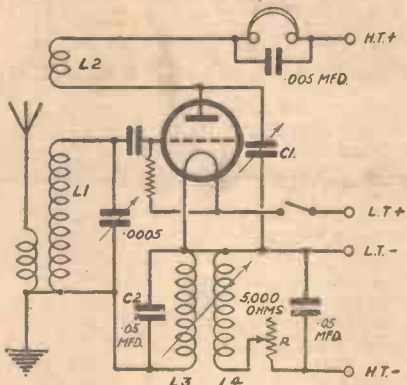


Fig. 2.—A super-regenerative circuit which some amateurs favour for ultra-short-wave reception.

in the length will result in the fact that a complete turn will not be made, and thus practically no inductance at all will exist, and thus the method of winding such a coil must be changed, and it will be found that coils for the ultra-shorts are wound on very small diameter formers, generally 1 in. in diameter, so that at least two turns of wire

the construction of the receiver of such a nature that many amateurs prefer to ignore these wavelengths. This is the lazy way out, and, in view of the fact that the forthcoming television transmissions are to be carried out below 10 metres, it behoves every listener to commence right away and attack the problem of ultra-short-wave reception. It is definitely a problem, and may not be lightly attacked, although formerly the ordinary short waves were similarly regarded and it has since been proved that this was a false impression.

First, it should be remembered that a wavelength of 10 metres corresponds to a frequency of 30,000 kilocycles per second and at this tremendous frequency the question of losses must be regarded in a different light from those met with at a frequency of 15,000 kc/s or 20 metres. But there is another important problem confronting the designer of the ultra-short-wave receiver, and that concerns the tuning circuits. It will be found that with the smallest practicable tuning condenser only one turn of wire will be needed on a 3 in. former in order to tune to about 10 metres, and this means that the coil contains about 9 ins. of wire. An examination of the ordinary type of receiver (amateur-built without following a published lay-out) will show that the leads from the tuning condenser to the coil or coil-holder

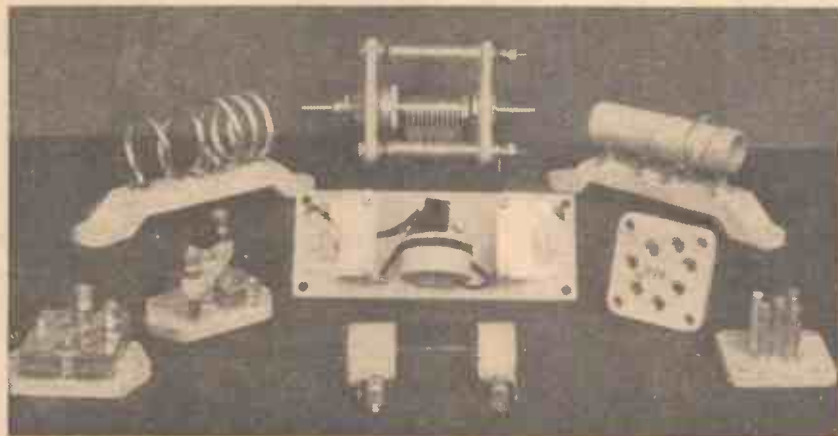


Fig. 3.—A group of B.T.S. low-loss short-wave components, characterised by silver-plated metal parts and ceramic material for insulation purposes.



### Other Components

The remaining components must also be similarly considered, silver-plated metal being used wherever possible, or, failing this, a perfectly clean surface maintained by means of lacquer. Naturally, this material must not be employed where contact between two adjacent metal surfaces is relied upon, and the reference to clean relates to the oxidation of the metal rather than ordinary dust, as this eats into the surface and provides a high resistance surface. Special valveholders are now readily obtainable for the ultra-shorts, and tuning condensers with silver-plated vanes are also on sale. Resistances, fixed condensers, chokes and other components should be mounted, wherever possible, direct on the terminals of the components to which they are connected, although, of course, these remarks do not apply to the low-frequency stages.

### Circuits

The circuits which should be employed on these ultra-short wavelengths may be left to individual taste, as practically all

types of circuit may be employed. The straightforward detector followed by L.F. stages is fool-proof provided it is designed on the above lines. The range of reception may not be great, but the performance should satisfy most. H.F. amplification will not be found of great use, as the stage gain will be so small, and the valves may be used to better advantage in other types of circuit. The superhet will, no doubt, form the main type of circuit for television receivers in view of the fact that it is the simplest type of circuit to adapt for the dual reception of vision and sound whilst permitting of a single tuning control. The design of the I.F. transformer will prove the only stumbling block, but even this may be overcome by adopting a simple autodyne circuit such as that shown in Fig. 1. Finally, the super-regenerative (Fig. 2) is favoured by many short-wave experimenters, although those who do not use it claim that their reason for discarding it is on account of the large degree of noise which accompanies its use. Whether or not this may be overcome may not be decided until more experimental work has been carried out, but it is a fact that this type

of circuit is productive of a peculiar background which is objectionable when a weak signal is trying to break through. The beginner should start with the simple detector, utilising the type of coil previously described, and carry out the connections for aerial or reaction purposes by means of small clips (preferably home-made from springy brass, rather than the standard crocodile clip, as this is too large), and this type of receiver may easily be converted into the super-regenerative, and finally into the superhet, with very little additional expense.

### Aerial Systems

The ordinary aerial cannot be employed satisfactorily and various forms of rigid vertical aerial should be tried out, the length and position being ascertained by trial and error methods. The complications of the dipole or other tuned aerial-systems may be ignored until experience has been obtained in circuit design and operation, but when television is finally inaugurated and that programme only is desired, a dipole aerial may be found most desirable.

