

CALLING UP THE LISTENER

Practical Wireless

3^D

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AND PRACTICAL TELEVISION

EDITED BY F.J.CAMM

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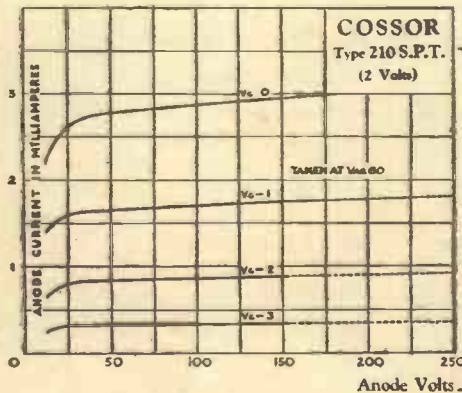
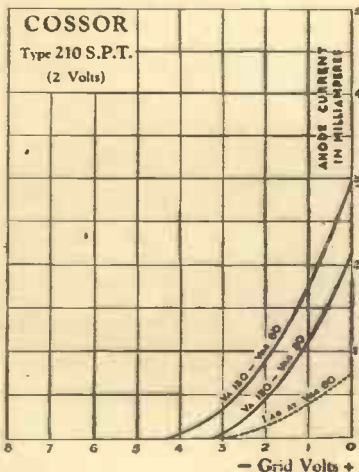
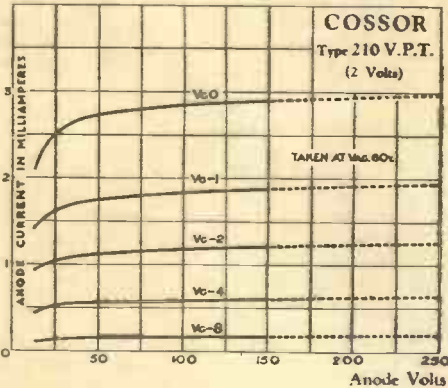
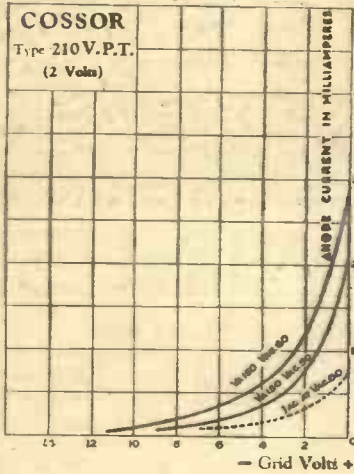


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EVOLUTION OF THE SUPERHET! See Page 266



EDITOR:
 Vol. IV. No. 87 || F. J. C.A.M.M. || May 19th, 1934.
 Technical Staff:
 W. J. Delaney,
 H. J. Barton Chapple, Wh.Sch., B.Sc. (Hons.), A.M.I.E.E.,
 Frank Preston, F.R.A.

ROUND *the* WORLD of WIRELESS

Summer Time

THE European countries which have now changed over to Summer Time include Great Britain, France, Belgium, Rumania, and Portugal. Holland alters her clocks on May 15th.

Australian Empire Day Broadcast

IN celebration of Empire Day, a programme from Australia will be given on May 24th, in the National programme, and will be re-transmitted by the B.B.C. to other parts of the Empire, either by means of simultaneous broadcast or by electrical recording. The programme will be devised and produced by the Australian Broadcasting Commission, and will open with the chimes of the General Post Office clock at Sydney, New South Wales. A demonstration by Kookaburra (Laughing Jackass) will follow. As an introduction to the playing of "Australia will be there," a favourite war-time song of Australian soldiers, a message of goodwill to the Empire will be broadcast.

Larger Stations for Austria

IT has been decided to replace the Dornbirn, Salzburg, and Linz relays during 1934-5; their power is to be increased by several kilowatts.

Avo Minor Competition—Correction

WITH reference to the announcement concerning this competition which appeared in a recent issue, we understand that a slight printer's error occurs in some of the folders sent out in connection with the competition. On page 3 the last range of meter readings should be 0-3 megohms, and not 0-3.

More Musical Interval Signals

OWING to the popularity achieved by the short musical phrase used by the Prague high-power transmitter, the Czechs have decided to adopt individual melodies as interval signals at all their stations. Prague (2) on 249.2 metres now uses a trumpet fanfare consisting of the first few bars of the Sokol March, and Bratislava a carillon of the folk song, *Hei Slovaci*. At Kosice, more distinction is obtained by introducing a native wind instrument, the *Fusar*, and from Moravska Ostrava will be heard a short excerpt of a national song, played on a vibraphone. Brno has not yet taken a decision in the matter.

The Range of Small Stations

ALTHOUGH the power of Zagreb (Jugo-Slavia) is only 750 watts, its broadcasts have been recently well heard in the United States. This fact proved of interest inasmuch as it was discovered that the aerial was slung east-west, and thus possessed excellent directional properties. Most of the letters confirming good reception were received from St. Louis (Mo.). Here you have the explanation of

Have You Seen Our Companion Journal

"THE PRACTICAL MOTORIST"

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3d. EVERY WEDNESDAY 3d.

A Modern Journal for Every Motorist

the reason for which some small European transmitters are heard at exceptional strength in certain parts of the United Kingdom.

Radio to Assist French Railways

FOLLOWING the recent Lagny disaster, the signalization on the French railways is to be completely modernized by the use of radio short-wave transmitters and receivers. In future trains will be equipped with apparatus permitting them to maintain communication with each other on the main lines. By this means the engine driver will be informed of the exact position of any train he may be following or which may be overtaking him.

Egyptian Broadcasting System

WITH the imminent opening of the new Cairo transmitter on 483.9 metres, the future plans of the authorities have been officially revealed. Egypt was granted four channels by Lucerne, and will make use of them. Work is to be started without delay on the Alexandria 5-kilowatt broadcasting station (267.4 metres) and later on two relays, namely, Cairo (2) and Alexandria (2), for which the international common waves of respectively 222.6 metres and 209.9 metres will be utilized. Their power will not exceed 2 kilowatts.

Television Transmissions

IN addition to television broadcasts carried out by the B.B.C. the amateur may be interested to learn that experiments are also being made by Germany and Italy according to a regular time schedule: The Deutschlandsender (Berlin), on 1,635 metres, transmits pictures (30 lines) 12.5 per second, on Tuesdays from B.S.T. 09.05-10.00; Thursdays 13.45-14.45, and Saturdays from 09.05-09.45. From the Berlin short-wave station on 6.98 metres (42,950 kilocycles) the transmissions are made on 180 lines, from 09.00-11.00 and 15.00-16.00 (Mondays and Wednesdays); 09.00-11.00 and 20.30-22.00 (Tuesdays and Thursdays), and from 09.00-11.00 on Saturdays. Rome works irregularly on 80 metres (3,750 kilocycles) with 60 lines (20 pictures per second).

Touting for Tourists

DURING the summer months many Continental States broadcast special talks in foreign languages with a view to bringing the attractions of their cities, watering and seaside resorts to the attention of prospective visitors. Such transmissions in French, German, and English may be picked up regularly from Italy, Switzerland, and Denmark, the last-named country calling Europe twice weekly at 11.0 p.m. towards the end of the day's programme.

New Trondheim Transmitter Testing

ON 476.9 metres, a channel shared with Radio Lisboa (Portugal) in the early morning and late afternoon hours, tests carried out by the new 20 kW Trondheim station may be heard on most days. When officially opened the transmitter will eventually relay the Oslo programmes.

ROUND *the* WORLD of WIRELESS (Continued)

Improving the Swiss Stations

IT has now been decided that in view of cost entailed the power of the Beromünster station alone will be increased this year. In addition to improvements and additions to the existing plant the aerial masts are to be raised some 246 feet in order to assist radiation. It is also proposed to change the wavelength of the old Berne station, now working on 218.2 m., to 500 metres, providing authority to do so can be obtained.

Wings of the Morning

LANCE SIEVEKING'S new radio play, *Wings of the Morning*, which is to be heard in the Regional programme on May 24th and the National programme on May 25th, is the story of "a fantastic crime committed in the Fourth Dimension." As may be gathered, there is a scientific touch about the play, which includes members of the Royal Society, as well as the more commonplace "minions of the law," among the characters. The author will be the producer.

A Broadcast Revue from Plymouth

ON May 18th, West Regional listeners will hear an extract from the George Clarke revue at the Palace Theatre, Plymouth. The Band of H.M. Royal Marines, Plymouth Division, will be heard on May 19th. The Director of Music is Lieutenant F. J. Ricketts, R.M., and the programme will be relayed from the Abbey Hall, Plymouth. Frederick Harvey (baritone) will be the vocalist.

Dance Music by Scottish Studio Orchestra

ON May 19th, the dance music period in the Scottish Regional programme will be interrupted for twenty minutes and a programme entitled "Jig Time" will be given by the Scottish Studio Orchestra directed by Guy Daines. This will provide a change for listeners who do not care for jazz.

Wireless Symphony Orchestra at Belfast

DR. ADRIAN BOULT will conduct the Wireless Symphony Orchestra in the final concert of the spring series, which will be given in the Ulster Hall, in co-operation with the Belfast Corporation, on May 19th. Dr. Boult paid his first visit to Belfast two years ago, and has become one of the city's favourite conductors in the interim. The programme on this evening will include the Brahms Concerto, Opus 77, in which the solo violin part will be played by Temianka.

"Hurdy Gurdy"

ANOTHER broadcast of the popular "Hurdy Gurdy" series will be given in the West Regional wavelength on May 2nd, when the artists will be John Rorke, Elsie Eaves, Brian Gaye, Mervyn Saunders, the Revue Chorus, and the Western Studio Orchestra. Listeners all over the world are delighted with the "Hurdy Gurdy" programmes, for they bring back memories of other days. The programmes are not built around any special theme, for the

INTERESTING and TOPICAL PARAGRAPHS

usual "Hurdy Gurdy" is somewhat inconsequent in its manner of presentation and that is, of course, a part of its charm.

"The Boat Train"

THE interesting series of talks which are broadcast on Monday mornings under the general title of "The Boat Train," include any subject under the sun, from witchcraft and carpet-buying in India to pleasure cruising, marrying an Englishman, or going on an elephant kraal. On

Edinburgh Entertains

A PLAY entitled *Edinburgh Entertains*, by Christine Orr, will be broadcast in the Scottish Regional programme on May 23rd. Listeners, many of whom may remember Christine Orr's previous broadcast plays—*Walter Scott*, *Dunbar*, and *Flodden*, and her historical programme of Edinburgh, are being taken by her on this night to the four chief places of interest in Edinburgh, but in modern times. Miss Orr has chosen Assembly Week as being a week not only of solemn functions and deep debate, but of junketing and jollity and the meeting of old friends. Gordon Gildard will produce the play and the principal parts will be taken by Margaret Adams, Bruce Morgan, and Isabelle Pagan.

NOVEL COOLING APPARATUS AT H.M.V. FACTORY.



A new form of miniature railway and wind tunnel has been devised by a member of the H.M.V. staff, and installed in the condenser-making plant at Hayes. The blocks of fixed condensers, after having been filled with pitch, pass through the tunnel on rails and are automatically cooled by air which is pumped through.

May 28th, Sir Malcolm Campbell will talk on Speeding, and on June 25th, Vice-Admiral Sir Charles Carpendale will talk about Europe's wavelength problems.

SOLVE THIS!

PROBLEM No. 87

Tompkins built up a disc television receiver, but although he obtained splendid results he decided that the brilliancy of the image was not really sufficient for his entertainment needs. He decided, therefore, to build a mirror-drum receiver. He purchased a complete mirror-drum, motor, and grid cell, and built this up with his existing neon and the necessary lens, but could obtain no results. What important point had he overlooked? Three books will be awarded for the first three correct solutions opened. Address your attempts to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 87, and must be posted to reach here not later than the first post Monday, May 21st, 1934.

SOLUTION TO PROBLEM No. 86

The output valves of Davis's push-pull amplifier were oscillating. A resistance in each grid lead, or a small resistance in each anode lead would have removed this instability and enabled good volume to be obtained. The following three readers successfully solved Problem No. 85, and books have accordingly been forwarded to them:—

Mr. James W. Forest, 7, Hamer Ave., Blackburn; Mr. S. W. Duncan, 24 Park Avenue, Dundee; Mr. H. Hill, 43 Bk., Tickle Street, Parr, St. Helens, Lancs.

The Finnish National Orchestra

IN the symphony concert by the Finnish National Orchestra, which will be heard by National programme listeners in a relay from the Queen's Hall on June 4th, Helmi Luikkonen, soprano, will be the soloist. The programme consists mainly of Sibelius music and includes his second and fourth symphonies. Other of his works to be performed are *Night Ride and Sunrise* and *Luonnotar*, for soprano and orchestra. The orchestra will also play *Merikanto's Pan and Swans*, by Raitio. The conductor is Georg Schnévoigt, who is already as well known to us, as he is to audiences in almost every city in Europe that has an orchestra or opera house.

"Choir and Cloister" Broadcasts

ON May 17th, the fifth relay in the Midland Regional "Choir and Cloister" series will be given from Worcester Cathedral, and Walter Pitchford, of Lamport, is again the narrator. He will find abundant material in the cathedral that looks down on the Severn, for it has a Norman crypt, where each year there is a special collect said for its builder, St. Wulfstan; it has one of the most beautiful thirteenth-century choirs in Europe; the tomb of King John, who was brought to Worcester from Newark Castle, where he died; and many other interesting features. Sir Ivor Atkins will play an organ solo from Sir Edward Elgar's second sonata, and will conduct the choir in choral music, composed by great composers of church music like Dr. Byrd, Dr. Blow, Tomkins, and Samuel Wesley—all of whom had Midland associations.

Torquay Municipal Orchestra Broadcast

TWO of the southern seaside orchestras which can always be relied upon to provide a first-class relay are Torquay and Bournemouth, while Hastings and Eastbourne also have a large following among listeners. One of the increasingly frequent broadcasts by the Torquay Municipal Orchestra will be heard on May 22nd in the National programme. The conductor will be Ernest W. Goss, scion of a famous musical family, and the soloist is Mary Hamlin, soprano.

CAR RADIO POSSIBILITIES

All of the Problems of Radio in the Car have Now Been Solved, and the Solutions are Here Described.
By W. J. DELANEY

FROM time to time we have dealt with the problem which faced the designer of a wireless receiver which had to operate in the confines of a motor-car travelling along the roads under all conditions. Briefly, interference from the magneto, sparking plugs, etc., had to be overcome. Some form of aerial or other efficient pick up of the wireless signals had to be fitted so as to introduce a really good signal to the receiver. Constancy of

fully satisfies every possible requirement of entertainment whilst driving.

Interference Suppression

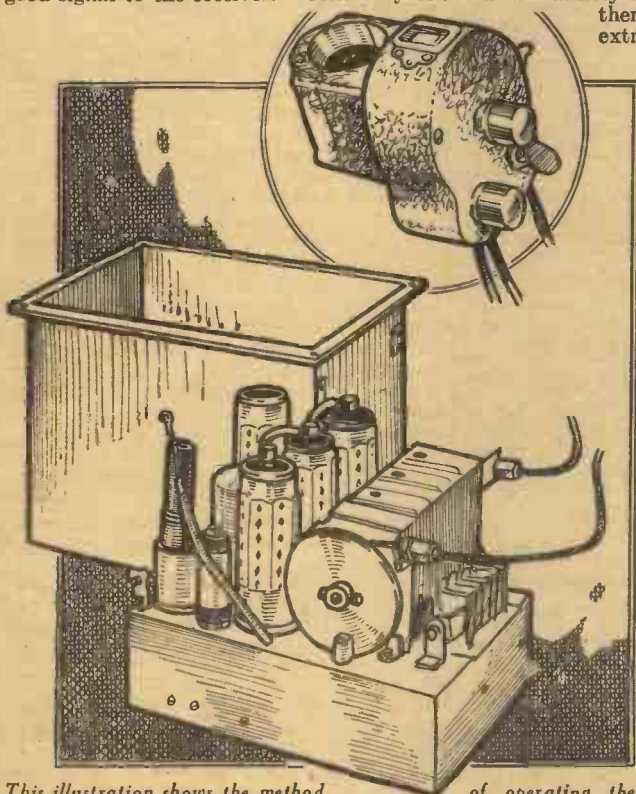
Special resistances have been designed, and are now manufactured on a commercial scale for fitting to the plugs and for use in conjunction with the magneto and associated distributors, which remove all interference from those sources. With these fitments and a suitably-designed radio receiver there are no crackles or other extraneous noises to mar the reproduction. Many car manufacturers are now fitting these suppressors as part of the standard equipment, but where it is desired to equip an existing car with radio the suppressors may be purchased from any good radio dealer. They are manufactured by firms who have had much experience in the manufacture of resistances, and may be relied upon to satisfactorily fulfil their function without breakdown.