SO much interest has been aroused by the direct capture of broadcasts from the R.M.S. *Queen Mary* on her maiden voyage, that many short-wave listeners are now turning their attention to the search of radio-telephony transmissions from other liners. There is no secret in the channels used by the ships for this public service, but it should be added that these communications are of a private nature and, in consequence, according to the terms of the Post Office listening licence, may not be revealed to a third party, or in any way communicated. The frequencies mostly used by the *Normandie* (FNSK) are 17,715 kc/s (16.94 m.), 13,225 kc/s (22.68 m.), 8,830 kc/s (33.98 m.), and when near the French coast 4,565 kc/s (65.72 m.), and 4,412 kc/s (68 m.). FNTQ, *Ile de France* works on approximately the same channels. DOAI, *Europa*, DOAH, *Bremen*, DHJZ, *Hamburg*, and DHEY, *Deutschland* as representing the German trans-atlantic ferries may be heard operating on 16,665 kc/s (18 m.), 12,600 kc/s (23.81 m.), 12,325 kc/s (24.34 m.), 11,140 kc/s (26.93 m.), 8,470 kc/s (35.42 m.), and 74.07 m. The crack vessels of the Italian mercantile fleet such as ICEJ, *Rex*, IBLI, *Conte de Savoia*, IBGI, *Conte Verde*, and IBEJ, *Conte Rosso* will be found working with IAC, *Coltano* (near Pisa), on such frequencies as: 17,640 kc/s (17.01 m.), 17,333 kc/s (17.31 m.), 13,050 kc/s (22.99 m.), 8,830 kc/s (33.98 m.), 8,667 kc/s (34.61 m.), 8,538 kc/s (35.14 m.), 4,350 kc/s (68.97 m.), and 4,177 kc/s (71.82 m.). Again, very often when twirling the dial you may pick up a transmission in clear speech from IAC *Coltano* on one of the following frequencies: 17,699 kc/s (16.95 m.), 12,795 kc/s (23.45 m.), 8,380 kc/s (35.80 m.), 6,650 kc/s (45.11 m.), and 4,355 kc/s (68.88 m.).

Germany is in touch with her liners through DAF, *Norddeich*, of which the busiest frequencies are 17,265 kc/s (17.38 m.), 13,100 kc/s (22.90 m.), 8,765 kc/s (34.23 m.), and 4,400 kc/s (68.18 m.). France works radio telephony through Paris T.S.F. and St. Nazaire. Try for 16,870 kc/s (17.78 m.), 12,920 kc/s (23.22 m.), 12,705 kc/s (23.61 m.), 12,570 kc/s (23.87 m.), 8,460 kc/s (35.46 m.), and others. Bear in mind, however, that according to the hour of the day or night, and the distance from the liner from its

## Leaves from a Short-wave Log

home port, so either higher or lower frequency channels are adopted for the communications.

In passing, I might add that the radio call-letters of the Zeppelin *Hindenburg*, from which listeners in the United Kingdom were also able to pick up direct broadcasts on her maiden trip to South America, are DEKKE. A number of wavelengths are used, but the most favourable for transmissions to be relayed by land stations (broadcasters), lie around 24 m.

### Trujillo City

I have received several enquiries this week regarding a new station in Trujillo City (formerly Santo Domingo), Dominican Republic, and have now ascertained that the broadcasts emanate from HISQ, which only advertises a power of 25 watts on 48.08 m. (6,240 kc/s). The programmes are simultaneously transmitted on 203.4 m. (1,475 kc/s). In the event of your desiring to report reception, you should write to Señores Abbes y Garcia, Ciudad Trujillo, Distrito de Santo Domingo, Dominican Republic.

Another piece of information which reaches me to-day refers to the Bulgarian station LZA, Sofia, which is now regularly on the air on 20.04 m. (14,970 kc/s). The schedule at present is still a limited one inasmuch as broadcasts only take place on Sundays from B.S.T. 07.30-15.00, and from 17.00-23.30. In the near future transmissions are to be made from B.S.T. 11.30-14.30, and from 19.00-23.00 on weekdays. Announcements regarding coming programmes will be given out in several languages every Sunday between 14.00-15.00.

PCJ, Eindhoven on 31.28 m. (9,590 kc/s) is now a fixture every Monday from B.S.T. 01.00-02.00, with a special news bulletin for the United States of America, towards which the transmission is beamed. The news—mainly of Holland—for Dutch residents in North America is given in English

and I understand that it is rebroadcast by WOR, the medium-waver at Newark (N.J.). On the other hand, W3XAU, Philadelphia, which shares the same channel as PCJ has agreed to close down for the hour coinciding with the broadcast in order to give the Dutchman a chance to get through to his listeners.

### Czecho-Slovakia

Although Czecho-Slovakia possesses a big medium-wave network, so far it has not broadcast on short-wave channels. We shall, however, shortly find the Prague programmes on the higher frequencies as the special transmitter at Podebrady near the capital is now due to carry out tests. Its power may be anything from 20 to 35 kilowatts. The channels allotted to Czecho-Slovakia for this overseas service are 13.99 m. (21,450 kc/s), 19.70 m. (15,230 kc/s), 25.26 m. (11,875 kc/s), 25.51 m. (11,760 kc/s), 25.54 m. (11,745 kc/s), 31.57 m. (9,504 kc/s), and 49.06 m. (6,115 kc/s), and it is the most favourable of these, following experimental broadcasts, which will be chosen.

Finally, ZCK3 (ZBW) Hong Kong on 34.29 m. (8,750 kc/s) has slightly altered its daily schedule. The times are now: B.S.T. 10.00-13.00 (Mons. and Thurs.), and 12.00-16.00 on other days. If you are lucky enough to pick up a programme, and wish to secure a "veri" address your report to the Station Director, P.O. Box, Hong Kong (China).

The 50-metre channel houses, in addition to a station in Southern Rhodesia and another in Bolivia, a 1-kilowatt, XEBT, at Mexico City, without forgetting the powerful RW59, Moscow. The latter operates until B.S.T. 22.00, but after that hour the more distant South American stations have a chance of being tuned in. It is an interesting section of the band full of transmissions well worthy of being logged.

### TELEVISION AND SHORT-WAVE HANDBOOK

By F. J. CAMM

3/6 or 3/10 by post from

Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.