Aerial Equipment

Many new cars have an aerial built into the body work or arranged in the roof of the car in such a manner that a fair length of wire is accommodated and at the same time there is little likelihood of interference being picked up. Where such a fitting is not provided some interesting types of aerial may be obtained from various firms for fitting to the car in an invisible manner. In most cases a copper gauze mat is employed, and this is enclosed in some dirt-proof casing and is



A complete modern car radio receiver and loud-speaker.

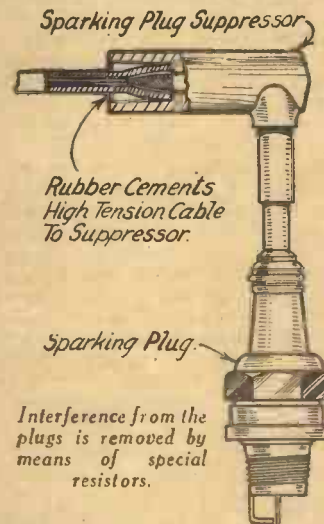


This illustration shows the method of operating the controls from the steering column, and how the apparatus may be enclosed in a metal case to be sunk in the floorboards.

signal strength had to be obtained under all conditions. That is to say, the screening effects of metal bridges, high hills, etc., had to be completely removed. The receiver had to be disposed in the car in such a way that it introduced no awkward boxes or other projections. The loud-speaker had to be fitted also in an unobtrusive place, but in such a manner that it could deliver its signal to the occupier of the car. The controls had to be arranged so that the driver could turn the set on and off and control the volume delivered by the speaker. A really good voltage (of the order of 200 or so) had to be obtainable without introducing too much bulk or weight. Although there are other smaller points, the apparently insolvable difficulties which have been enumerated have now been overcome in a most satisfactory manner, and the following notes will show in what an efficient manner the designers have been able to build a receiver which

generally designed to fit beneath the running boards.

A length of flexible lead is fitted and this is of the ordinary or screened type, depending upon the particular make. Fitting is only a matter of drilling one or two holes



and passing bolts (which are provided with the equipment) through the running board and locking up with wing nuts. The whole job may be carried out in less than half an hour. As the car is running on rubber tyres it is effectively insulated from earth, but by connecting the chassis, etc., of the receiver to the framework of the car a satisfactory earth connection is obtained.

(Continued overleaf)



This aerial fitment is intended to be mounted below the running board.

CAR RADIO POSSIBILITIES

(Continued from previous page)

Constancy of Signal Strength

Until one has experienced the testing of a simple receiver in a car travelling at speed over a road which passes through a hilly district and over or under metal bridges, one cannot appreciate the variations in signals which can occur. This has obviously been overcome with the simple automatic volume control circuit which is now so popular, and which is carried out by means of the double-diode type of valve. By employing the superheterodyne circuit good signal strength is obtained and the modern output pentode enables a really loud signal to be obtained under practically all conditions.

Apart from the actual circuit, the disposition of the receiver at one time seemed a tough proposition. To facilitate its incorporation in the car without intrusion the general procedure is to build the receiver into a small metal box so designed that it may be sunk into the floorboards, or else incorporated in a cabinet with a loud-speaker and designed to be fitted beneath or behind the dash.

Special loud-speakers of the Midget type have been designed and these may be built into the dash in the case of modern cars, or incorporated in a specially-built cabinet for inclusion beneath the dash in the case of older cars. The glove box may be extended to accommodate the speaker if thought desirable.

The Controls

In the design of the controls exceptional ingenuity has been displayed. It is an essential that the driver shall have these at his immediate reach and an indication must be afforded as to the tuning setting, in either wavelengths, or by means of a simple calibrated dial. In the case of the Lissen car radio outfit, a neat fitting is designed to be bolted to the steering column, and adjustment of the tuning knob is no more difficult than the manipulation of the horn control, and a neat window discloses a numbered dial to enable the tuning-range to be identified. The tuning condenser is operated from this control through the medium of Bowden cables, and there is no backlash and tuning is delightfully simple. In another case a neat dial of the clock-face type is fitted to the steering column, and small knobs on the moulding enable the tuning to be carried out as well as providing for volume and tone control. The large pointer provides an immediate indication, visible at a glance.

High-Voltage Generators

It is obvious that ordinary H.T. batteries could be carried without taxing the engine, but the problem of replacement has to be faced and accessibility must at the same time receive attention. Special small generators have, however, now been developed and these operate from the starting or lighting battery and deliver a good 200 volts, thus permitting of the employment of ordinary mains-type valves with their resultant high efficiency.

There only remains the question of legislation which might be introduced regarding the use of a wireless receiver in a car. Does a wireless receiver distract the driver's attention from the road and increase the risk of accidents? Or, alternatively, does the fitting of a wireless receiver prove so entertaining that the driver is prevented from driving dangerously?

AN EXCELLENT HOME-MADE MICROPHONE

THE photograph and sketches show a very neat and efficient microphone of the pedestal type, which can be quickly constructed from simple materials. The main parts, which can be clearly seen in the photograph, consist of a base, a tubular upright, brass swivelling ring, and a microphone-carrying disc.

The base was taken from an old Amplion horn speaker and is ideal for the purpose, but if this is not available, a very effective base can be made from wood, as shown in sketch.

The tubular upright is a 14in. length of ordinary steel casing, as used in electric wiring. This is flattened at one end, and drilled to take base-bolt. If, however, the alternative wooden base is used, the end of the casing is left circular, but is turned over with pliers to form a flange as shown. A hole is made in the centre of the top disc, the tube passed through, and the bottom disc screwed on. A disc cut from sheet lead and sandwiched between the two wooden ones will help to weight the base. The size can be about 6in. diameter, and fairly heavy hardwood, such as oak, should be used. A short wooden peg (drilled with a 2B.A. clearance hole) is driven into the top of the upright. This forms a socket for the shank of the brass swivelling ring.

The brass swivelling ring is formed from a 16½in. length of ½in. diameter brass rod, bent round and having two brass lugs soldered to the ends as shown. A short length of 2B.A. screwed rod is passed through and the nuts tightened up. This completes the ring, which can then be inserted into the tubular upright.

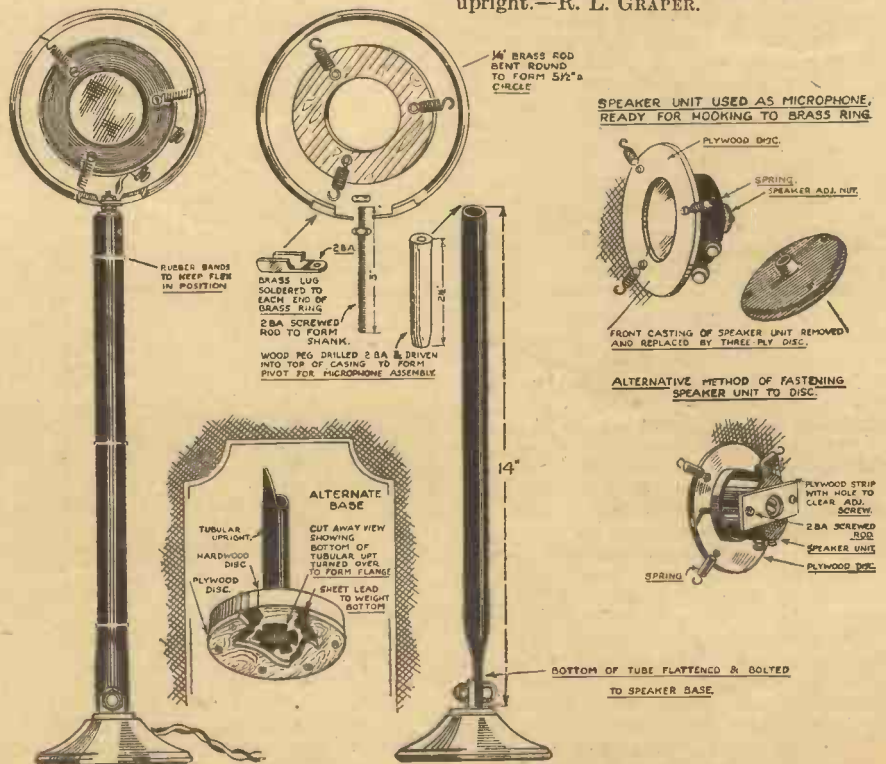
The microphone-carrying disc is made from three-ply, 4in. diameter. The springs can either be screwed direct on to the disc or inserted under the set screws of the speaker unit. The size of hole in the disc will, of course, depend on the microphone used.

In the writer's case, the Amplion speaker unit was employed as a microphone, and the hole was made 2½in. diameter. If using the Amplion unit, the cover should be removed by unscrewing the three set screws, and, as these have flush heads, a slot should be filed in each to facilitate removal.

The three-ply disc is next drilled at the same centres, adjusted over diaphragm and spring washer, and the set screws tightened up. The flex lead is connected to the speaker terminals and held in place by three small rubber bands against the upright.—R. L. GRAPER.



Photograph of the complete microphone.



Full constructional details of the microphone and stand described in this article.

TRIMMING GANG CONDENSERS

The Methods to be Adopted and Some Simple Tests are Described Below

ANY receiver having a gang condenser requires a certain number of preliminary adjustments if satisfactory results are to be obtained. These trimming adjustments are not usually very difficult to make, but it appears that many readers are not quite sure of the procedure which should be followed. The first thing to bear in mind is that, if a gang condenser is to be employed with any measure of success, it is essential that all the tuning coils upon which it is operative should have identical values of inductance; it is futile to attempt to use, say, two coils of similar type in conjunction with a two-gang condenser unless the coils have been bought as a matched pair. When the constructor has one coil of a particular type which he wishes to fit into a new receiver with ganged tuning, it is best to send the coil to the makers and ask for the other coils required to be exactly matched to it. This is especially true in regard to iron-core coils, and there are a few manufacturers of high-class air-core coils who guarantee all their specimens to be identical to within a margin of 1 per cent. or so.

Use Matched Coils

In case it should be thought that identical coils can be used with a gang condenser without the necessity for any further matching or trimming, it should be borne in mind that the connecting wires modify the coils' characteristics. These leads introduce all kinds of stray capacities which are probably appreciably different for each of the coils in use. The object of the trimmers is therefore to balance out such strays.

The actual system of setting the trimming condensers depends very largely upon the circuit in use, but the first thing is to turn the adjusting screws to their midway positions. To do this, they should first be screwed fully in, and then unscrewed until the springy plates upon which they work are in the "full open" position. If the number of revolutions is counted whilst unscrewing, it is an easy matter to turn back the screws for half the total distance of movement.

The next step is to tune in a station on about 240 metres. The strength of this should be reduced until signals are only just audible, either by means of the variable- μ control or by fitting an aerial volume control; for example, a 100,000-ohm non-inductive potentiometer may be connected between the aerial and earth terminals, and the aerial lead connected to the slider.

By varying the trimmers until signal strength attains a maximum their correct settings can then be found. It is not quite so simple a matter as might be conveyed by the last sentence, however, and the procedure should be on systematic lines. First of all, the reaction condenser should be turned to its midway position between oscillating point and "off," to ensure that the capacity in this part of the circuit is at its average value. After that the trimmer on that section of the condenser which tunes the detector valve should be moved slowly backward and forward, meanwhile trying the effect of slightly varying the position of the tuning scale.

When this portion of the condenser has

been trimmed properly, one should work backwards toward the "aerial" section. It will be found that some of the trimmer screws have to be nearly full in, and others almost right out. If it is found that any trimmer requires to be set to its extreme position, all the others should be varied. In other words, suppose, for instance, that the "detector" trimmer needs to be "full out," the others should be unscrewed a little until the first one does not require to be in the extreme position. If this is not done, there will be no means of checking that the trimming has been done correctly.

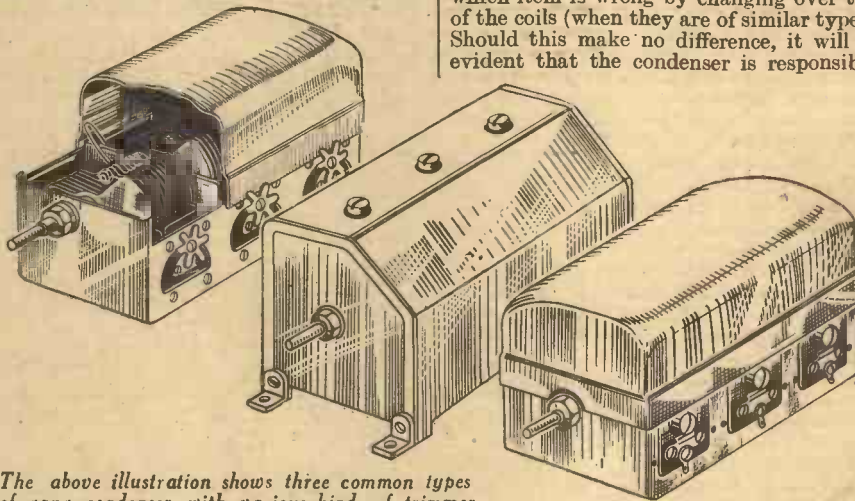
Use the Lowest Possible Trimming Capacity

When all the trimmers have first been set as explained, they should be examined to see if one of them is nearly at its minimum capacity; if not, they should all be unscrewed a little until one of them is practically "all out." The reason for this is that the tuning range will be restricted

the adjustments should be made on a station which is not subject to fading, whilst the process is considerably simplified if speech is being transmitted, since this maintains an almost uniform strength; most music, on the other hand, varies considerably in sound intensity.

Coil and Condenser Tests

Whilst making the trimmer adjustments the conclusion might be reached that the coils are not properly matched, or that there is some variation in capacity between the different sections of the gang condenser. In such a case a further test should be made by connecting a single tuning condenser in place of one or other section of the gang component. If signal strength is better when the separate condenser is correctly tuned, it will be evident that there is a defect in either the coils or condenser. Very often it is possible to decide which item is wrong by changing over two of the coils (when they are of similar types). Should this make no difference, it will be evident that the condenser is responsible,



The above illustration shows three common types of gang condenser with various kinds of trimmer adjustments. The condenser on the left has "star-wheel" trimmers, the other two having ordinary screwdriver screws.

unnecessarily if the trimming capacities are any greater than they need be. This also explains why some constructors of PRACTICAL WIRELESS receivers find that they cannot cover the tuning range for which the set was intended—simply because the trimming capacities are too high.

The above general method is applicable to all types of receiver, but the procedure is slightly different in the case of superhets. When trimming a superhet, a start should be made with that section of the gang condenser which tunes the oscillator valve. This is the most critical tuning circuit and must be treated rather carefully, rotating the trimmer adjustment as slowly as possible.

After all the trimmers have been set on the low wavelength mentioned, it is advisable to tune to a station somewhere near the top of the medium wavelength range in order to make sure that the settings "hold" as they should. Try moving the trimmer screws very slightly in both directions, and if it is found that any appreciable variation is called for, a third test should be made on a station at about 400 metres. It is scarcely necessary to point out that

but if a different tuning circuit is then unmatched, the coils will have been proved to be the cause of trouble.

When the coils are at fault the only remedy rests with their replacement. The only alternative is to abandon the idea of using a gang condenser and to use two or more separate ones. Sometimes, however, if the coils are only slightly "out" (when only two are used) it is possible to make use of a gang condenser having an external trimmer knob; this must be adjusted after making each tuning adjustment.

THE WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA

(2nd Edition)

By F. J. CAMM

(Editor of "Practical Wireless")

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THE EVOLUTION OF THE SUPERHET

The Superheterodyne Receiver Offers the Best Demonstration of the Utility of the Modern Valve. By W. J. DELANEY

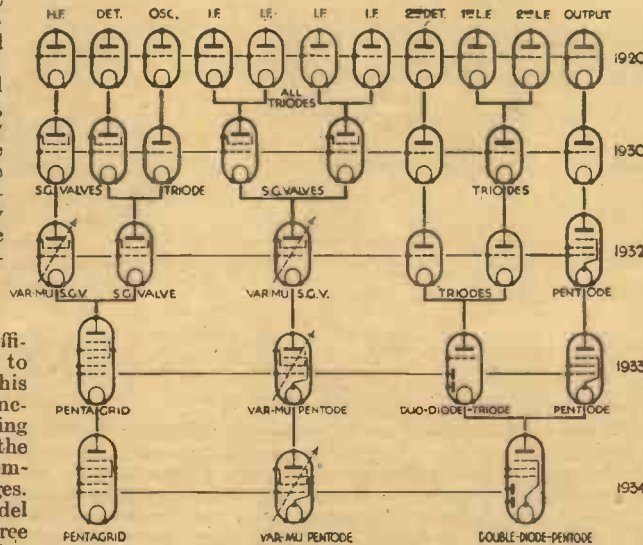
HERE is a common belief in the minds of many of the British public that any newly-introduced invention is brought about by a desire to obtain money from the public, without introducing any real advantage by that purchase. I have heard, for instance, several suggestions made by wireless enthusiasts that all the new valves are really unnecessary, and that they are really "manufacturers' ramps." Of course, this is not true, and I think a simple explanation of the progress of the modern superheterodyne will prove that not only have these new valves actually introduced many benefits to the wireless listener, but that they have, contrary to the above-expressed view, actually resulted in a saving of money for the purchaser.

The Original Superhet

I remember one of the really first commercially-produced superheterodyne receivers to be introduced from America. It employed no less than eleven valves. Each of these was enclosed in a separate metal compartment, and affixed to the end of the metal cabinet was a socket to contain a frame aerial nearly two feet square. Such a receiver would be laughed at to-day, yet it was the only method then available for utilizing the valuable superhet principle. It has already been shown in these pages how the superheterodyne works. Briefly, H.F. amplification has to be employed to deliver a sufficiently powerful signal to a first detector, and this is employed in conjunction with an oscillating valve to change the frequency to that employed in the I.F. stages. This gave us, in the model mentioned above, three separate valves. Owing to the very low amplification given by valves, it was necessary to follow these three stages by four I.F. stages before coming to the second detector. To enable a really good output volume to be obtained, two L.F. stages preceded the output valve.

Modern G.P. Valves
The normal general-purpose valve has an amplification of 30 or 40, and is equivalent, at the very least, to two of the above-mentioned L.F. stages, thus enabling the over-all number to be reduced; but it is with the modern type of valve that I wish to deal. The heptode or pentagrid has enabled the function of the oscillator and first detector to be combined, and such a valve will thus perform, in one single stage, the duties previously carried out by two valves. But more than this, the charac-

teristics of the valve are such that we can dispense with the pre-H.F. stage and still obtain louder signals. It is even possible to employ automatic volume control with the combined valve, and from the point of view of expense, therefore, no one can deny that there is a definite saving in this one stage alone. In addition to the saving in actual expense there is also the much greater efficiency which is obtained, and this represents a greater advantage than the saving in cost. Coming to the intermediate-frequency stages, one of the modern variable-mu pentodes will not only deliver a greater signal than four or even five of the old-type triodes, but its variable-mu characteristics will enable the automatic volume control feature to be fully employed in maintaining a constant signal to be handled by the second detector. Thus, we have obtained in two stages a signal which previously required probably six stages, plus the advantages of the A.V.C. system and the increased stability which comes from the few components which are required and the consequent reduction in screening.



This illustration shows the development of the superhet from 1920 to the present day.

The double-diode-triode and valves of a similar nature are now employed following the I.F. stage, and these combine the functions of second detection (one diode) and A.V.C. (second diode). The triode portion may be used as a first L.F. stage, and thus combine in one glass bulb three separate stages or functions. The double-diode-pentode, however, has such remarkable characteristics that it may be employed to feed a loud-speaker direct, and this means that with only three valves the whole of the functions of the previously-mentioned eleven-valve may be performed. The genealogical tree of the superhet shows its progress from the first-mentioned receiver down to the very latest type of apparatus in the terms of valves only.

A CHEAP POWER SUPPLY FOR COUNTRY LISTENERS



This photograph shows the complete apparatus.

A MAINS supply of electric current was not available, and, as power was needed both for various experimental receivers and also for a low power transmitter, something both efficient and practical had to be evolved. The following gives details of how this difficulty was overcome at low cost.

An old disused Triumph motor-cycle engine was salvaged from the scrap-heap; this was bolted to a large plank, the foot rests being heated and bent at right angles and passed through the plank, the nuts being screwed on from the underside. Two more bolts were passed through the plank from the back-stays, making the whole job firm. A dynamotor was taken from an old car and bolted firmly to the plank behind the engine. The dynamotor, being chain driven, was driven off the gear box, the cog being the one taken from the original drive on the car and fitted to the shaft of the gear box. A fan was fitted close to the cylinder of the engine and driven by a belt from the engine pulley for cooling purposes. To overcome the noise from the exhaust a 10-gallon oil drum was buried in the ground, and a pipe from the engine exhaust was led into this at the bottom of the oil drum, another pipe being led out to above ground with a fish-tail on the end.

The switchboard taken from the car and comprising a cut-out, ammeter and starter switch was mounted on the wall. A 12-volt sixty ampere-hour car battery completed the outfit. The field brush on the dynamotor was adjusted to give 10 amperes with the engine running smoothly, although the rate could be increased to 16 amperes without any undue stress on the engine. The dynamotor acts as a motor to start up the engine by just pressing the starter switch. The running costs are very moderate, and one gallon of petrol will run the outfit for 4½ hours, whilst the amount of oil consumed is very small.

The 12-volt supply is used to supply the filaments of the transmitter and receivers. For the H.T. supply 300 volts from H.T. accumulators is used. These are charged from the 12-volt supply, being banked into 10-volt blocks for this purpose, and the charging rate multiplied by the number of units in parallel.—H. J. LONG.

CALLING UP THE LISTENER

Details of an Interesting Method by means of which Receivers can be Switched On from the Transmitting Station

By J. X. STONE

THE ordinary calling-ring as used with a telephone tells the subscriber when he is wanted to receive a message. This simple yet essential part of the telephone service could, with advantage, be applied to the needs of the broadcast listener.

Of course it can be argued that the latter is able to consult a daily list of programmes from which he can "spot" any particular item he wishes to hear, and then tune-in at the appointed hour. But this does not always turn out to be as simple or convenient as it looks.

One may decide, perhaps, when reading the morning paper that such and such an item should be worth listening to; but by the time evening comes one has either forgotten all about it or else cannot remember the time or station. And so, if the printed programme is not handy, the occasion goes by.

But apart from helping the absent-minded listener, there is much to be said for the idea of being able to broadcast a "general call" on special occasions which would automatically switch-in sets that had been left on "stand-by." In this way one would be certain of receiving, say, an emergency news bulletin, or any item of outstanding importance.

Automatic calling devices operating on these lines have already been used as a "watch-dog" for the all-important SOS signal at sea, where human lives may depend upon the safe receipt of the message.

There is also a rapidly growing field for wireless in connection with police work, where, similarly, it is of the utmost importance that every mobile patrol carrying a wireless set should be kept in constant touch with messages sent out from headquarters.

A Circuit Arrangement

The accompanying diagram shows a receiving circuit which has recently been designed for this kind of work. The set can be switched over to "stand-by" and left in that condition pending a "call." Directly upon receipt of the signal, a bell is automatically rung—or a lamp is lit—to warn the operator, who then switches over to "receive" and listens to the message.

It will be seen that the output circuit of the low-frequency valve V2 contains two transformers, T and T1. The first feeds a bridge detector D, whilst the second is back-coupled to the input of the first H.F. valve V.

If the switch S is left open, the set is on

"stand-by," and the first signal received—on the wavelength to which the circuit L.C. is tuned—will send a rectified pulse of current through the valve V2. This is fed back to the H.F. valve V through the couplings T, T1, and after passing through all three valves, is fed back again, together with other rectified pulses from the incoming carrier.

The feed-back process is continued until, in a fraction of a second, the current through the bridge detector D becomes sufficiently

impulse brings a second contact into action to show a blue light. And so one can ring the changes. The owner of the set can elect either to switch off or to listen-in, according to his mood at the moment.

A further refinement allows the listener to push a button-switch under a signal-lamp of selected colour, so as to keep the set silent until the required kind of item is on the ether. As soon as this happens the relay automatically switches the set on and brings the loud-speaker into action.

Instead of using differently coloured lamps, a buzzer or alarm bell can be arranged to give audible warning to anyone in another room of what is afoot.

The use of such a calling device means, of course, that at least one of the valves in the set must be kept constantly in action, so as to amplify each control signal as it comes in sufficiently to operate the relay. This, however, involves very little expenditure of power—particularly in a mains-driven set—and need scarcely be taken into consideration on the score of expense, particularly where a luxury set is concerned.

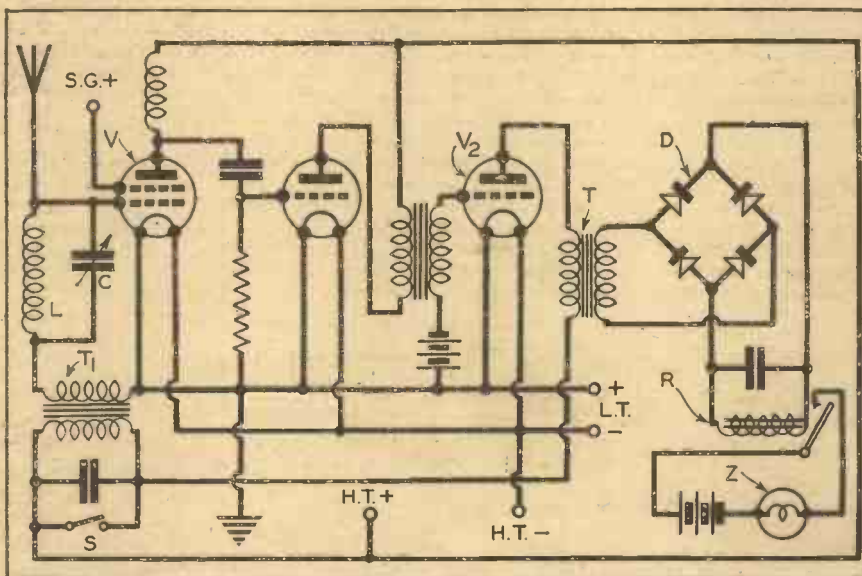
The calling signal may be transmitted on a note of definite frequency, to which a polarized relay in the output of a single "live" valve is tuned. The receipt of the signal is sufficient

to throw over the relay and so close a contact which brings the remaining valves and loud-speaker into action.

An alternative scheme, which does not require even one valve to be left constantly in circuit, is to use a clock switch to turn the set on, say, for thirty seconds every half-hour, and then to switch it off if the programme is not to the listener's liking. If it is, he closes another switch to keep the set going.

By fitting an automatic selector, the relay can be made to switch on the remainder of the valves automatically as soon as a particular type of programme is available and to switch them off again on receipt of a new control signal indicating a change in the type of programme.

Special calling-up signals are usually radiated on a frequency well below the audible range. In the first place this is a part of the frequency-band not otherwise required, and in the second place it does not interfere with or obtrude itself on any receiver already in operation.



The circuit of a police patrol receiver.

strong to operate the relay R and light the warning lamp Z, or sound a buzzer alarm.

This warns the operator, who closes the switch S, to cut out the feed-back coil, whereupon the set receives in the ordinary way.

Much the same kind of idea is now being exploited in America in connection with broadcast reception. A type of relay is used which is sufficiently selective to distinguish between different control signals and to respond accordingly. The control signals are sent out in code on a frequency well below the audible range.

Coloured Signal Lamps

There are various interesting possibilities in this direction. For instance, supposing the set is left on "stand-by," an indication of any particular kind of programme then on the ether is given by means of differently coloured flash-lamps—red, say, for dance music, blue for a symphony concert, yellow for the Children's Hour, and so on. Each lamp is energized by the same relay, which is rotated into different positions according to the particular "control signal" sent out at the beginning of each performance.

For instance, a long "dash" closes one circuit to light up the red signal, whilst one "long" followed by a "short" signal-

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PERMEABILITY TUNING POSSIBILITIES

An Explanation of the Function of Iron-Core Coils and of the Principles Underlying Permeability Tuning

THE tuning of radio receivers consists of establishing a resonant circuit which is responsive to the desired programme, the circuit accepting a relatively low band of frequencies, and rejecting signals outside this band. The fundamental properties of a tuned radio circuit are capacity, inductance, and resistance, and it is an elementary principle that variation in tuning can be affected either by varying the value of the capacity, the inductance, or both.

In the early days of crystal receivers a large coil of wire, wound on a huge former, was employed, and by sliding a suitable contact along a brass rod, the desired number of turns was selected. This varied the inductance and the idea was to change the relationship of capacity to inductance.

Practical Methods of Tuning

For many years now we have used variable condensers to tune coils of fixed values, and because of the mechanical convenience of this method it has come to be universally adopted.

The introduction of commercially-produced iron-core coils has now brought to the fore the possibilities of an alternative method of effecting gradual variations in the relationship of inductance to capacity, and a brief explanation will suffice to indicate why such a departure should be necessary and desirable.

It is very difficult to explain the reasons for new methods in radio without the aid of mathematical formulæ or, rather, to prove the efficacy of the method without actual demonstration, so the reader will have to accept certain statements which could be tested if this survey were to be made more academical.

An analysis of a tuned circuit which is responsive over a broad band of frequencies indicates that its electrical properties are materially changed with variations in frequency.

The decay co-efficient changes if the capacity is varied for tuning; this is due to the fact that the resistance increases with frequency. This variation in the decay co-efficient can be side-tracked by arranging the tuning circuits in such a manner that the inductance or the relative inductance and capacity is applied so that for every incremental increase in inductance the resistance is correspondingly increased.

Uniform Sensitivity

It has always been the aim of designers to bring about a tuning device which will be equally selective and sensitive at all points of its tunable range, and since the decay co-efficient is a direct measure of the selectivity of a single tuned circuit the necessity for maintaining this factor at a constant value will at once be apparent.

In parallel resonance circuits, selectivity and amplification adversely affect each other, due to the fact that the tuned circuit is a direct load on the anode of the valve. The cure lies in the use of suitably-designed valves. Modern H.F. pentodes have a high amplification factor and anode

resistance, consequently the damping and its resultant effect on selectivity are practically negligible.

Another factor determining amplification or voltage on the aerial system is the frequency, but this is something over which we, at the receiver end, have no control.

The aim of the foregoing is to show that if inductive tuning can be arranged so as to

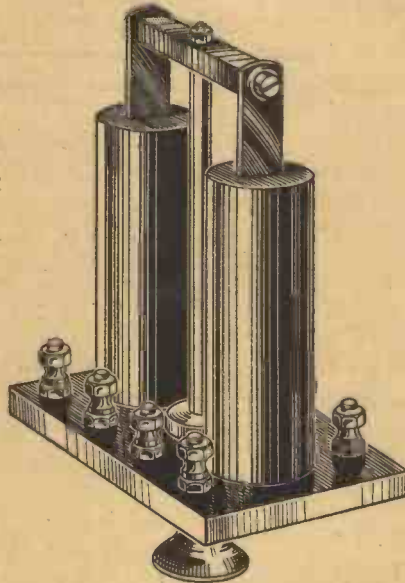
introduced renders such circuits aperiodic, and since for selective tuning periodic tuning is essential, a method has had to be devised to overcome the losses which the introduction of iron would bring about. This has resulted in the commercial production of finely powdered or divided particles of ferro-magnetic cores. These cores are made of highly-permeable alloys so as to compensate for the losses resulting from the numerous air-gaps between the particles.

In audio-frequency amplifying work we are accustomed to insulated laminations in L.F. transformers to reduce the losses due to eddy currents and hysteresis. However, it is found that at high frequencies the hysteresis losses are extremely small. The eddy currents introduce resistance losses proportional to the square of the frequency, and to the length of the circular path around each particle.

Since the object of tuning devices is to ensure constant selectivity and sensitivity over the tuning range it has been found that the relationship of inductance to capacity can be varied by inserting permeability cores into coils of special design, and achieve the desired object with cores which have the particles or pellets graduated in varying intensity, that is to say, to have these dust molecules packed loosely or tightly at different parts of the core.

Core Shape

Another method is to shape the core in such a manner as to bring about the same result. We are familiar with "shaped" vanes in the stator section of a ganged tuning condenser as used in superhet receivers, and the principle is much the same. The various relationships between inductance, capacity, and resistance can be maintained by suitably moulding or shaping the core material. This brings us to another possibility—the ganging of multi-permeability tuned circuits. In the same manner that superhet ganged condensers function by virtue of the shaped stator vanes the differences in multi-circuit values can be adjusted by suitable compensation in the design of the cores.



In this coil the variable iron core is used for controlling selectivity.

maintain the ratio of resistance to inductance or *vice versa*, many highly desirable results will accrue such as:—

Uniform selectivity over the whole of the wave-band.

Uniform gain in H.F. amplifying stages. Favourable gain relation in a tuned aerial circuit throughout its tuning range.

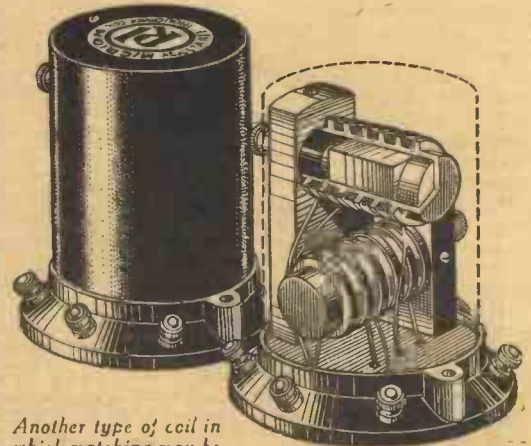
Practical possibility of tuning the aerial circuit to obtain greater input gain and thus to increase signal-to-noise ratio.