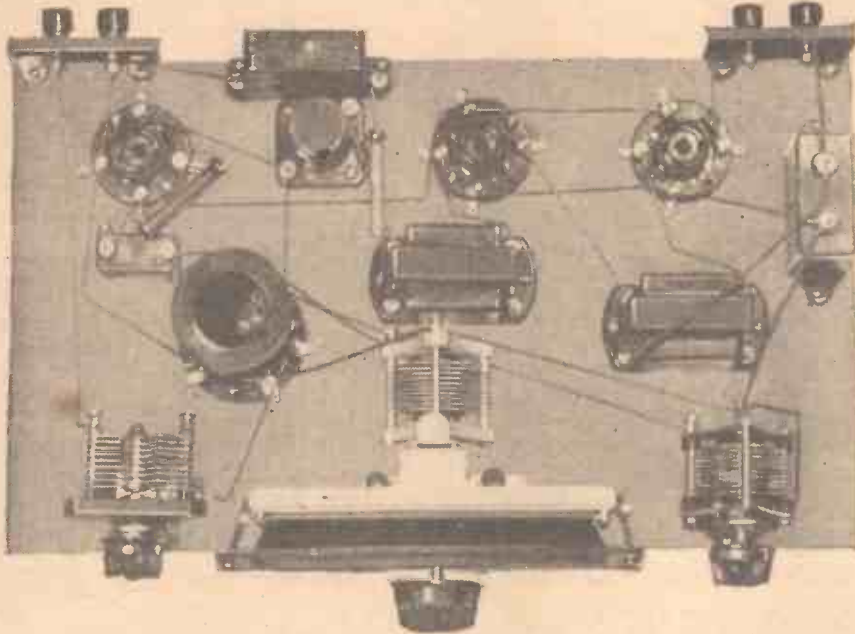
# AN N.T.S. ALL-WAVE KIT

A Simple Three-valve Receiver Designed for All-wave Use and Supplied as a Kit of Parts for Home Assembly

THE illustration below shows the latest kit to be released by Messrs. New Times Sales, and which is designed to function on the short waves as well as

has a horizontal full-vision dial calibrated in degrees.

The kit is supplied complete with three six-pin coils, one for the waveband from



The N.T.S. All-wave Kit assembled ready for use.

on the normal broadcast wavebands. The circuit employed is of the standard detector-2 L.F. type, which, as most amateurs are now aware, offers one of the simplest types of receiver for construction and operation and which is capable of remarkable performances under favourable conditions. The aerial is fed to the tuning coil through an air-dielectric condenser, and the tuning coil is of the standard six-pin type. Transformer coupling is employed between the first and second stages and between the L.F. and output valve, whilst the first anode circuit is decoupled. Tuning is carried out by a special short-wave condenser of the type having ceramic end supports and silver-plated vanes and other metal parts, and for reaction purposes a standard low-loss brass reaction condenser is employed. The whole of the parts are mounted on a base-board, which has a metallised surface, and separate H.T. feeds are provided for the detector and remaining valves. To facilitate tuning a slow-motion tuning drive is mounted on the main condenser and this

12 to 26 metres, one covering the medium broadcast band from 260 to 510 metres, and one for the long-wave band from 1,000 to 2,000 metres.

### Test Result

The kit was assembled and tried under our normal conditions and proved very efficient on the short-wave band. The slow-motion drive and the use of the series aerial-condenser enabled the various regular short-wavers to be heard with satisfactory volume and there was no trouble from dead spots, threshold howl or other common defects. On the broadcast bands, of course, as was to be expected with the simple aerial circuit, tuning was rather on the flat side, but by judicious use of the reaction control and with a suitable aerial the two London stations could be heard clear from interference with each other, and the usual high-power stations were heard at good volume. The kit will appeal to many who are anxious for a low-priced receiver capable of covering all wave bands, and the price is 37s. 6d., less valves.

## 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.

### WELLINGBOROUGH AND DISTRICT RADIO AND TELEVISION SOCIETY

A MEETING of the above Society was held at the Midland Hotel, Wellingborough, on Monday, June 13th, and was attended by a large gathering of wireless enthusiasts. Full details from the Sec.

It was decided that a receiving competition for members should be held commencing July 1st and ending September 30th. Prizes of short-wave components are to be awarded to those members who score

the larger total of points, counting one card only from each country, and multiplying the number of cards by the total number of continents.

Following this announcement a lecture was given by Mr. F. C. Brew, B.Sc., entitled "Radio-activity and X-Rays." During the course of his talk, Mr. Brew described the various types of tubes produced commercially for the propagation of X-Rays, and dealt at some length with the effect these rays have upon the human body.

Hon. Sec., Mr. L. F. Parker (G5LP), 127, Jubilee Crescent, Wellingborough.

### SLADE RADIO SOCIETY

ON Thursday, June 11th, our member Mr. C. H. Young gave a lecture upon five-metre transmission and reception. The members showed a great deal of interest in this subject in which there appears to be a very large scope for amateur experimental work. Hon. Sec., Chas. Game, 40, West Drive, Heathfield Park, Handsworth, Birmingham, 20.

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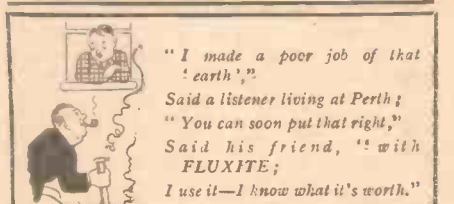


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# Facts and Figures

COMPONENTS TESTED IN OUR NEW LABORATORY

## New Lissen Three-Wave Receiver

THE latest Lissen receiver to be released is the Model 8130, designed for use on A.C. or D.C. mains without alteration. The three bands covered are 18.5 to 54, 202 to 560 and 900 to 2,000 metres, and a single circular tuning dial is employed for these three ranges. The valve combination consists of a variable- $\mu$  H.F. pentode, triode detector, and output pentode, with a valve rectifier. Four controls are fitted, one of which is a two-position tone control. The coils employ Litz windings, and the receiver is provided with sockets for an external speaker. The price is 9 guineas.

## Bennett S.W. Guinea Kits

A NEW tested and guaranteed kit of parts for a short-wave converter is announced by Bennett Television Company. This kit is complete with an aluminium panel and baseboard and includes all the essential parts for the building of a unit which, when completed, may be employed as a superhet. converter, an adaptor, or as a simple one-valve receiver. The circuit is the standard reacting detector arrangement with a B.T.C. low-loss short-wave tuning coil covering the band from 13 to 52 metres, and a valve adapter plug and flex is provided for connection to the receiver with which it is employed. When used as a converter, of course, the valve is made to function on the autodyne principle and a standard broadcast H.F. choke is included in the kit to complete the anode circuit, in addition to the special MSV short-wave choke. The unit may be obtained for battery or mains use and the price is 21s., complete with layout diagram and full instructions.