Simplification of the circuits themselves since transformers are not required.

The introduction of the new type of variable ferro-inductance has been produced with the intention of obtaining the above results. The aim of the design is to produce a unit, the coil of which is arranged to have the desired performance at the highest frequency in the band to be covered. A magnetic core is introduced into the field of the coil in order to increase the apparent inductance for tuning to lower frequencies. The introduction of metal into the field of a coil would at first sight appear to be akin to placing an L.F. transformer in the aerial circuit.

Core Materials

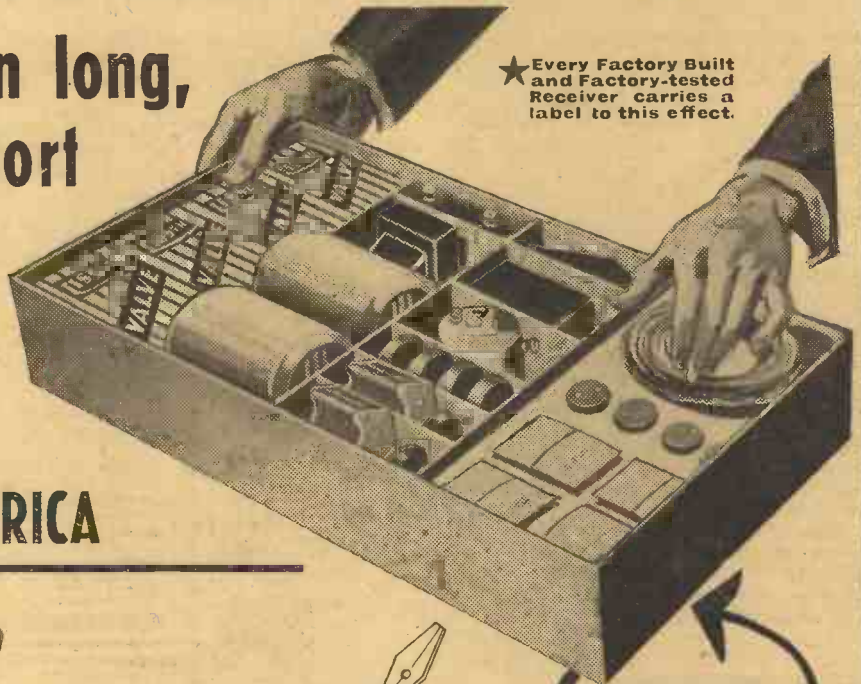
The flattening and damping of an H.F. circuit into which iron is



Another type of coil in which matching may be carried out by varying the position of a small iron core.

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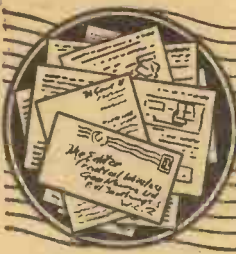
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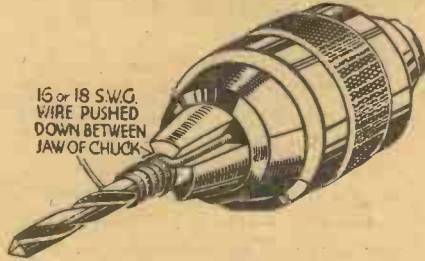


READERS' WRINKLES

THE HALF-GUINEA PAGE

Simple Drilling Jig

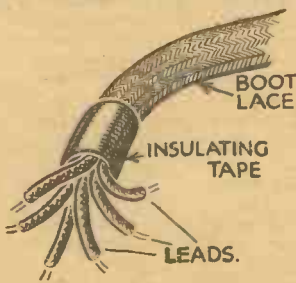
IT often occurs that a hole has to be drilled a certain depth into ebonite or metal, and the following dodge enables the operation to be done accurately. Insert



A simple drilling jig.

the drill to be used in the drill chuck, take a length of No. 16 or 18 S.W.G. wire, push one end down between the jaws of the chuck, then proceed to wind the wire on to the drill by turning the handle of the brace. Take care to keep the wire tightly wound, until the length of drill protruding from the coil of wire is the same as the depth of the hole to be drilled. Cut off the wire not required, close to the drill.—E. T. BOWEN (Twickenham).

Making Five- to Seven-way Battery Cords
NEAT five- to seven-way battery cords can be made in the following manner. Obtain a good quality tubular boot-lace, and after cutting off the metal tags, push through it a long wooden knitting needle



Making multiple battery cords.

at least 1/4 in. diameter. Remove the needle and proceed to thread through five to seven strands of flex of medium thickness, afterwards cutting it to the length required and attaching a wander plug to each end. Unless different coloured flex is used, it will be necessary to mark each strand with a piece of stamp edging, for indicating purposes, before the flex is passed through the lace covering.—W. V. ANDREWS (Swansea).

Remote Control On-off Switch

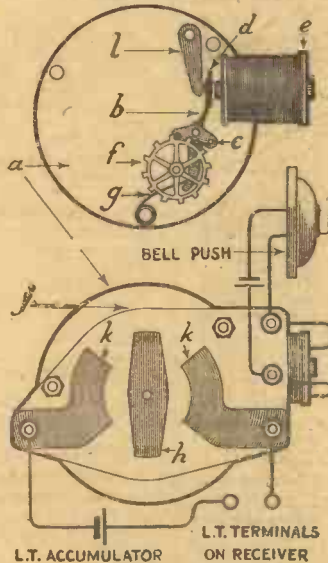
A SMALL clock which refuses to function may be brought into very useful service as a remote control switch, as follows:—

The clock, represented by (a) in the illustration, should have the balance wheel,

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face, and hands removed. Next, the small pin (c) on lever (b) should be broken off and armature (d) (a small piece of tin) soldered on to the lever. The electro-magnet



A combined clockwork and electric remote control switch.

(e) is easily made by winding about 500 turns of No. 32 gauge wire on a cardboard bobbin with a piece of a stout iron nail for the core. The magnet is energized by a 4 1/2-volt torch battery operated through the distant bell push. On pressing the button the armature is pulled towards the magnet, thus disengaging the lever and allowing the escapement (f) to revolve. A weak wire spring (g) brings back the lever when button is released.

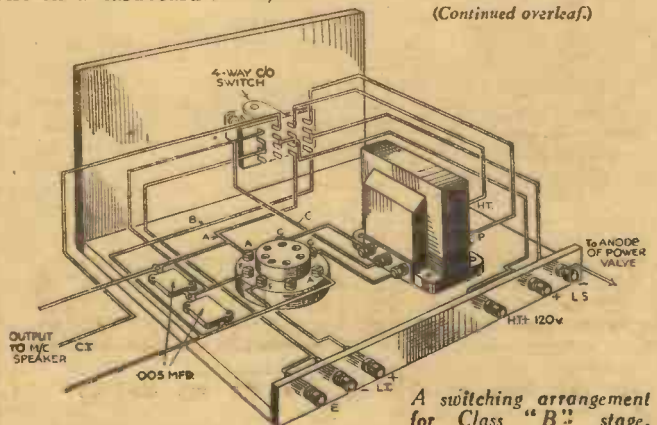
For the switch proper, a piece of springy brass (h) should be soldered to the spindle which once carried the minute hand of the clock. The switch panel (j) is secured to the clock frame and can easily be made from a piece of red fibre 1/4 in. thick into which sheet copper contacts (k) are inlaid so as to form a flush surface for the revolving switch arm. The instrument should be fitted into the receiver cabinet with the clock hand adjusting knob in a suitable position and which thus serves as a normal on-off switch in place of the existing one.

It is important that the gap between the armature and magnet be made as small as possible, and in order to regulate this to a nicety an adjustable brass stop (l) should be bolted to a convenient part of the clock. As this switch is very sensitive and requires only a feeble current to operate it, the extension leads can be made of quite fine cotton-covered wire. Its one great advantage over most gadgets of a similar type is that the rotary switch is operated by the powerful force of the clock spring, and, therefore, the contacts can be made very efficient and noiseless. The battery lasts many months, and the clock needs but an occasional wind.—H. J. WATSON (Southampton).

Switching Arrangement of Class "B" Stage

PROBABLY many readers would like to try Class "B" owing to its economy, especially if they are using batteries with a small output in milliamps. This was my experience, so I devised the switching arrangement shown in the accompanying diagram. By using a four-way switch, which I found in the junk box, I am now able to switch over to Class "B" or to power output, as required. On occasions when it is required to boost up the set, this dodge will be found very handy, if the speaker is of the permanent magnet type. If the speaker is not of this type wires A and B can be taken to an ordinary speaker. Also, if the valve is of the Osram type make wire C a flexible one, and take it to the grid-bias battery (about 3 volts) instead of to L.T.—W. ROGERS (Deptford).

(Continued overleaf)

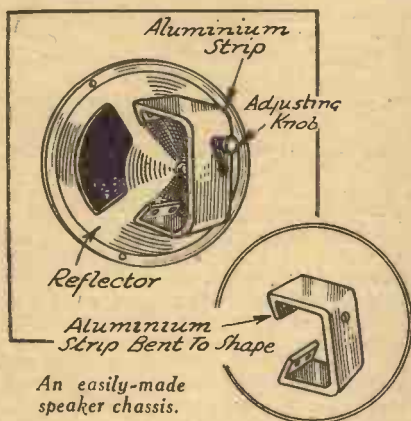


READERS' WRINKLES

(Continued from previous page)

An Easily-made Speaker Chassis

THE following description of how I constructed a speaker chassis from an old motor-headlamp reflector and a piece of aluminium may interest other readers.

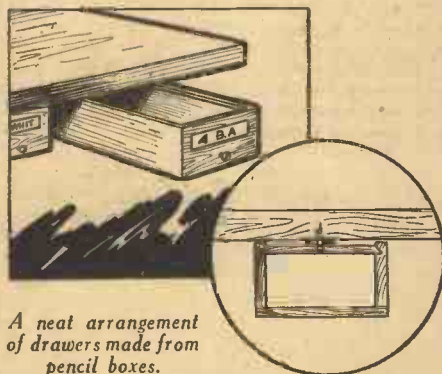


An easily-made speaker chassis.

First of all I took the reflector and cut out four sections with a hacksaw. The outside rim of the reflector was then hammered flat and four fixing holes drilled in it. The strip of aluminium was then taken and the unit bolted to it. The aluminium strip is fixed by bending the ends down and holding the reed of the unit exactly in the centre of the hole in the apex of the reflector. When four holes were drilled in each corner, the strip was bolted to the chassis with four small bolts. The cone is made of cartridge paper and fixed to the front edge of the chassis with adhesive tape.—R. Worth (Guernsey).

A Novel Drawer Arrangement

HERE is a useful hint which may appeal to those readers who like to have a tidy workshop, and are at a loss for storage for small parts such as terminals, wander plugs, drills, etc. The writer purchased a dozen pencil boxes with sliding lids at the price of 2d. each. These were fixed to the underside of a shelf in the following manner. The shelf was first removed for convenience in working. Twelve lines were then



A neat arrangement of drawers made from pencil boxes.

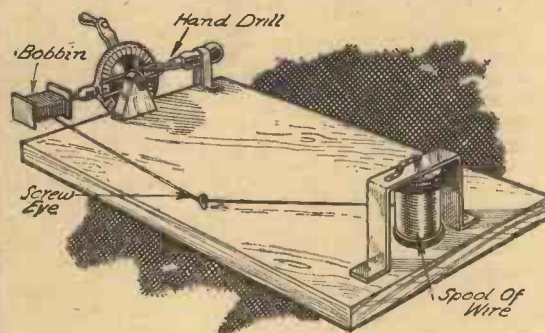
marked across the underside, the distance apart being a little more than the width of each box, to allow for clearance. The lids of the boxes were removed and a centre line drawn down each. On this centre line, holes were bored to take small countersunk screws, and each lid was then screwed down to the shelf, as shown in the sketch, a thin brass washer being slipped over each screw between the shelf and the lid. The shelf was then refixed to the wall, and

the boxes slid on to the lids. The addition of a small round-headed screw to the front of each box, to act as knobs, completed the job.—R. W. FARMER (Manchester).

A Simple Coil Winder

IT is not an easy matter to wind coils, chokes, and transformer coils calling for many turns of very fine wire. The simple coil-winder shown in the accompanying sketch will be found useful for winding transformer coils and chokes. At one end of a wooden base, wooden blocks are fixed with clamps to support the hand-drill horizontally and in line with the end of the board.

At the other end is fastened a U-shaped piece of sheet metal, as shown. Its inside height is 1 1/2 in. and a hole is made at the top, and one in the baseboard for the spool spindle. The winding bobbin consists of a suitable piece of wood with the shank of an old drill driven in length-wise. The wire is led from the wire spool through a screw-eye near the edge of the board and then to the bobbin. The number of turns of the chuck to each turn of the crank is then ascertained so that the bobbin turns can be tallied. The run of the wire along the bobbin is maintained by slight finger pressure on the wire between the



A simple coil winder.

eye and the bobbin. A thousand turns can be wound by this little device in less than ten minutes.—J. CROWSHAW (Bolton).

Tape Machine for Recording Morse

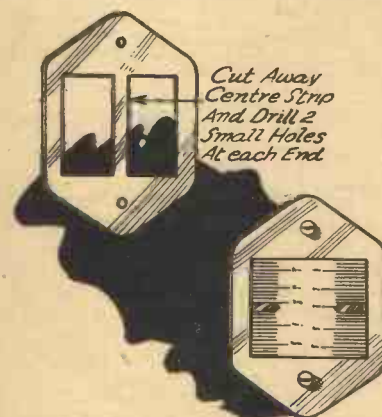
THIS machine can be made very cheaply and assists correctly. Commence by making four supports from 3/16 in. brass rod, one a little longer than the others to take the ink pot. Cut a short piece of soft iron rod, the length of bobbin, and drill two small holes at one end to take elastic. Glue the bobbin to the baseboard, and fit the supporting rods as shown, spaced at equal distances from the bobbin. Place a wooden stop below the plunger so as to limit the size of marking on the tape. Next, fix the elastic to the supports after passing it through holes made in the soft iron rod.

For the inker, use thin syphon wire (wire tube) supported on a small tin trough, one end being open for writing, while to the other a piece of brass tube is soldered to take a piece of valve rubber for connecting to ink tap. For working the apparatus, use 4 to 6 volts, and for the

morse read the lower part of the writing. A paper streamer can be used for the tape.—F. W. MARLOW (Wembley).

A Novel Escutcheon Plate

THE accompanying sketches show how an escutcheon plate can be fashioned from a lady's belt buckle. These buckles



An escutcheon plate made from a buckle.

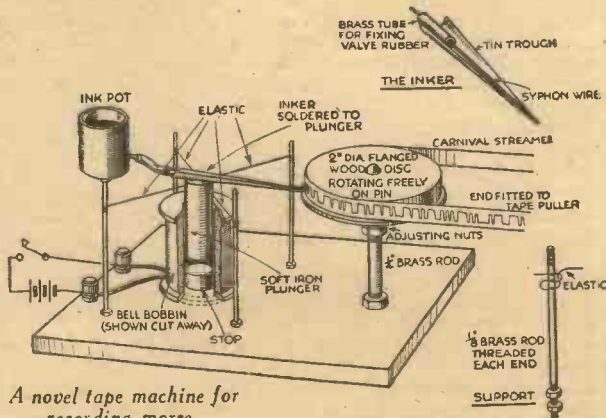
are obtainable in a variety of shapes, and the one used for the escutcheon shown in the sketches was chromium plated with bevelled sides. The escutcheon can be fixed to the panel with two screws, as indicated.—R. L. PRESTON (Sheerness).

A Source of Trouble

IF you are finding your receiver is not giving the results with which it has been accustomed in the past, try cleaning the aerial and earth switch. It will be found on examination the copper switch points have oxidized and this sets up a very high resistance. Clean the blade and the jaws with fine sandpaper so that they make good contact. Unless the wires connected to the switch are soldered in lugs, which, in turn, are clamped under screws, remove the wires, polish them thoroughly with fine sandpaper and replace, tightening the screws as much as possible.

Drilling Ebonite

I HAVE always found, when preparing a panel composed of bakelite or ebonite, that it is best to use drills of the best high carbon steel variety. They should be kept sharp, so as to avoid burrs on the face of the panel. When sawing this kind of material do so with a hacksaw having about twenty-four teeth to the inch.



A novel tape machine for recording morse.

SIMPLIFIED MAINS TRANSFORMER CONSTRUCTION

The Making of Mains Transformers Has Been Considerably Simplified by the Introduction of a Number of New Components, which are Referred to Below. By FRANK PRESTON

A VERY large percentage of readers always evince a considerable amount of interest in the subject of transformer construction, and, although a number of practical articles have previously been published no apology is considered necessary in presenting yet another one.