A cheaper edition is also obtainable for battery use only, and this is designed for use only as an adaptor or one-valve receiver. It does not include the adapter plug, switch or socket terminal strip, and a mica dielectric reaction condenser is supplied. This cheaper kit costs only 15s.

## New G.E.C. Receivers

THE General Electric Company announce the release of two new receivers, a battery three and an A.C. four. The former is an H.F.-detector-output type of receiver with a tetrode in the first position and pentodes in the remaining stages, and is complete with a full-vision wavelength-calibrated tuning dial. A pre-set reaction circuit is employed, together with a combined form of volume control acting on the H.F. circuit. The speaker fitted is an 8in. permanent magnet moving-coil and automatic grid bias is provided for the output valve. The price is £7 19s. 6d., complete with valves and all batteries.

The A.C. Super 4 is a four-valve (plus rectifier) superhet. with a triode-hexode frequency-changer and a variable- $\mu$  screened pentode in the I.F. stage. A double-diode is employed for second detector and A.V.C. and a high-slope pentode is fitted in the output stage. The tuning dial which is fitted is of the horizontal type, full-vision scale, and this is floodlit, with station names printed in two colours for each wave range. The power con-

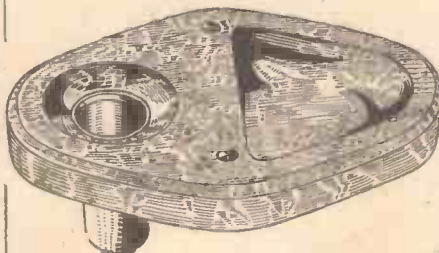
sumption of the receiver is 70 watts approximately, and the price is 10½ guineas, complete with valves.

## Mullard Triode-Hexode

FULL details have now been received concerning the new Mullard Triode-hexode which was mentioned in our issue dated June 6th. The oscillator section consists of a normal triode assembly, with a hexode mixer assembly built round a common cathode. The triode grid is connected internally to the third grid of the hexode, and the heater is of the indirectly-heated type designed to operate 4 volts 1 amp. The valve is rated for 250 volts maximum H.T. voltage on the hexode, and 70 volts on the screen. With 1.5 volts grid bias the anode current is then 4 mA. and the screen current 6 mA. The normal anode voltage of the triode section is 100 volts and the anode current 6 mA. The valve will be supplied in gold metallised finish with seven-pin base and thimble-top cap, price 20s.

## Bulgin Gramophone Accessory

WHILST most constructors pay particular attention to the theoretical considerations of their apparatus the smaller points in design are often neglected. For instance, in building a radiogram the circuit, layout of the motor-board, etc., may receive great care, but by the inclusion of one or two small accessories the use of the apparatus will be simplified and the reproduction improved, as well as the life of gramophone records lengthened. One such accessory is illustrated on this page and is a needle-holder which fits flush on the motor-board but which definitely prevents the use of "used" needles. With many radiogram outfits, the user takes great care to use each needle once only, but has no receptacle into which they can be then placed so that they cannot be used again by mistake. In the Bulgin unit shown the "used" receptacle is deep and projects down through a hole cut in the motor-board and the holder for the new needles is in the form of a shallow tray. There can thus be no mistake and the records are safeguarded, whilst reproduction is also kept at its best. This useful little accessory costs 2s. in finely-grained Italian walnut or standard walnut.



There is no danger of using worn needles and ruining your records, if you use this Bulgin needle accessory.

THE BEST WEEKLY FOR CYCLISTS  
THE CYCLIST  
2d. WEEKLY

## 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.

**J. R. (Sidcup).** There is obviously some mistake in your wiring as there should be nothing like a drain of 10mA from a G.B. battery. If the volume control potentiometer is faulty or of too low resistance it will cause an excessive drain but this is only whilst the receiver is in use as a switch is provided to open the battery circuit. You could not fit automatic bias in this particular circuit.

**A. C. (Birstall).** You did not enclose a stamped envelope so that we cannot return your sketch duly amended. However, it is only necessary to remove the second L.F. transformer and to fit a push-pull transformer in its place, with primary connected as in the present case. The two G terminals on the transformer are then connected to the grid terminals on the push-pull valveholders, with the centre tap connected to a suitable tap on the grid bias battery. The two anodes are joined to the respective terminals on the loudspeaker or speaker transformer.

**D. B. (Burnley).** It is not possible to state how many stations may be heard or the range covered in any part of the country in view of the lack of knowledge of local conditions.

**L. D. (Carlou).** The resistance value is too high. Try a lower one, or consult the makers of the transformer as to the correct value to be used in this particular position.

**C. V. H. (Langport).** The control should not burn out and we suggest that you make quite certain that the circuit is correctly wired.

**S. H. (Thurso).** We regret that we can no longer ask readers to supply back numbers in view of the lack of courtesy which has been shown in certain cases.

**E. E. B. (Bow).** The coils may be incorrect, but should be capable of incorporation in the circuit if they are of the correct type. The reference number of those we used was L.N. 5162.

**T. McC. (Knightswood).** The nearest receiver is the Prefect S.W. Three, blueprint P.W.63. There is no receiver which uses exactly the components listed by you.

**L. R. M. (Caterham).** We cannot supply the data required in the form of a reply or letter. It is the subject of a complete article.

**T. M. P. (Sibley).** It is impossible to help you. You should have marked the ends of the windings in some way. There is no standard by which it may be examined, and the only way out is to take it to a good radio dealer who may be able to trace out the windings with a suitable meter.

**A. B. (N.W.10).** A standard L.F. amplifier could be employed, but the volume control should preferably be included between the present two valves. We have no blueprint but refer you to the recent articles on L.F. amplifiers.

**W. H. (Hartlepool).** The noise is motor-boating and the anode circuits of the receiver should be decoupled.

**T. W. (Edinburgh).** Three turns for the grid winding and two for the reaction winding should prove suitable. It is impossible to compare the two condensers as the plate shape may be different and thus there will be no relation between the degree settings for various wavelengths.

**D. R. P. (Dublin).** The A.V.C. bias is not always fed through the tuning coil, as several receivers employ the direct-to-grid method with a grid leak and condenser in circuit. The former way is cheaper as it saves the cost of a condenser and resistance in some types of receiver.

**S. J. (Monton Green).** The total consumption of H.T. may be ascertained by including your milliammeter in the H.T. negative lead. Disconnect this lead from the earth line and place the milliammeter between these two points. A large capacity fixed condenser should be connected across the meter to avoid instability.

**D. A. B. (Cleethorpes).** The coil details you give appear quite satisfactory. We suggest the HL 210 and the Pen 220A.

**M. B. (Bangor).** The damping of the aerial-earth circuit is responsible. Improve the earth connection and attend to the aerial insulation, as well as reducing the capacity which may exist between the aerial and lead and any earthed object.

**No Name (Staincliffe).** The "Elf Portable," which is the subject of blueprint No. 65 may prove the most suitable in your particular case.

**D. C. H. (Cirencester).** The coil you mention is only suitable for medium-wave stations and as it is rated to tune only to 840 metres we cannot understand your reference to Droitwich. The trouble may be that this station breaks through owing to its high power, or you may be mistaking the medium-wave National programme for Droitwich. If breakthrough is the trouble you should reduce the size of the aerial and try some different position as it may be directional. A more selective aerial tuner might also be worth while.



# LETTERS FROM READERS

The Editor does not necessarily agree with opinions expressed by his correspondents.



All letters must be accompanied by the name and address of the sender (not necessarily for publication).

## Our Short-wave Single-valver

SIR,—I recently built your simple one-valve short-wave set as described in your issue dated 14.9.35. This was my introduction to both short waves and set construction. Results were at first rather poor, but by shortening the wiring and obtaining proper low-loss components results began to improve. At the end of about twelve weeks my log consisted of sixty stations, forty-five of which were amateurs, and fifteen broadcasting stations including EAQ, W2XAF, CTICT, HVJ, LKJI, also several Zeesen and Daventry stations.

Short-wave listening had become so interesting that I built an O-V-1 receiver, the results of which prove that the slight extra trouble taken to build an efficient S.W. receiver is well worth while.

I think that more practical articles on short-wave work and television, especially the latter, would be welcome, now that television is nearly ready for the public.—S. WINTER (Southchurch).

SIR,—I have built the simple one-valve set described in the issue of March 21st last. Here are the chief stations I have logged: VK2ME, PRF5, W8XK, W3XAL, W1XAL, W2XE, W2XAF, and JVM (Tokio). Can any reader beat this on one valve?—A. P. L. CASLING (Hale, Cheshire).

## A Short-wave Superhet

SIR,—I should, in common with a lot of other short-wave enthusiasts, like to see a design in your excellent paper for a complete battery short-wave receiver of the de-luxe type capable of LS reproduction, and preferably of the superhet type. Such a receiver as I have in mind would be one with the following stages:

Pre HF—Frequency-changer—One I.F.—Second Detector—beat oscillator for c.w. work—one LF.

This would mean a set with five stages, not including the beat oscillator, and I feel sure that there is a real demand for such a receiver both by the listening fraternity, and also by the transmitting amateurs. It is evident that the old 1-V-1 or O-V-2 has had its day just as it did on the longer waves, and anyone who spends much time listening to either broadcast or c.w. on the short-waves soon realises that selectivity is now as much a problem on the shorts as it was on the long before the multi-valve set became popular. I feel that it is time that the multi-valver was pushed a little more in your short-wave articles, and I am confident that if you were to publish a complete design somewhat on the lines suggested above, it would have a large following.—L. F. PARKER, G5LP (Wellingborough).

[We shall be glad to know what other readers think of this suggestion.—ED.]

## A Log on 20 metres

SIR,—As I have not yet seen a log from this district published in your pages I enclose my own, thinking it might be of interest to other readers. My receiver is of the O-V-1 type and I use a 13ft. 6in. dipole aerial. All stations are on the 20-metre band:

W2BSD, W2ELO, W2AKK, W2MJ, W2ER, W2AJJ, W2DP, W2EUG, W2CC, W2CBO, W3BSY, W3LM, W3ENC, W3OX, W4ELG, W4ZF, W4GGI, W8JQQ, SU1CH, SU1SG, CO6OM, HI7G, VE2EA, VE1AW, and PY2ET.—R. LEVER (Hammersmith).

## The British Short-wave League

SIR,—I read with interest week by week your correspondents' logs on the short-wave bands, particularly on 20 metres. The majority of these are good, but have they seen the wonderful work of various members of the British Short-Wave League? If they have not, I strongly advise them to get a copy of the above League's publication, namely, the "Review" (obtainable from the address given on cover iii for June 13th), and see for themselves what is being done by some of these D.Xers on two- and three-valve receivers.—RAYMOND HOPPER (March, Cambs.).

## An Appreciation, and a Suggestion

SIR,—As a regular reader of PRACTICAL AND AMATEUR WIRELESS may I express my appreciation of your valuable journal. I enjoy each feature of it, and am pleased to note that the high standard of its articles are maintained.—W. E. ALLCROFT (Worksop).

CUT THIS OUT EACH WEEK

# Do you know

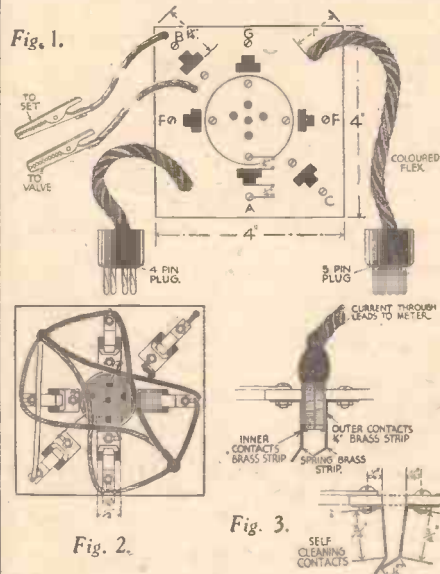
- THAT when using a universal receiver on an A.C. mains supply it may often be found that hum troubles may be cured by a reversal of the mains plug.
- THAT a short-wave converter may be operated from ordinary battery supplies when used with a mains receiver, to avoid interference and hum difficulties.
- THAT for ultra-short-wave reception on a fixed wavelength (such as for the television transmissions) a tuned aerial system will be found ideal.
- THAT if a safety spark-gap is not provided in the aerial circuit it may prove dangerous to touch an air-dielectric condenser included in the aerial circuit during a thunderstorm.
- THAT when all the ordinary arrangements for the eradication of hum have failed, it may be found worth while to try a different earth connection, as hum may be induced through this lead.
- THAT the ordinary flash-lamp bulb consumes .35 amps. which is as much current as three ordinary battery valves, and it should not, therefore, be used as a dial light.