In the past many readers have experienced some little difficulty in obtaining the component parts required in making

Constructional Details

The method of construction is practically the same no matter which set of parts is used, and a very satisfactory instrument is sure to result in either case. First of all the bobbin must be wound, the primary being put on first. For the type of transformer previously referred to the primary consists of a total of 1,920 turns of 32-gauge enamelled wire, windings being taken after winding 1,600 and 1,760 turns. By making connection to the "beginning" end of the winding and the 1,600-turn tapping the transformer is suitable for use on 200-volt A.C. mains having a frequency between 40 and 60 cycles per second; for

the copper foil method is employed it is very important that the foil should not completely encircle the bobbin, because, if it does, it will act as a short-circuited turn and cause the transformer to overheat, besides reducing the output almost to zero. A flexible lead should be soldered to the screen and this will later be clamped up in contact with the core. (Incidentally, it might be mentioned that a screen is provided on the ready-wound bobbins previously referred to.)

Another layer of oiled silk must be used to cover the metal screen. If the L.T. secondary is to be used as a screen it should simply be wound on top of the primary in the form of a single layer comprising 32 turns of 18-gauge d.c.c. wire. A tapping should be taken after winding on 16 turns, and this will be made exactly as explained in respect of the primary. In order to avoid any confusion later on it is advisable to mark all the leads by means of paper tags, or otherwise to pass them through systoflex sleeving of various colours for easy identification.

Cover the L.T. secondary with a strip of oiled silk, and then put on the 4-volt, 1-amp. winding; this will consist of 32 turns of 20-gauge d.c.c. wire, a tapping being taken after winding 16 turns. Again insulate and finally wind on the high-tension secondary. This will consist of a total of 4,000 turns of 38-gauge enamelled wire, a tapping being taken after the 2,000th turn. Wind on this wire as evenly as possible and insulate after about every 1,000 turns, taking care that no later turns slip past the insulation.

The set of No. 4 stalloy stampings comprises 6 dozen pairs, and there will be two or three left over. The stampings are

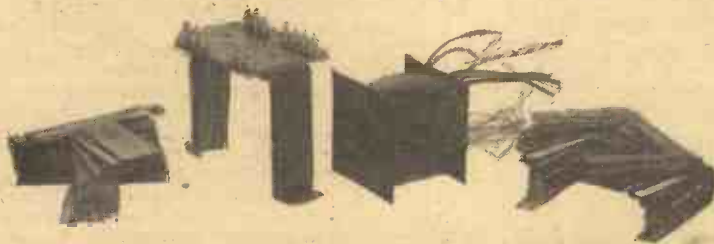


Fig. 1.—A set of parts for making a mains transformer, which, complete with wound bobbin, costs 11s. 4d.

transformers, and, therefore, it will be of especial interest for them to learn that complete kits of parts can now be bought quite cheaply. Moreover, by using these parts, it is an easy matter to construct even a pretentious type of mains transformer on the dining table without the use of any other tools than a screwdriver and, perhaps, a pair of pliers and a soldering iron. Winding spools can be obtained in a variety of sizes, whilst terminal strips, core clamps, and mounting bolts can be obtained ready made and finished in a workmanlike manner. Those who wish to avoid the rather tedious process of winding the many hundreds of turns of wire on to the spool can buy the latter already wound to the appropriate specification and ready to fit on to the core stampings.

A Transformer for a Type "A" Rectifier

A complete set of parts for a mains transformer giving outputs of: 250-0-250 volts at 60 milliamps., 2-0-2 volts at 4 amps., and 2-0-2 volts at 1 amp. is shown in the photograph, Fig. 1. This kit, with wound bobbin, costs only 11s. 4d., and it can be completely assembled in a quarter of an hour. If desired the same parts, but with bobbin unwound (all wire supplied), can be bought for 9s. 4d.; the construction in this case will occupy five or six hours, whilst the work involved will be found both interesting and instructive.

As mentioned above, the kit includes the core stampings—6 dozen size No. 4 stalloy—winding spool to fit, three bobbins containing the required wire, and the special shroud clamp fitted with a neat paxolin terminal plate and terminals. For those who prefer it, however, four angle clamps, the necessary clamping bolts, and two terminal strips (shown in Fig. 2) can be obtained in place of the shroud clamp, the total price of the kit in this case being 11s. 4d. with the unwound bobbin, or 13s. 6d. ready-wound.

220 or 240-volt mains connection must be made to the 1,760-turn tapping and the end of the winding respectively. For intermediate voltages it is in order to use the nearest tapping point.

Before commencing the winding make a small hole in one end-cheek of the spool and pass a short length of flex through this. Solder the end of the 32-gauge wire to the flex and cover the joint with a strip of insulation tape. The appropriate number of turns can then be wound on either by hand, or by mounting the spool in a lathe or in the chuck of a hand-drill, this tool being held in a vice. So as to guard against breakdown the winding should be put on as nearly as possible in layers, and a sheet of oiled silk should be used to separate the winding approximately into two halves. Tappings are made by baring the wire for a short distance, making a loop, and soldering short lengths of flex. The flexible leads can be brought out through the end cheeks.

The Secondary Windings

After the primary has been completed it should be covered with a layer of oiled silk before commencing to wind the secondaries. It is desirable to screen the primary since this reduces the possibility of mains hum. The screen may consist of a sheet of copper foil wound nearly round the bobbin, or the 4-volt, 4-amp. low-tension winding might itself be employed as a screen. If

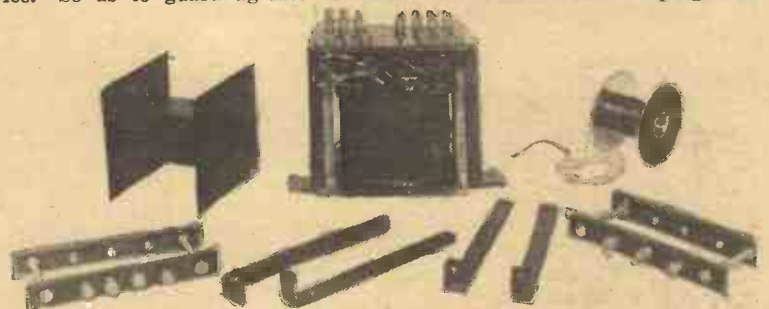


Fig. 2.—Another set of parts for a mains transformer including angle clamps, clamping bolts, and terminal strips.

inserted alternately from one end of the spool and then from the other, and are fitted in the following order; first insert a "T" and then a "U" from one end; then repeat from the other. This order is maintained until the bobbin is quite full, the last few stampings being lightly driven into place to ensure that the core will be a tight fit and therefore free from vibration.

All the parts referred to above, and illustrated, can be obtained from Messrs. McDaniel and Co., Eastern Road, Romford, Essex, whilst this firm will be pleased to quote for any kind of transformer materials.

TWO INTERESTING UNIVERSAL AMPLIFIERS

The Universal Amplifiers Described Below are Supplied by the High-Voltage Radio Co., and can be Bought as Kits of Parts or Completely Assembled and Tested

UNIVERSAL valves, which can be operated equally well from either an A.C. or D.C. supply, have rapidly increased in popularity during the last twelve months and are now recognised to be as efficient as their ordinary A.C. counterparts. We have described from time to time a number of circuits in which this type of valve can be employed, and we therefore found it particularly interesting to try out in our laboratories two powerful low-frequency amplifiers in which the universal valves have been successfully employed. The amplifiers in question have been designed and made by The Universal High-Voltage Radio Co., who are well known as suppliers of Ostar-Ganz universal valves.

The 3-4 Watt Unit

The smaller amplifier has a maximum undistorted output of some 3.5 watts and is built around a comparatively straightforward circuit comprising a special screen-grid input stage, resistance coupled to a type K 3560 triode output valve. A type EG 100 Ostar-Ganz half-wave rectifier is used in the H.T. circuit and is followed by a Ferranti smoothing choke and two 8-mfd. Dubilier electrolytic condensers. An output transformer is fitted, and this will give correct matching with most types of loud-speakers, including small ones for home use and large auditorium models. The amplifier can be obtained ready-made and tested for £6 6s., or as a complete kit of parts with wiring plan and full instructions, for £5 5s. British-made components are used throughout, and the unit is assembled upon a very stout steel chassis.

It can readily be connected to almost any type of receiver without any modification to the standard wiring being necessary. On test, the amplifier proved to be exceedingly efficient, and gave great volume and particularly pleasing quality. There was an almost complete absence of hum both on A.C. and D.C. supplies, and this says much for the rectifier and smoothing equipment which are provided.

A Larger Amplifier

The larger amplifier has the same input circuit, but the first valve feeds into a double amplifier using a modified duophase circuit arrangement. There are two triode valves (Ostar Ganz type K3560) and the two ends of the primary winding on the output transformer are connected between their anodes, a centre tapping going to H.T. positive. The grid of the second valve is fed from the anode of the first through a .01 mfd. condenser and a 1 megohm grid leak, a .5 megohm leak also being connected between the grid and H.T. negative. Both valves receive their correct bias due to the voltage-drop across a 500-ohm

resistance, which is by-passed by an 8-mfd. electrolytic condenser.

A Double Rectifier

The power-supply system is very interesting and includes a "double" half-wave rectifier—an Ostar-Ganz type NG100. This is again followed by a large smoothing choke and two 8-mfd. electrolytic smoothing condensers. Very ample decoupling is used throughout, with a result that mains hum and signs of L.F. instability are entirely absent. The undistorted output is just about twice that provided by the smaller unit, or, in other words, between 6 and

heaters are fed directly from the mains) are supplied in different working voltages.

Advantage of Universal Valves

It need not be stressed that universal (A.C. or D.C.) mains working is an extremely valuable feature in an amplifier, and is generally of greater importance than it is in a wireless receiver. This virtue is very pronounced in cases where an amplifier is used by a dealer or tradesman for demonstrating purposes, although it is by no means insignificant from the amateur's point of view, since it enables him to test out quickly any type of set with the amplifier in circuit. Those readers who at present have a D.C. mains supply which will in all probability be changed to A.C. in the very near future (as soon as the grid scheme is completed), will readily appreciate the advantages of a universal receiver or amplifier which can be used just as well after the supply change-over as it can now, and without the slightest modification being necessary.

Special Rectifier

The special mains-voltage rectifying valve has a heater which is fed directly from the mains supply, in the same way as are the heaters of the receiving valves. This rectifier functions in the normal manner when the amplifier is fed from A.C. mains, but behaves purely as a series resistance when D.C. mains are

The larger amplifier described on this page.

employed. The resistance is, of course, quite low and therefore does not reduce the H.T. voltage to any appreciable extent. Incidentally it might here be mentioned that the special "double" half-wave rectifier used in the larger amplifier is an entirely new departure. It is also wired in an unusual way so that one section supplies the necessary D.C. current for the field windings of a normal mains-energized moving-coil speaker, whilst the other half feeds the anodes of the valves in the usual manner. By following this system the advantages of the energized speaker can be made use of without the introduction of any attendant voltage-drop, such as occurs with the generally-adopted method of speaker energization.

8 watts. It is thus more than sufficient for "home" use, and certainly adequate for many forms of public address work and for use in small halls.

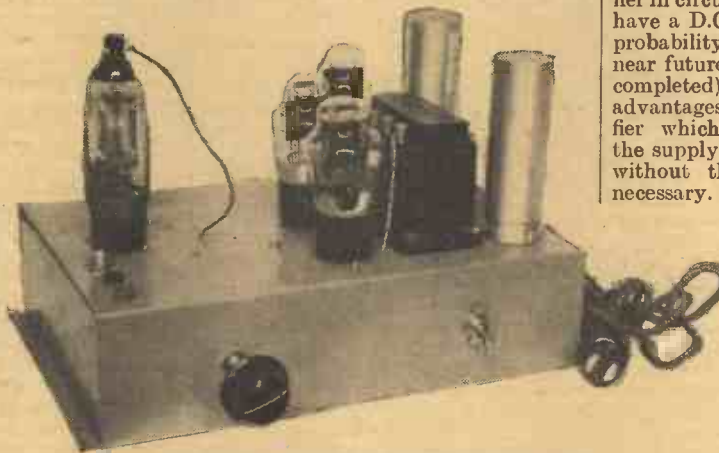
Like the 3.5 watt amplifier, the larger one can be bought either completely assembled or as a kit of British-made parts; the prices are £8 8s. and £10 10s. respectively.

Both amplifiers are sure to prove very popular, and it need scarcely be mentioned that the prices are distinctly reasonable in view of the excellent quality. Either unit can strongly be recommended to any reader who is in search of a really first-class amplifier for use on any mains supply. When ordering it is best to state what mains voltage the amplifier will generally be operated from, since the valves (whose

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Altogether, the amplifiers under review have been well and carefully designed, with the result that they are just as good in theory as in practice.



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The above photograph gives a general impression of the 3-4 watt amplifier and shows the underside of the 7-8 watt chassis.

Practical Television

SUPPLEMENT TO PRACTICAL WIRELESS

MAY 19th, 1934. Vol. 1. No. 20.

NOTES OF THE WEEK

By H. J. BARTON CHAPPLE, Wh.Sch., B.Sc., A.M.I.E.E.

Additional Power for Television

MANY readers using simple disc receivers have found that their radio set used in conjunction with it just lacks sufficient power adequately to modulate the neon lamp or give a strong enough synchronizing signal to hold the image steady. In such cases one of the easiest solutions to the problem is to make up an amplifier adaptor to connect between the radio and television receivers.

Although many circuits can be furnished to cover such a scheme as this, that shown

pair of input terminals of the unit, thereby inserting in circuit an efficient constant-inductance low-frequency choke L.F.C.₁. The input potentiometer, which should have a resistance of 100,000 to 250,000 ohms, serves as an efficient volume control.

In the anode circuit of V are two switches, S₁ being a triple-pole double-throw type and S₂ a double-pole double-throw type. The object of S₂ is to change a negative image into a positive one merely by reversing the primary

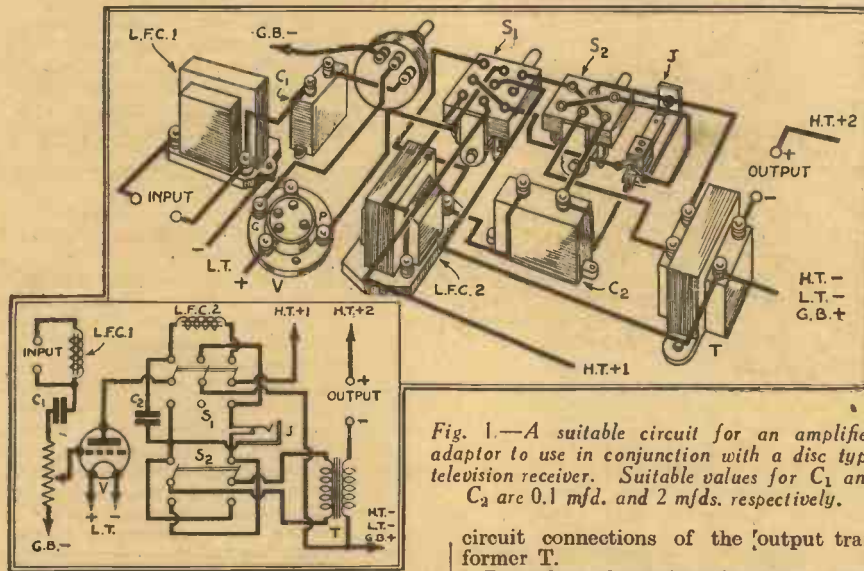


Fig. 1.—A suitable circuit for an amplifier adaptor to use in conjunction with a disc type television receiver. Suitable values for C₁ and C₂ are 0.1 mfd. and 2 mfd. respectively.

in Fig. 1 is of quite a representative and efficient type. It converts the output valve of the radio receiver into a choke-capacity stage coupled to an additional super-power valve. The "open" anode circuit of the receiver's output valve is connected across the

circuit connections of the output transformer T.

Regarding the switch S₁, when this is in its bottom position the unit is connected to the television apparatus via the

transformer T alone, as shown in Fig. 2, which represents a simplified diagram of Fig. 1 with S₁ switch blades down, S₂ omitted (this only is for positive and negative pictures) and the jack J ignored. The voltage applied to H. T.+1 must suit the valve employed—a valve such as the Cosor 620T is admirable for a unit of this character—and since the neon lamp (and synchronizing coils if included) are joined across the output terminals the voltage for H.T.+2 should be 200/250 and drawn from a source capable of furnishing the full polarizing neon lamp current.

With the switch blades of S₁ in the top position the circuit connections are changed to a choke-capacity transformer link with the television apparatus as indicated in the simplified diagram of Fig. 3. The high-impedance choke L.F.C.₂ is now inserted directly in the anode circuit of V, the transformer primary of T being linked to L.F.C.₂ by C₂.

If switch S₁ is left in this top position and a loud-speaker plug inserted into jack J, then the transformer and television apparatus are cut out of circuit, Fig. 4 showing the simplified arrangement. The unit then functions as an additional power amplifier for ordinary sound reception.