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, Geo. Newnes, Ltd., 8-11, 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.

## A HANDY VALVE TESTER

MOST of the parts for making this efficient valve tester can be found in the scrap box. The diagrams are self explanatory, and Fig. 1 shows a top view of the tester. The 5-pin valve holder in the centre is surrounded by T-shaped plug-holes. A.B.C.F.F.G., which are respectively Anode, Screen-Grid Valve Anode, Cathode, Filaments, and Grid. These



Plan, underside view, and details of a handy valve tester.

plug-holes should be made of a size to allow of a good fit of the non reversible plug (Fig. 3). This, of course, will depend on the materials used. Two old valve-bases (4- and 5-pin) will also be required, or if you cannot manage to solder the coloured leads to these, adapters can be used. These are wired to the corresponding pins as shown in the under-panel view, Fig. 2. The action of the plug, as it is inserted in the sockets, is illustrated in Fig. 3. This automatically interrupts the flow of current to the valve and takes it through the test leads to the meter, thus making it impossible to damage the valves, set or meter, providing, of course,

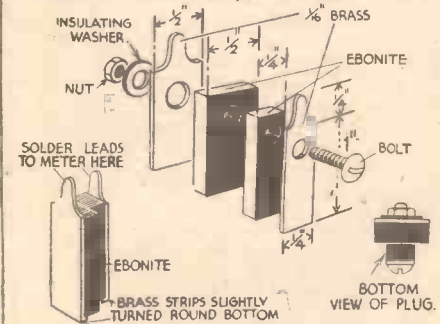


Fig. 4.—Details of plugs.

that the correct setting for the meter is used. Fig. 3 also gives the dimensions of the brass contact strips, of which six pairs will be required. This tester will test any circuit of a 4- or 5-pin valve. The crocodile clips are for testing screen-grid valves or pentodes. The tester could easily be modified for testing 7-, or even 9-pin valves.—H. HUNTER (Ashington).



# Practical and Amateur Wireless BLUEPRINT SERVICE

## PRACTICAL WIRELESS STRAIGHT SETS. Battery Operated.

One-valve : Blueprints, 1s. each.

Description	Date of Issue	No. of Blueprint
All-Wave Unipen (pentode)	—	PW31A
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag. Two (D, Pen)	11.8.34	W36B
Three-valve : Blueprints, 1s. each.		
Selectone Battery Three (D, 2 LF (trans.))	—	PW10
Sixty-Shilling Three (D, 2 LF (R.C. & trans.))	2.12.33	PW34A
Leader Three (SG, D, Pow.)	—	PW35
Summit Three (HF Pen, D, Pen)	18.8.34	PW37
All-Pentode Three (HF Pen, D (pen), Pen.)	22.9.34	PW39
Hall-Mark Three (SG, D, Pow.)	—	PW41
Hall-Mark Cadet (D, LF Pen (R.C.))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (pen), Pen) (All-Wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (trans.))	June '35	PM2
Cameo Midget Three (D, 2 LF (trans.))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (R.C.))	31.8.35	PW55
The Monitor (HF Pen, D, Pen)	8.2.36	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	—	PW64

Mains Operated.

Two-valve : Blueprints 1s. each.

A.C. Twin (D (pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Power)	7.10.33	PW31
Selectone A.C. Radiogram Two (D, Pow.)	—	PW19

Three-valve : Blueprints 1s. each.

Double-Diodo-Triode Three (HF Pen, D, D.T., Pen)	10.6.33	PW23
D.C. Ace (SG, D, Pen)	15.7.33	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Power)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	18.8.34	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-wave" A.C. Three (D, 2LF (R.C.))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	31.8.35	PW56

Four-valve : Blueprints, 1s. each.

A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	—	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47

SHORT-WAVE SETS.

Two-valve : Blueprints, 1s. each.

Midget Short-Wave Two (D, Pen)	15.9.34	PW38A
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Three-valve : Blueprints, 1s. each.

Experimenter's Short-wave Three (SG, D, Power)	—	PW30A
The Prefect 3 (D, 2LF, RC and Trans.)	8.2.36	PW63

PORTABLES.

Three-valve : Blueprints, 1s. each.

F. J. Camm's ELF Three-valve Portable. (HF Pen, D, Pen)	10.5.36	PW65
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Four-valve : Blueprints, 1s. each.

Featherweight Portable Four (SG, D, LF, Cl. B)	—	PW12
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MISCELLANEOUS.

S. W. Converter-Adapter (1 valve)	23.2.35	PW48A
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AMATEUR WIRELESS AND WIRELESS MAGAZINE CRYSTAL SETS.

Blueprints, 6d. each.

Four-station Crystal Set	—	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450

STRAIGHT SETS. Battery Operated.

One-valve : Blueprints, 1s. each.

B.B.C. Special One-valver	—	AW387
Twenty-station Loud-speaker One-valver (Class B)	—	AW449

Two-valve : Blueprints, 1s. each.

Melody Ranger Two (D, Trans.)	—	AW388
Full-volume Two (SG, Det, Pen)	—	AW392
Iron-core Two (D, Trans)	—	AW395
Iron-core Two (D, QPP)	5.8.33	AW396
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans.)	—	AW388A
Lucerne Minor (D, Pen)	—	AW426

Three-valve : Blueprints, 1s. each.

Class-B Three (D, Trans, Class B)	22.4.33	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-Built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher: Baseboard Model (SG, D, Pen)	20.1.34	AW417
1934 Ether Searcher: Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cosser Melody Maker with Lucerne Coils	—	AW423

P.W.H. Mascot with Lucerne Coils (D, RC, Trans)

Mullard Master Three with Lucerne Coils	—	AW374A
£5 5s. Three: De Luxe Version (SG, D, Trans)	10.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM818
Simple tune Three (SG, D, Pen)	June '33	WM327
Economy-pentode Three (SG, D, Pen)	Oct. '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	Mar. '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	June '34	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
Graduating to a Low-frequency Stage (D, 2LF)	—	WM378
P.T.P. Three (Pen, D, Pen)	June '35	WM389
Certainty Three (SG, D, Pen)	Sept. '35	WM393
Minutiae Three (SG, D, Trans)	Oct. '35	WM396
All-wave Winning Three (SG, D, Pen)	Dec. '35	WM400

Four-valve : Blueprints, 1s. 6d. each.