Polarized Light

The original Kerr cell, which was later

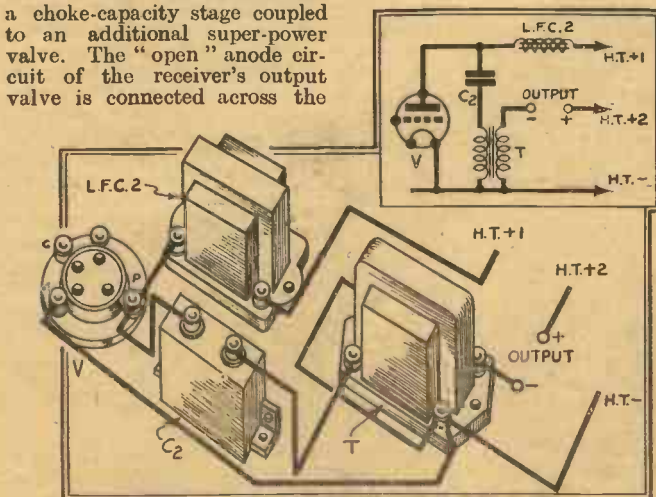


Fig. 3.—Modifying the output connections to a choke-capacity transformer feed.

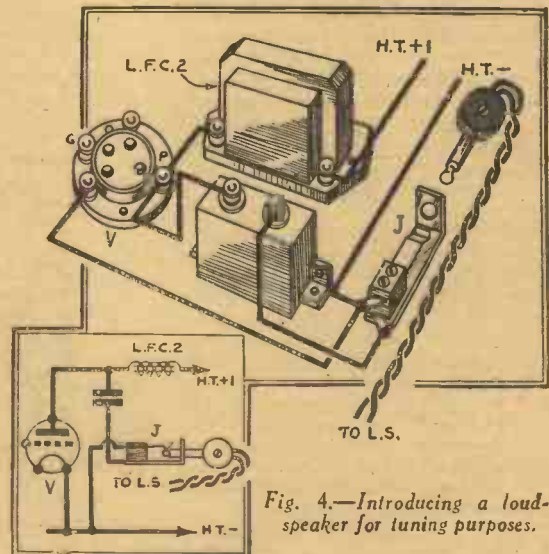


Fig. 4.—Introducing a loud-speaker for tuning purposes.

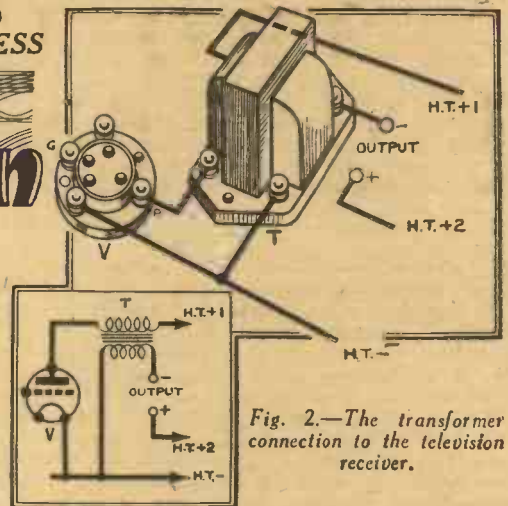


Fig. 2.—The transformer connection to the television receiver.

developed by Dr. Karolus for television purposes, has played an important part in the science of television. It enables a bright source of light to be modulated in intensity and, as far as low definition television reception is concerned, it gives the brightest and largest image.

The complete unit operates on the principle of polarized light, of which the following is a simple explanation. Light itself is an electro-magnetic manifestation, and a beam of light consists of transverse vibrations in all directions at right angles to the direction of propagation. Many years ago it was discovered that light could be polarized, or limited to a single plane of oscillation or vibration. Later it was found that a crystal of Iceland spar, cut along its axis and with a segment removed, could be rejoined in such a manner that it would transmit advancing light in one plane only.

Two of these crystals in series and with their axes crossed at right angles would entirely prevent the passage of light. In other words, the action of a Nicol prism (this is a particular form of Iceland spar crystal) is to select the component of all the transverse vibrations (our light beam) in the direction of a given line fixed with respect to the prism.

It is difficult to show this effect in a scientifically correct manner, but a reference to the accompanying diagrams will no doubt help to convince readers. Suppose a rope or string is drawn through two diaphragms, as shown in Fig. 1, in such a manner that one end is fixed and the other free to be moved by the hand. Moving the string rapidly up and down will result in the travel of a wave along the cord passing through both diaphragms, provided they are in the same direction.

If now the second diaphragm is turned through a right angle, as in Fig. 2, so that the slots are as indicated, the wave motion will stop at this second diaphragm. In effect this is analogous to the operation of the two Nicol prisms with their axes crossed. Light passing through a Nicol prism is said to be plane polarized since it exists in one plane of oscillation only. (Strictly speaking, when there are two prisms the first is called the polarizer and the second the analyzer.) Thus, if two such prisms are set up as in Fig. 3, no light passes, but if it was possible to rotate the first prism a gradually increasing passage of light would be secured as the axes of the two prisms approached the parallel state.

It is not possible for television purposes to effect this actual rotation rapidly enough by mechanical means to make this property of any value, but by means of the Kerr cell, it is possible to utilize the polarization effect. The simplest type of Kerr cell consists of a pair of plates suspended or immersed in a medium of nitro-benzene, carbon bisulphide, or other highly refractive dielectric fluid. If this device is placed between the two Nicols it has the effect of distorting the line of vibration passing through the first prism into an ellipse of eccentricity progressively changing as the voltage between the plates is increased, passing through a circle and eventually becoming a line of vibration at right angles to the initial direction. Accordingly, a progressively increasing component is available for passage through the second prism.

As the light-voltage characteristic curve

of a cell of this nature is not a complete straight line (it resembles somewhat a static characteristic curve of a thermionic valve) it is necessary, in order to avoid distortion, to apply an initial D.C. biasing voltage just the same as we do to a L.F. amplifying valve. Whereas for a valve the bias is negative, however, that for a Kerr cell is positive and of much greater magnitude (up to 400 volts) and under these conditions the light variation with voltage



Fig. 1.—Allowing the string to vibrate.



Fig. 2.—Wave motion is stopped at the second diaphragm.



Fig. 3.—When the prisms are set up in this manner, no light passes.

variation is linear over quite a large range of signal voltage.

If the received and amplified television signals are fed to the Kerr cell it is possible to secure an amount of light passing out of the second or analyzer prism, which is proportional to the light activating the photo-electric cells at the transmitting den. The addition of a scanning mechanism, preferably of the mirror-drum type, completes the television receiver, as was the case of the Mirrorvisor described recently in this journal.

A TELEVISION STROBOSCOPE FOR D.C. MAINS

A TELEVISION receiver is only capable of giving images which can be watched satisfactorily when the speed of the rotating scanning member (disc, mirror drum, mirror wheel, etc.) is identical with that employed at the transmitting end. For the standard B.B.C. transmissions this is 750 revolutions per minute, but without some means of checking or measuring, the experimenter can very easily waste a considerable time in getting his speed correct. Those readers with 50-cycle A.C. mains installed have a ready means of checking to hand by using a flashing neon lamp. When this is connected across the 50-cycle mains its light is interrupted or is extinguished 100 times per second (one for each half-wave of voltage). As the scanning mechanism rotates through 4,500 degrees per second ($12\frac{1}{2} \times 360$) the number of degrees passed through in one second is 45. If, therefore, there are eight spokes or marks spaced at equal angles of 45 degrees round the disc or drum at the correct isochronous speed of 750 revolutions per minute the regular flashing neon lamp illumination thrown on to these spokes will give the

impression that they are stationary. By adjusting the motor speed to this condition, therefore, before the television transmission commences, the image will appear stationary right at the beginning, and time is therefore not wasted.

But what can be done by those readers with D.C. mains, or alternatively use H.T. batteries and a 6-volt motor to feed the television receiver? If the ordinary neon lamp is connected in series with a D.C.

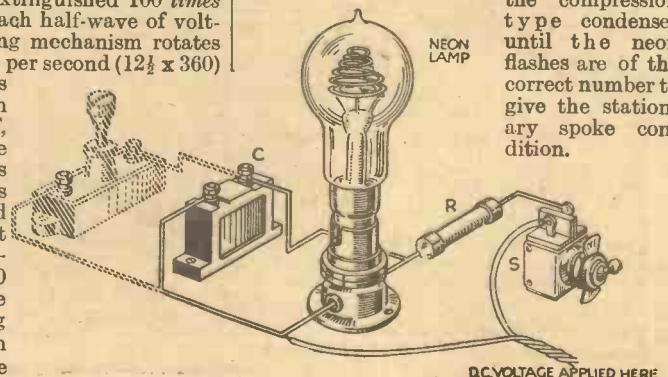
voltage through a resistance (this is usually included in the lamp's base for normal domestic illuminations purposes) with a condenser of any capacity joined in parallel with the neon lamp, the previous steady direct current supply will be converted into a regular pulsating current. With a large capacity condenser the pulsations will be seen as light flashes which can be counted. The period of the neon flashes or current pulsations bears a definite relationship to the resistance and condenser included in the circuit. Referring to the diagram, the period of the current pulses is given by the simple equation $P = kCR$, where k is a constant and C and R represent the capacity in farads and resistance in ohms respectively.

With C or R constant and R or C varied, a linear law exists between the frequency of the flashes and the variable quantity, and this holds good over very wide limits.

Here, then, is a very simple method for building up a stroboscopic neon "flasher" with either D.C. mains or a 200-volt H.T. battery joined across the voltage source terminals shown in the diagram. Exact values for C and R cannot be furnished, as the pulsations will obviously vary with each form of assembly, but as a rough guide it can be stated that with a 2-megohm resistance for R and a .01 mfd. capacity condenser for C , an ordinary beehive neon lamp will pulsate with approximately 50 flashes per second. If this condition is used, then only four spokes will be required in the scanning component, but if the resistance is halved (or the capacity halved) then we shall have 100 flashes per second, and eight spokes are necessary.

Connect up the apparatus as in the diagram, using the values just mentioned, but arrange a semi-variable compression-type condenser (or an ordinary tuning condenser if preferred) of about .0005 mfd. maximum capacity in parallel with the fixed condenser. Close the switch S during the course of one television transmission, and adjust the motor speed to its correct value so that there is no image drift. Now adjust

the compression type condenser until the neon flashes are of the correct number to give the stationary spoke condition.



The complete circuit for a D.C. television stroboscope.



THE EASY ROAD TO RADIO

THE BEGINNER'S SUPPLEMENT

FADING—ITS CAUSE AND PREVENTION

A Simple Explanation of a Summer Topic.

THOSE readers whose interest in wireless dates only from last winter may have been surprised and rather perturbed of late to find that the reception afforded by their receivers is now considerably worse than it was, say, a month ago. The longer periods of daylight are largely responsible, so there is no need to start to dismantle the set with the idea that it has suddenly developed a fault. There is, in fact, very little that can be done except to add an H.F. amplifying stage or to erect a new and more efficient aerial, but both of these points should be considered.

The reason for the falling-off in strength of the more distant stations is very similar to that which accounts for fading, a phenomenon which is often more pronounced in winter than in summer. To understand the cause of fading and reduced signal strength in summer it is necessary to consider how wireless signals actually travel from the transmitting to the receiving aerial. Although we speak rather loosely of wireless waves, there are really two sets of waves, one of which travels parallel to the surface of the earth—called the ground wave—and one which is sent upwards into space. The latter is called the reflected wave, for reasons which will be explained.

The Reflected Wave

It is known that the upward set of waves is reflected back to earth again in the manner represented diagrammatically in Fig. 1, and reflection takes place at what has come to be called the Heaviside Layer. This is a layer of gas situated some sixty miles above the surface of the earth, the condition of which depends upon the strength of the sun's rays upon it. When the rays are strong the Heaviside Layer is a very poor reflector, and it absorbs the greater portion of the wireless waves which strike it. When it is in darkness, however, this layer of ionized gas acts as a very good reflecting surface, and so "returns" the waves to earth.

Reflection and Wavelength

Not only does the effect of the Heaviside Layer vary with the amount of sunlight falling upon it, but also with the wavelength of the high-frequency wireless waves which strike it. The conditions of

reflection stated above apply most accurately to medium-wave broadcast signals, for waves shorter than 100 metres or so are reflected very little by the Heaviside Layer, and pass through it. The "transparency" of the Layer increases rapidly as the wavelength is reduced, so that wavelengths of 20 metres or less pass through it almost without hindrance.

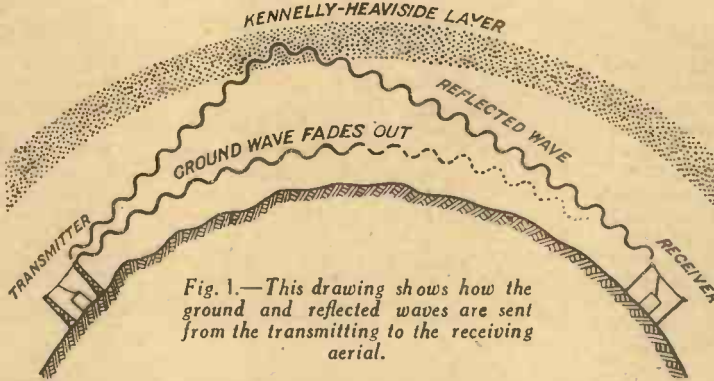


Fig. 1.—This drawing shows how the ground and reflected waves are sent from the transmitting to the receiving aerial.

The shorter waves, however, are reflected back to earth, but from a much greater height—that of the so-called Appleton Layer, which is thought to be nearly 160 miles above the earth's surface.

How Fading Arises

It is now possible to understand exactly how fading takes place. Consider for the moment a medium-wave transmission and assume that the ground and reflected waves are approximately equal in intensity. During darkness the receiving aerial will pick up both sets of waves, although the ground waves become very weak after travelling for a comparatively

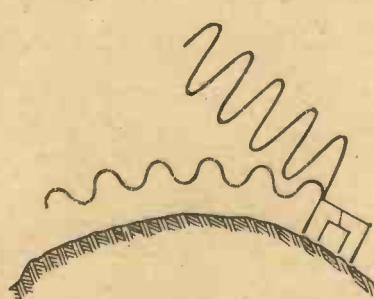


Fig. 2.—When the ground and reflected waves are in correct phase, as shown above, signal strength is at maximum.

short distance, due to the fact that they are fairly readily "absorbed" by metallic objects, hills and buildings. The reflected waves, however, are strong, and therefore produce good signals. If the surface of the Heaviside Layer remained perfectly still, signals would be received at uniform strength so long as darkness prevailed. But it is considered (no one has yet produced a definite proof) that the layer is in constant movement, with a result that the degree of reflection varies from one moment to the next. At one moment the signals from any particular station might be directed right at the receiving aerial, but shortly afterwards the angle of reflection would have changed so that the signals were not received so well.

Phase Difference

There is another point to consider, which is in relation to the "phase" of the ground and reflected rays. Supposing that both waves were in the same "phase," as shown in Fig. 2, then they would be added together, the signal strength being equivalent to the combined effect of the two. On the other hand, if the two were of opposite "phase" (see Fig. 3), the effect upon the receiving aerial would only be equivalent to the difference in strength between them.

It is not difficult to imagine what would be the combined effect of changes in the reflective angle and also the changes of phase! Nor is it difficult to understand why signals from any particular (distant) station may vary from full strength to inaudibility in a few minutes.

Fading on Long and Short Waves

Before considering methods of preventing fading we must see what happens on wavelengths other than those generally referred to as "medium" and being between 200 and 600 metres. On long waves, for instance, fading is almost entirely absent. This is because the transmission is almost entirely confined to the ground waves; any upward waves that there might be would be completely absorbed by the Heaviside Layer. It is also worthy of note that there is less absorption of the ground wave, and therefore the distance over which the signals can be sent without any trace of

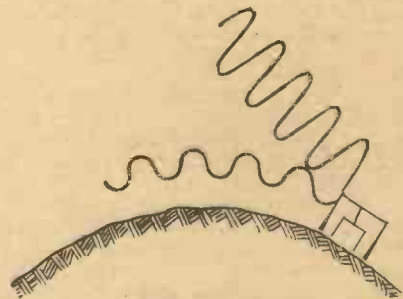


Fig. 3.—This drawing shows condition of minimum signal strength, the ground and reflected waves being out of phase.

THE BEGINNER'S SUPPLEMENT
(Continued from previous page)

fading and with a given power is greater on long than on medium waves.

It has been explained that short waves are reflected from the Appleton Layer, and the effect is very similar to the reflection of medium waves from the Heaviside Layer. The principal difference is that on the shorter wavelengths the ground wave is almost non-existent, due to the fact that it is so rapidly absorbed by metallic objects. Thus, the reflected wave gives somewhat more steady reception because there is no question of phase difference. It is also very important to note that the Appleton Layer is not so greatly affected by daylight and darkness; in fact, wavelengths in the region of 20 metres can generally be received better in daylight than after dark.