05/- Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal four (2SG, D, Pen)	16.9.33	AW402
2 H.F. Four (2SG, D, Pen)	—	AW421
Crusaders' A.V.C. 4 (2HF, D, QP21)	18.8.34	AW445
(Pentode and Class-B Outputs for above: blueprints 6d. each)	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	Aug. '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	Feb. '35	WM381
The H.K. Four	Mar. '35	WM384

Five-valve : Blueprints, 1s. 6d. each.

Super-quality Five (2HF, D, RC, Trans)	May '33	WM320
New Class-B Five (2SG, D, LF, Class B)	Nov. '33	WM340
Class-B Quadradyne (2SG, D, LF, Class B)	Dec. '33	WM344
1935 Super Five (Battery Superhet)	—	WM370

These blueprints are full size. Copies of appropriate issues containing descriptions of these sets can in most cases be obtained as follows:—"Practical Wireless" at 4d., "Amateur Wireless" at 4d., "Practical Mechanics" at 7d., and "Wireless Magazine" at 1/3d., post paid. Index letters "P.W." refer to "Practical Wireless" sets, "P.M." to "Practical Mechanics" sets, "A.W." refer to "Amateur Wireless" sets, and "W.M." to "Wireless Magazine" sets. Send (preferably) a postal order (stamps over sixpence unacceptable) to "Practical and Amateur Wireless" Blueprint Dept., Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.

Mains Operated.

Two-valve : Blueprints, 1s. each.

Consoelectric Two (D, Pen) A.C.	23.9.33	AW403
Economy A.C. Two (D, Trans) A.C.	—	WM286
Unicorn A.C./D.C. Two (D, Pen)	Sept. '35	WM394

Three-valve : Blueprints, 1s. each.

Home-lover's New All-electric Three (SG, D, Trans) A.C.	—	AW383
S.G. Three (SG, D, Pen) A.C.	—	AW390
A.C. Triodyne (SG, D, Pen) A.C.	19.8.33	AW399
A.C. Pentaquester (HF, Pen, D, Pen) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF, Pen, D, Pen) A.C.	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen)	Jan. '36	WM401

Four-valve : Blueprints, 1s. 6d. each.

All Metal Four (2 SG, D, Pen)	July '33	WM320
Harris Jubilee Radiogram	May '35	WM380

SUPERHETS.

Battery Sets : Blueprints, 1s. 6d. each.

Modern Super Senior	—	WM375
Varsity Four	Oct. '35	WM395

Mains Sets : Blueprints, 1s. 6d. each.

1934 A.C. Century Super A.C.	10.3.34	AW425
Heptode Super Three A.C.	May '34	WM359
"W.M." Radiogram Super A.C.	—	WM366
1935 A.C. Stenode	Apr. '35	WM385

PORTABLES.

Four-valve : Blueprints, 1s. 6d. each.

Midget Class-B Portable (SG, D, LF, Class B)	20.5.33	AW638
Holiday Portable (SG, D, LF, Class B)	1.7.33	AW393
Family Portable (HF, D, RC, Trans)	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21)	June '34	WM363
Tyers Portable (SG, D, 2 Trans)	Aug. '34	WM367

SHORT-WAVERS—Battery operated.

One-valve : Blueprints, 1s. each.

S.W. One-valve converter (price 6d.)	—	AW329
S.W. One-valve for America	—	AW429
Roma Short-waver	—	AW452

Two-valve : Blueprints, 1s. each.

Ultra-short Battery Two (SG det, Pen)	Feb. '36	WM402
Home-made Coil Two (D, Pen)	—	AW440

Three-valve : Blueprints, 1s. each.

World-ranger Short-wave 3 (D, RC, Trans)	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen)	30.6.34	AW438
Experimenter's short-waver	Jan. 19, '35	AW443
The Carrier Short-waver	July '35	WM390

Four-valve : Blueprints, 1s. 6d. each.

A.W. Short-wave World Bcater (HF, Pen, D, RC, Trans)	—	AW436
Empire Short-waver (SG, D, RC, Trans)	—	WM313
Standard Four-valve Short-waver	Mar. '35	WM383

Superhet : Blueprint, 1s. 6d.

Simplified Short-wave Super	Nov. '35	WM397
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Mains Operated.

Two-valve : Blueprints, 1s. each.

Two-valve Mains Short-waver (D, Pen) A.C.	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C./D.C.	Aug. '34	WM368
"W.M." Long-wave Converter	—	WM380

Three-valve : Blueprint, 1s.

Emigrator (SG, D, Pen) A.C.	—	WM352
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Four-valve : Blueprint, 1s. 6d.

Standard Four-valve A.C. Short-waver (SG, D, RC, Trans)	Aug. '35	WM301
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MISCELLANEOUS.

Enthusiast's Power Amplifier (1/6)

June '35	WM387	
Listener's 5-watt A.C. Amplifier (1/6)	Sept. '35	WM392
Radio Unit (2v.) for WM392 (1s.)	Nov. '35	WM398
Harris Electrogram (battery amplifier)	Dec. '35	WM399
De-Luxe Concert A.C. Electrogram	Mar. '36	WM403
New style Short-wave Adapter (1s.)	June '35	WM388
Trickle Charger (6d.)	Jan. 5, '35	AW462
Short-wave Adapter	Dec. 1, '34	AW456
Superhet Converter	Dec. 1, '34	AW457





# QUERIES and ENQUIRIES

## Short-wave Tuning

"You recently gave instructions for making some short-wave coils to be tuned with a .00015 mfd. condenser. Can you please tell me the wavelengths with a tuning condenser of .00025 mfd. as I intend to use them with a condenser of this value?"—J. E. T. (Winchester).