Beam Transmission

One method of overcoming fading is to direct the transmission along a narrow beam, and although this has proved a very effective method it has the great disadvantage that the signals can only be picked up by aerials situated in the line of that beam. The only other method of preventing the effects of fading is to fit an automatic volume control device to the receiver itself. There is no need to describe here the method of doing this since the subject has been very fully treated in these columns before. At the same time a warning should be given that constructors should not expect too much of A.V.C. It is possible to design a receiver the output volume of which will remain constant for signal ratios of 1,000 to 1, but such results cannot be expected from a simple set modified to incorporate an A.V.C. arrangement. The average modified receiver of the type having a couple of H.F. stages and fitted with an A.V.C. unit can scarcely be expected to provide a uniform output for signal ratios in excess of 50 to 1 or so on the medium waves. In other words, if the signal voltages applied to the aerial exceed a value which is fifty times greater or fifty times less than the average value, the output volume will be affected. With a good superheterodyne having two I.F. stages it is possible to compensate for signal variations up to about 300 to 1 by fairly simple means. When considering a very simple type of set such as that described in PRACTICAL WIRELESS dated Nov. 4, 1933, the A.V.C. action cannot be expected to be complete on any signals whose aerial-voltage ratio exceeds about 15 to 1, but even this apparently small degree of compensation is extremely useful.

There is just one other point which should be made clear in connection with A.V.C. This is that the control does not—cannot, in fact—increase the strength of fading signals; it can only reduce the strength when the signal voltages become greater than some particular value. It is therefore useless to expect A.V.C. to be of any appreciable value in a comparatively insensitive receiver.

The only other solution to the fading difficulty rests with the wider use of short waves, and those readers who are D.X. (long-distance) "fans" would do well to build a short-wave receiver for reception during the summer months.

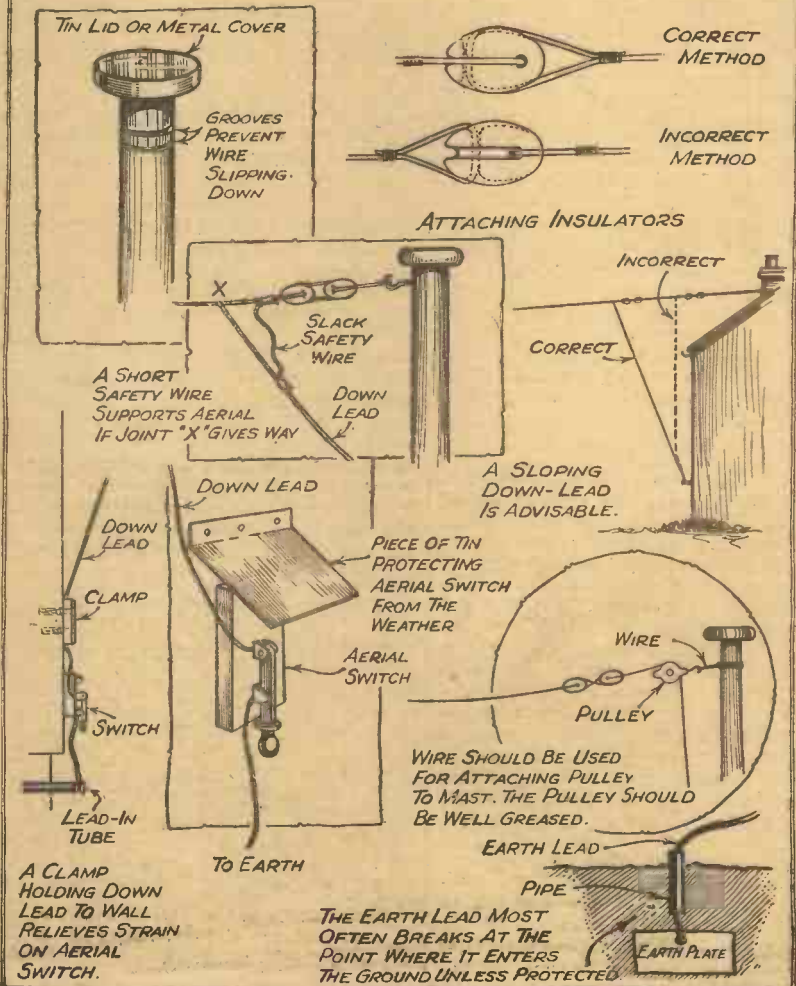
THE IMPORTANCE OF VOLTAGE MEASUREMENTS

It is small wonder that in many sets valves have a tendency to fail in their emission or suddenly fade out altogether. It is a common practice with set operators to feed the valves in a set with a high-tension potential which according to their reasoning is correct. The method usually adopted is to increase the H.T. until the reproduction in the speaker is what they consider it ought to be. This adjustment by ear, whether high-tension batteries or eliminators are used, is a very bad policy, for it almost invariably results in the use of excessive plate voltage, and is frequently responsible for dissatisfaction on the part of the listener at the service life of the valve. This point is particularly true in the case of power valves, with which the reception, when judged by the ear, improves as the valve is overloaded as regards plate voltage. If the best life is to be expected from a valve, a careful survey and study should be made of

the complete specifications and operating characteristics regarding the proper use which valve manufacturers supply with the valve, and is usually to be found in the carton. The information regarding the proper filament voltage, plate voltage, and grid bias to use and the best application of the valve in a circuit should be studied carefully, so that full advantage can be taken of the knowledge gained by the manufacturers in the experimental and development work which has been done with the valve. It is very essential, after having done this, to measure the voltages applied correctly. As these eliminators and the conditions under which they are used vary greatly, it is almost impossible to determine the correct settings merely by listening to the reproduction of the receiver and adjusting the supply until reception sounds all right. The variable adjustments on these units should be set accurately to the receiver with which they are used, and a high-resistance voltmeter employed for the purpose.—C.D.K.

AERIALS-4

ALTERNATIVE METHODS OF FIXING AERIAL AND EARTH LEADS





By the Editor.

Broadcast Reorganization In Switzerland

IT is reported that Marconi's Wireless Telegraph Company, Limited, have received an order from the Swiss Telegraph Administration to increase the power of the existing Marconi station at Beromünster from 60 to 100 kilowatts. At the same time, a number of modifications will be effected which will make the station one of the most up to date in existence.

One of the most interesting of these modifications is the incorporation of the "floating-carrier" system, which automatically controls the carrier wave radiated by the station. In this system both the carrier power and the input power are small in the absence of modulation, or when a low degree of modulation is present. Deeper modulation automatically increases the carrier power, and, consequently, the input power, so that higher modulated voltages can be correctly reproduced. By this means a large saving of power is effected. The transmitter will be still further improved by the introduction of the Marconi "series modulation" system, similar to that incorporated in the design of the new Droitwich station and that at Motala in Sweden. This feature represents the latest development in broadcasting transmitters, ensuring the highest possible quality of reproduction and, at the same time, a marked simplification of design and construction.

Lucerne Wavelength Plan

UNDER the re-allocation of wavelengths recently decided upon at Lucerne, the question of stability of the transmitted frequencies has become of the greatest importance, and most existing broadcasting stations are now being re-equipped with drives of a far greater precision than those in use previously. To meet these new conditions, Beromünster will be provided with a high-precision crystal drive having a frequency that will comply with the most stringent international frequency stabilization requirements.

The increase of power from 60 to 100 kilowatts will be effected by re-

placing the existing power amplifier at Beromünster, which consists of two aluminium and glass units, by a new stage of a similar construction containing two Marconi CAT. 14 valves, the largest water-cooled valves of their type in existence. Droitwich, Motala, and other high-power stations now

under consideration are being fitted with the same type of valve. The appearance of the other units of the Beromünster transmitter will not be changed, but the technical alterations projected will naturally require considerable modification to the internal layout of the circuits. The new equipment necessary is being manufactured at the Marconi Works, Chelmsford, and it is expected to be ready for fitting at Beromünster in the autumn of this year.

Wembley's New Amplifying Apparatus

THE Empire Stadium, Wembley, after using various types of amplifying equipment since its opening, is now equipped with a permanent installation. Probably the biggest of its kind in Europe, since the Stadium holds nearly 100,000 people, the apparatus is the work of Philips, the lamp and radio manufacturers.

Formerly, a stand carrying the amplifying gear used to be placed in the middle of the grass and dragged off after the music had finished, just before the beginning of play. But spectators at the England-Scotland International and the Cup Final will have noticed the shining new aluminium painted loud-speakers on their poles encircling the ground. The apparatus includes a 600w. amplifier, giving 130w. undistorted output, a double turntable gramophone cabinet for two microphones, fourteen super-power loud-speakers, and two high-capacity rectifiers for loud-speaker field excitation. The amplifier valve is a Philips type MA. 4/600, operating at an anode potential of 4,000 volts, and dissipating approximately 600w. There are two rectifier valves, type 1762. The amplifier is housed in an earthed metal casing so constructed that all power is automatically cut off on the opening of the inspection gate.

AN "EKCO" OF THE CUP FINAL



Manchester City football team, who recently won the F.A. Cup at Wembley, enjoying a little relaxation with their Ekco model 74 receiver.

Early Morning Broadcasts

THE British listener who rises at an early hour is now given many opportunities of hearing musical broadcasts whilst enjoying his breakfast. Hamburg is already on the air at B.S.T. 6.20 a.m. and the concert is taken by a number of German transmitters; Cologne (Langenberg) follows at 7.0 a.m., with Stuttgart a close third at about the same time. The Dutch stations are usually heard working from about 7.40 a.m., and Poste Parisien, Radio-Normandie and Radio-Paris also offer recitals of gramophone records almost daily from 7.0 a.m.

"Intimate" Stagecraft

AN entirely new type of stagecraft performance has been designed by Marconiphone Publicity. Previous shows embodying the stagecraft principle were put over to audiences of from fifty to 2,000 people and, as is by now well known, were distinctly successful and fulfilled their object. The new entertainment, whilst embodying the above-mentioned stagecraft principle, differs materially from its predecessors. More attention has been devoted to continuity of the entertainment as well as to subject matter. The show is designed for presentation to audiences of not more than fifty people and, when put over properly, gives the listener the impression that he or she is seated at home listening to broadcasts in normal home surroundings.

Marconiphone have taken as the basis of their operations two B.B.C. plays, namely, *Flags on the Matterhorn* and *Chopin*. Both of these have been very successful on the air, and have been recorded on ordinary gramophone records.

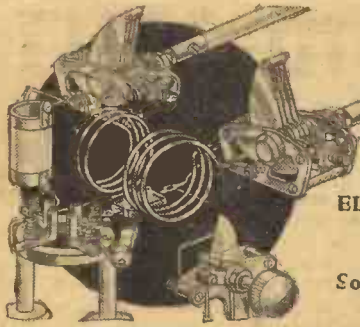
Those entrusted with the task of presenting this entertainment have a very important psychological factor to bear in mind, to which every attention will be given. These recorded plays will be put over on a single instrument, which will be placed to one side of an ordinary domestic fireplace. The show will take place in a very dim light in order to lend that intimacy to the occasion which home listening demands.

"Tom Thumb" Valves

THE introduction of a "Tom Thumb" Osram valve may mean that in the near future the police throughout the country will be equipped with miniature wireless receiving sets in which these valves are incorporated. As these valves are only about two inches long, with a circumference not much larger than that of a shilling, it is obvious that they can be installed in a set of very small dimensions, particularly as they can be associated with the more compact coils and condensers of a highly efficient character, which are now available.

An Interesting Lecture

THE last lecture of the present session to be delivered before members of the British Radio Institution, members of the International Faculty of Sciences and visitors will be given at King's College, Strand, W.C.2, on Thursday, May 24th, at 7.0 p.m., by Professor A. M. Low, D.Sc. The subject will be "Sound and Noise." Readers of PRACTICAL WIRELESS are especially invited. Admission is, of course, free, although invitation cards may be obtained, if desired, from the Secretary, 36, Gordon Square, W.C.1. This lecture concludes a very successful session before large audiences and has the strong support of both the Faculty of Sciences and of King's College.



Short Wave Section

ELIMINATING NOISES IN A.C. MAINS-DRIVEN SHORT-WAVE RECEIVERS
By A. W. MANN

Some Useful Hints on Tracking Noises Which Apply to Both Broadcast and Short-wave Receivers

THE elimination of parasitic noises, should they develop in A.C. mains-operated short-wave receivers, is not a difficult undertaking, but one which requires systematic methods of procedure and common-sense reasoning. The purpose of this article is to enable technically-minded readers, who may look upon the chassis of an A.C. short-wave receiver as a mass of complications which is a little beyond them, to tackle the elimination of minor troubles without difficulty.

Do not get into a panic and jump to the conclusion that the source of the trouble is inside the receiver. It may be external—and, above all, do not guess or take anything for granted when trouble tracking. File this article for future reference in case of doubt, should hum, crackling, buzzing, and ticking noises be super-imposed upon the programme matter emitted by the loud-speaker, and proceed to trace and eliminate them as follows:—

Hum

In order to trace the cause, examine all external leads. Aerial, earth, or speaker

leads may run too close to a wall in which mains wiring is embedded. Remove each lead in turn from the wall. If this procedure causes hum to cease, direct inductive pick-up by the respective lead which, when moved, cured the hum, was responsible for it in the first place.

The possibilities of sound-wave emission from the speaker causing vibrations of the internal valve elements, should not be overlooked. Move the speaker away from the receiver, and note the effect.

Microphonics

Tap valves in turn (set working), in order to test for microphonics, and if any particular valve causes a howl to build up in the speaker when tapped, replace with a new valve.

Examine all electrically-operated domestic appliances, fans, vacuum cleaners, etc. Appliances of this nature, even though located some distance from the receiver, may cause interference.

Crackling

Remove aerial and earth leads, switch on receiver (as in case of hum). If crackle

stops, examine all lighting and power switches, operate them, and note if crackling is heard in speaker when doing so. Examine and operate all domestic appliances. Examine fuse and junction boxes.

An Obscure Fault

The writer recently traced two causes of crackling in a mains receiver; another, however, remained, and tests as described above showed O.K. It was noted that when someone overhead crossed the landing, crackling was heard in the speaker. Examination showed a slack connection in a junction box of the house wiring under floorboards. One of the latter, when walked upon, pressed down on to mains lead, causing sparking between the bare ends and junction box terminals, which, being in effect a miniature transmitter, caused crackling in the speaker, due to pick-up by aerial system. This was cured by switching off mains and tightening junction box terminals.

Common Sources

Do not forget, that unless suppression devices are fitted, electric neon signs, robot traffic signals, trolley systems, and car ignition systems are all sources of crackling and interference.

Rock each valve in its associated socket (set operating). Increased crackling denotes faulty contact between valve pins and sockets respectively. Hum, if heard, denotes open circuit between valve pins and socket. Adjust sockets or valve pins.

Clean between tuning and other variable condenser vanes with a pipe cleaner. Before using the cleaner compress it between two pieces of board, so that it will pass between vanes without forcing.

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VALVES

A "SAFETY-FIRST" SWITCH

Constructional Details for a Simple and Novel Switch, for Disconnecting the H.T. Supply when the Lid of the Set is Opened

IMEDIATELY the lid of the receiver is opened more than an inch the set is switched off and remains so until the lid is almost closed again, the switch operating on the initial opening movement and the final closing movement.

The actual method of operation of the switch is clearly shown in Fig. 1. With the lid open the switch knob is in the "Off" position. On closing the lid the sliding arm slides down the knob until the spring catch and the knob are in contact. By this time

connections to the switch, and to prevent these connections being touched by hand without removing the bracket from the side of the cabinet. The actual connections should be made with heavy flex leads before the bracket is fixed in position.

The Sliding Arm

The sliding arm is made from a lid stay, the part which is usually fixed to the side of the cabinet being removed. This can be accomplished by filing away the top or cutting the arm at the bottom and resoldering after removal. This latter operation will definitely be necessary if a lever switch is used, because the slot must be narrower than the diameter of the switch knob, otherwise it will slip through. With the rotary switch this is not necessary, because the screw can be fitted through the slot. This soldered cut will be seen in Fig. 1.

The spring catch is clearly illustrated in Fig. 1, and is made from springy brass. Do not make the arm too short, otherwise the movement may be somewhat erratic when it is in use; it should be securely fixed to the sliding arm with a nut and bolt.

To simplify the fitting of the switch, make the two distances (marked X) equal, it will then be found that as the stay is upright when the lid is closed, one or two dimensions will suffice to ensure that the switch is in the right position. The ideal to aim at is—when the lid is closed the spring catch has just slipped over the knob (or screw-head), the latter being, of course, in the down (or "On") position by this time.

The distances X should also be chosen so that in the maximum open position the lid just goes over the top dead centre. The switch is additional to the usual On-Off switch. The mains lead should be taken direct to this new switch and from there to the present mains-input terminals.