IF the condenser is a good one it may be taken that the minimum capacity will be identical with that of a .00015 mfd. condenser, and thus the minimum wavelength of the coil will be unchanged. As however, the maximum capacity is nearly double, then the maximum wavelength covered will be nearly double. Thus if the coil is designed to cover from 11 to 25 metres with a .00015 mfd. condenser, the .00025 mfd. condenser will result in the coil covering a range from approximately 11 to 45 metres or so. It will therefore be apparent that tuning will be extremely difficult as such a wide band is covered that station separation will be reduced and each individual station will cover such a small point on the dial that it will be very difficult to tune in the station and therefore you should adopt the condenser specified.

## Dual Loud-speakers

"I am interested in better reproduction, and to this end propose to buy a new speaker to use in conjunction with my present model to extend the frequency range. I enclose a circuit of the set I am using, and should like to know how to connect the additional speaker to the present model. The latter is a 9in. diameter cone, and I am thinking of getting one of the little midget moving-coil speakers for the high-note response. Can you improve upon this suggestion and help me to improve the reproduction?"—G. T. (Bath).

IT is of little use improving the output arrangement if the receiver will not deliver a frequency response which may be adequately dealt with by the speakers. Thus, a study of your circuit shows that it will probably be lacking in real high-note response due to the use of the superhet arrangement and sharply tuned circuits, whilst the general quality produced by the L.F. circuits will not be better than can be dealt with by your ordinary speaker. Thus, to include a high-note speaker you must first arrange the circuit so that the high notes are present in the output stage, and flatly-tuned circuits will be the first step in this direction. The L.F. couplings should then be improved and more H.T. employed on the L.F. and output valves. You may then consider the additional speaker, and for best results from the point of view of matching, etc., we suggest a special crystal tweeter.

## Output Transformer

"I have just obtained a loud-speaker but this has five terminals on it, whilst my old one only had two. These were marked positive and negative, but the new one has no such markings, but one terminal has the letter O and the others have numbers

20, 45, 55 and 75. I wonder if you could explain what these mean and how to identify the positive and negative connections to suit my set. I might mention that the new speaker is an M.C. model, while the old one was moving-iron. This will not make any difference, will it?"—D. O. W. (Stroud).

WITH an ordinary moving-iron type speaker the polarity of the winding is maintained in order to retain the magnetism of the unit. With a moving-coil speaker an input transformer is fitted, and it does not matter in which direction the current flows through the primary, consequently no polarity indications are given on the input terminals. To make the modern moving-coil speaker of universal application it is now customary by most manufacturers to take tappings from the primary winding and these provide various ratios to suit different valves. The figures marked on your particular model indicate that the terminal marked 0 should be joined to one of the L.S. terminals or sockets on your receiver, whilst the other terminal

## 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.

Please note also, that queries must be limited to two per reader, and all sketches and drawings which are sent to us should bear the name and address of the sender.

If a postal reply is desired, a stamped addressed envelope must be enclosed. Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

should be connected to the most appropriate tapping, providing a step-down of 20 to 1, 45 to 1, 55 to 1, or 75 to 1. The latter is generally required with a pentode or other high-impedance valve, whilst the lower ratios are required with low-impedance valves, and for maximum results you should ascertain the effective load at each ratio and then apply the nearest value recommended by the valve makers for your particular output valve.

## Short-wave Coils

"I have been given a number of coil forms which are fitted with various pins on the base, some of which appear to be in the same order as the ordinary valve—as though the coils are intended to be used in a valveholder. I wonder if you could give me instructions for winding a set of coils on these to cover the ordinary short waves, in conjunction with a standard short-wave condenser?"—B. F. S. (Clapton).

WE have recently published an article dealing with the method of winding this type of short-wave coil and detailing the connections which are adopted to the standard 4-, and 6-pin base. We therefore refer you to this article which appeared in our issue dated May 9th last.

## A Frequency Doubler

"I am interested in transmitting circuits, and although I know that you do not give circuit details I should be glad if you could explain the arrangement of a simple frequency doubler which I could make up. What is its use? Perhaps you could also give brief details to enable me to make it up, as I might mention that I am fairly well advanced in radio technique and can understand most terms."—G. B. (Pembroke).

THE frequency doubler is employed in the short-wave transmitter on account of the difficulties of successfully employing extremely high frequencies. We presume that you understand the normal features of a transmitting circuit. In order, therefore, to employ successfully the high frequencies it is customary to generate the oscillations in the first place at a lower frequency and then to use a circuit to multiply the frequency. An ordinary push-pull arrangement is generally employed, and the valves are over-biased, whilst the two anodes are linked and connected to a tuned circuit which is tuned to double the generated frequency, thus providing the frequency doubling referred to. Modifications of this circuit may be employed, but this is the fundamental scheme.

## Class B Tone

"I have been using a Class B circuit but am not entirely satisfied with the tone. This seems to be rather high-pitched and I should like to reduce it, with, if possible, some form of adjustable control for various musical items. What is the best way of effecting this tone control with the least expense and with the least modification of the circuit wiring?"—H. W. B. (Yarmouth).

THE simplest Class B tone control is a fixed condenser across the entire secondary winding of the Class B input transformer. This may be as large as desired to effect the desired reduction in tone, the higher the capacity the lower the tone. To make a variable tone control the condenser may be joined to one side of the secondary winding, the other side of the condenser being joined to the arm of a potentiometer having a value of 30,000 or 50,000 ohms. One side of the potentiometer is then joined to the other side of the secondary winding. The condenser in this case may have a value of .05 mfd.

## Progressive Home Construction

"Please could you inform me as to which issue of your periodical contains the articles on Progressive Home Construction and what apparatus is described in each issue?"—B. B. (Tiverton).

THE series referred to commenced in our issue dated January 26th, 1935, and appeared in the following issues: Feb. 2nd, 1935, Feb. 9th, 1935, Feb. 16th, 1935, Mar. 2nd, Mar. 9th, Mar. 16th, Mar. 23rd, April 6th, and April 27th, 1935. The subjects dealt with in order were: A Simple One-valve Set with Home-made Components; Making Condensers and H.F. Choke for the Simple One-valver; An L.F. Amplifier; Making an L.F. Transformer; D.C. Battery Eliminator with Home-made Parts; H.T. Rectifier and Mains Transformer for A.C. Mains; H.F. Amplifier with Home-made Parts; Converting a Battery Receiver for A.C. Operation; Making a Class B Amplifier, and finally, Making Trickle Chargers with Home-made Components.

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