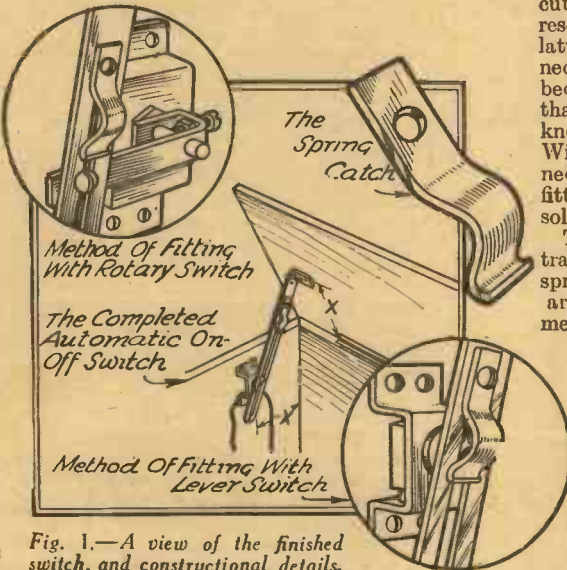


Fig. 1.—A view of the finished switch, and constructional details.

the lid is almost closed, and in the final movement the knob is pressed down (and "On") by the spring catch, and then, having reached the end of its movement, allows the spring arm to be clipped over it. On opening, the strength of the spring catch is sufficient to operate the switch, the latter then remaining in the up (or "Off") position while the spring catch slides over the knob and the lid is fully opened.

When Using a Rotary Switch

If a rotary type of switch is used the method of connection is shown, inset Fig. 1, the lower inset showing how the lever type is utilized. An arm will be necessary with the former type, but it can easily be made from a piece of aluminium or, preferably, brass. If the latter material is used the nut in the lower parts of the "U" can be soldered in position. A screw is inserted into this nut and turned until it grips the spindle, holding the arm in any desired position.

A round-headed screw is inserted in a nut soldered on the end of the arm, a further lock-nut securing it in position, the head of this screw taking the place of the knob of the lever type. A less workmanlike, but quite efficient arm, is illustrated in Fig. 2, the inset showing the arm before bending.

The switch is supported in a brass or aluminium bracket of the type shown. This bracket should be large enough to clear the

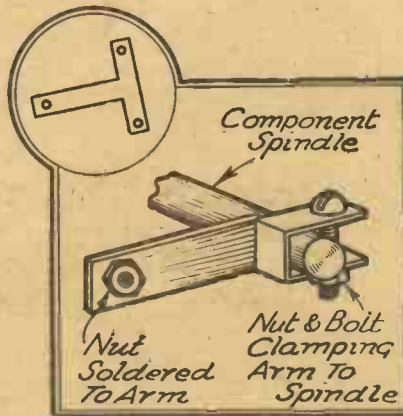


Fig. 2.—An alternative form of connecting arm.

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Before You Go For Your Holidays!

Some Timely Hints On Leaving Your Radio Behind.

By A RADIO ENGINEER

THOSE who are about to depart for any holiday will assuredly not forget to turn off the gas and the water, to lock and bolt all the doors and windows, and put the cat or dog out to board. Will they, however, expend an equal amount of care upon the radio equipment which has served them so well month in and month out? Probably not, but here are a few suggestions which are worth considering if you intend to be away from home for any time.

Let us start at the very beginning of things—the front and back door of our radio, so to speak. I mean the aerial and earth. The risk of an aerial being struck by lightning is very remote in any case, but certain periods usually bring one or two severe thunderstorms, so it will be as well before leaving home to disconnect the aerial and earth leads from the set and connect them together, thus earthing the aerial.

One listener I know goes further than this. He actually lowers his aerial (not the pole but only the wire) and coils it up for storage in his garage. His explanation is that it is as well to be on the safe side, and besides, if he takes the aerial down it gives him an automatic reminder to clean or renew the insulators when he comes back, and to examine and, if necessary, repair the halliards. Quite an excellent scheme, this. If you decide to leave your aerial up, and to earth it, I think I should give the ground near the earth tube a good soaking before I went away. This will ensure a reasonably good earth connection—lightning has been known to seek a better path than that afforded by a poor earth.

Accumulators

The next thing to consider is the set itself. If it is a mains operated receiver, you will, of course, see that it is switched off, and pull out the plug if it is normally supplied via a wall socket. Beyond this, no further precautions are necessary in the case of a mains set.

With a battery-operated receiver, however, one has to consider what to do with the batteries. A few years ago, listeners were warned that if they intended to leave their radio for as long as two weeks it was essential to empty out the acid and leave the low-tension battery filled with distilled water. To-day, however, batteries have been so improved that this precaution is no

longer necessary. It is, however, very unwise to leave a low-tension accumulator for any considerable period in a run-down or even partly run-down condition.

The best plan is to take your accumulator to the charging station a couple of days before you go away, and have it properly charged. Then you may leave it at home for two or even three weeks without risk of it becoming sulphated. This, of course, is assuming the battery is in reasonably good condition. If, however, you suspect that your battery is in poor health—if, that is to say, it has not been retaining its charge well—why not give it an overhaul as well? Hand it over to the care of a really reliable charging station, asking the proprietor to examine it thoroughly and have it properly charged and ready for you by the time you return.

The cost will not be great, and you will have the satisfaction of knowing that your battery will return to you with a new lease of life. If you are leaving your battery in the house, it will be wise to remove it to the kitchen or scullery, or somewhere else where there is a stone floor so that, should any acid leak out, no damage will be done to carpets or furniture.

As for the high-tension battery, I think I should disconnect it in order to remove the slight possibility of its running down if the insulation of the circuit is not perfect, or the unlikely risk of damage should chemicals leak out. I have known instances where some defect in one or more cells has resulted in the formation of a sticky mess of chemicals which could damage neighbouring components and at all events cause unsightly stains.

If your high-tension battery does not live in the radio cabinet, see that it is not placed where it will be exposed to any form of heat. Neither should it be stored in a very damp place. Provided these simple precautions are taken, no harm is likely to occur to your high-tension battery.

Now let us see if there are any other points which require attention before you lock up the house. The set itself—that will come to no harm if left in its normal position. As for the remainder of your equipment, speakers, extensions leads, and so forth, they will come to no harm whatsoever if you leave them as they are.

Overhauls

But the fact that you are going away

gives you an opportunity of having any overhauls or repairs done which you may have been inclined to put off previously because of the inconvenience of being without the radio. Perhaps you have a "sticky" condenser, or an unreliable switch; or possibly you know there is a bad connection which causes crackling noises at odd intervals. If you are not one of the amateurs who build their own receivers and do their own running repairs, now is the time, while you are on holiday, to hand your set over to your local dealer with instructions for repairs and renewal.

Or possibly you have long intended to have your set modernized, or even converted for mains operation. This is a job which your dealer will be glad to tackle while you are away. Perhaps it would not be a bad plan if I suggested a few of the improvements which could be carried out on various types of set at very moderate cost.

Suppose you are now running a two-valve or three-valve battery set of the detector and low-frequency type. A screen-grid valve in front of the detector will make all the difference to the range and selectivity of your set, and the cost, including the price of the screen-grid valve, should not exceed about thirty shillings.

If your set already incorporates a screen-grid high-frequency stage, you may think it worth while to substitute one of the latest variable- μ valves, and thus obtain smooth and efficient volume-control by the use of a simple potentiometer across the grid-bias battery. This is a very cheap reconstruction. Beyond the price of the variable- μ valve, there is only two or three shillings for the potentiometer.

Conversion to mains operation is, of course, a rather more costly job, because there are new valves to buy as well as a power unit. If you are now using a mains eliminator, this can also be used for the high-tension part of the power pack, when the only new apparatus beyond the mains valves will be the filament transformer. There will, of course, be the cost of the work of conversion, and a shilling or so for five-pinholders.

Another job which might be done while you are on holiday is the overhaul of your moving-coil speaker, should it need adjustment. It is something of a ticklish job to re-centre a moving coil, and it is better, unless you are really handy at this sort of thing, to return the speaker to the makers for servicing.

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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.

INTERNATIONAL SHORT-WAVE CLUB (MANCHESTER CHAPTER)

The seventh meeting of the above Chapter was held on May 1st, at 8 p.m. at the Clarion Cafe, 50A, Market Street, Manchester, at which there was a good attendance of radio enthusiasts.

Arrangements were considered for visits to Barton Airport and the North Regional transmitters at Moorside Edge; also a proposed "Field Day" in July or August was discussed. At this meeting a lecture was given by Mr. G. V. Colle, of Ward and Goldstone Ltd., entitled "Practical Consideration of Short-wave Reception, including Interference Problems." Reference was made in this lecture to the use of A.V.C., Q.A.V.C. and superhets on short waves.

The next meeting will be held on Tuesday, June 5th, at the Clarion Cafe, 50A, Market Street, Manchester, at 8 p.m. Any PRACTICAL WIRELESS reader desiring further information should write to the secretary, R. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield, near Manchester.

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

Mr. K. T. Cawse demonstrated his transmitter at the last meeting of the Uxbridge District Branch of the above society. Among the experiments carried out were the exploding of gunpowder by means of induction. To do this, gunpowder was placed across a one-turn coil, and when this coil was placed near the tuning coil of the transmitter the gunpowder went up.

Mr. William Johnston was appointed honorary secretary.

There are no charges for attending meetings of the branch, and everyone is welcome. Full particulars from Leslie W. Orton, "Kingsthorpe," Willowbank, Uxbridge.

INTERNATIONAL SHORT-WAVE CLUB (LONDON)

At a meeting of the London Chapter, held on Friday, May 4th, Mr. J. A. Wilen, B.Sc., described and demonstrated the new Scott all-wave fifteen-valve superhet on both radio and record. The receiver tuned from 13 to 550 metres, good reception being obtained from W8XK, WIXAZ, RW50, CT1AA, EAQ, etc. Records of reception of the Empire Station and the German short-wave station as received in America were then reproduced. All readers of PRACTICAL WIRELESS are welcome at these meetings, and the next one will be held on Friday, May 18th, at 8 p.m.—Secretary, Arthur E. Bear, 10, St. Mary's Place, Rotherhithe, London, S.E.16.

SLADE RADIO

Another lecture by Dr. Ratcliffe was given at the last meeting of this society, and for the benefit of members who were not present on the previous occasion, he repeated the details of the early experiments by Carl Hertz, Clarke Maxwell, Sir Oliver Lodge, and Senator Marconi, etc. In the course of his lecture he described how the propagation, transmission, and detection of wireless waves were discovered.—Hon. Sec., 110, Hillaries Road, Gravelly Hill, Birmingham.

REPLIES TO BROADCAST QUERIES.

EDITOR'S NOTE: Querists must limit their queries to three per letter.

H. RUSSELL (Leeds): EAQ: P.O. Box 951, Madrid, Spain; W8XK, Westinghouse Electric and Manufacturing Co.; studios at William Penn Hotel, Pittsburgh (Pa.); 12RO; E.I.A.R., via Asiago N.10, Rome, Italy. ONE-VALVE (Forest Hill): W8CPC, B. T. Simpson, M.D., 108, Homer Avenue, Buffalo, New York; VK2WB, W. Bullivant, West Wyalong, N.S.W.; K4SA, R. Bartholomew, Barrio de Sabana Hoyos, Garrochales, Porto Rico. E. WALKER (Sheffield): F8RR, E. Bonamy, Les Pleux (Manche), France; G6LL, J. Matthews, 178, Evering Road, Clapton, E.5. G6LI, A. Livesey, Stourton Hall, Horncastle, Lincs. SHORT-WAVE (Greenock): SUR, Abou Zabal (Egypt), 44.25 m. (6,780 kc/s); ORD, Ruysselede (Belgium), 22.19 m. (13,520 kc/s); RKL, Khabarovsk (Siberia), 17.26 m. (17,380 kc/s), 27.97 m. (10,723 kc/s) and 45 m. (6,666 kc/s). ADAPTOR (S.W.26): OK1BC, J. Chmel, Libusina 6, Plzen-Lochotin, Czecho-Slovakia; EA5BE, Santos Yebenes, Juan de Austria 17, Valencia, Spain; VE1BZ, F. W. Hyndman, Box 249, Charlottetown, Prince Edward Island. D. C. PARKER (Witham): W1BES, L. Bellem, Jnr., 143, Eastwood Avenue, Providence, Rhode Island; W2GAQ, S. T. LeRoy, 103, 5th Avenue, Watervliet, New York; W2TT, G. W. McCauley, 220, Front Street, Mineola, New York. BR81330 (r. R.E.S.): LR5, Radio Excelsior, Buenos Aires, on 361.4 m.

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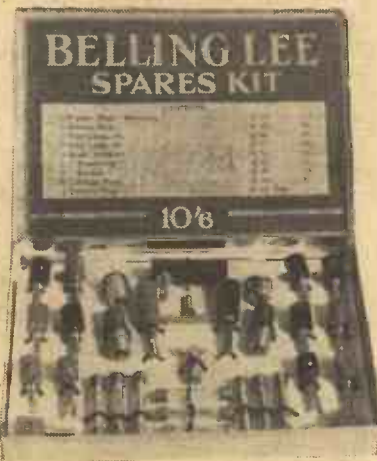
Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

A USEFUL KIT

ALTHOUGH probably appealing more to the service man than the average experimenter, the interesting kit of spare parts which is here illustrated should find a place on every experimenter's workbench. Often it is found necessary to fit a new fuse or a plug for some temporary connection, and although many of these parts may be found lying on the bench or in some drawer, it is very convenient to have them all together in one spot as in this kit. Elastic bands firmly grip each individual part, and in addition to the standard types of plug, there are ten cartridge fuses and 2 screw-type fuses. The price of the individual parts is 10s. 7d., so that the makers of the kit, Messrs. Belling and Lee, give you 1 Twintap plug valued at 1d., in addition to the box and packing free. It is a very handy kit.



A neat kit of spares which should find a place on every experimenter's bench.

NEW BULGIN CONTROLATONE

A NEW version of the Controlatone has been received from Messrs. A. D. Bulgin, and this is known as a De Luxe model. There are several interesting features about this particular component, one of the first being the interesting type of dial which is supplied. The principle of the Controlatone is, of course, to give a variation in tone from deep bass to high treble, and to give some indication of the response of the device at various settings the dial is engraved with a tapered line, wide at the position of good low-note response, and thin at the position of high-note response. The central position, which provides practically even amplification at all frequencies, is marked "normal," and a small catch may be felt as the knob is rotated so that this setting may easily be



The newly-designed Controlatone, showing the graduated dial.

reproduced when desired. Unlike the previous models of this type, it is conductive to D.C., and it is therefore advised that the potential difference across the terminals of the Controlatone should not exceed 12 volts D.C. As the device is intended for connection across the output load of a receiver (or across the primary of an L.F. transformer in an L.F. stage) it is unlikely that this condition will be exceeded when used in the correct manner. The list number of this device is C.T.5 and the price is 7s. 6d.

A NEW ANTI-FADING BATTERY VALVE

THE use of double-diode-triode valves for volume control purposes with mains receivers is now well known, and battery users will be interested to know that a very efficient valve of similar type is now available to them. This is the Osram HD21. This valve is unique in that it consists of two entirely separate electrode systems within the one bulb—more or less similar to the principle adopted in Class "B" valves. The filament system is divided into two halves within the bulb; one half encloses the two small diodes necessary for detection and A.V.C., and the other filament encloses the triode system necessary for amplification. Owing to this method of construction the diode system can be enclosed within an earthed screen which provides a very effective electrostatic shielding within the valve. In addition, the whole of the filament on the second system is available to provide the necessary electron emission for the triode.

The main points, therefore, of interest in the Osram HD21 valve are as follows:

1. Two diodes provide linear detection and delayed action A.V.C. combined with the triode for high-efficiency amplification.
2. Extremely efficient shielding between the diode and triode elements avoids distortion and improves the action of the valve.
3. The full characteristics of the triode element, in this case similar to those of an Osram HL2 valve, are realised, giving great sensitivity on weak signals.

The Osram HD21 is fitted with a filament taking 0.2 amp. at 2 volts, and gives the following triode characteristics: amplification factor 27, impedance 18,000 ohms, mutual conductance 1.5 ma/volt.

The valve is supplied in a 7-pin base with metallised or clear bulb, and in this valve the control grid is taken to a small metal cap on the top of the bulb. This metal cap takes the place of the screw terminal, and is a convenience in making a quick and firm connection by means of a metal clip.

The price of the Osram HD21 valve is 9s.

WEARITE "NUCLEON" COILS—A CORRECTION

IN our issue of April 28th we illustrated one of the Nucleon coils and described this as being the same as is used in Leader series of receivers. The coils in the Leader receivers do not, of course, employ iron-cores, and we regret that we wrongly described these.

NEW ERIE VOLUME CONTROL

THE makers of the well-known Eric composition resistors have now introduced a very neat variable resistor which is of the three terminal, or potentiometer type. Of very small dimensions, the element and moving arm are protected by an insulated cover and the actual essential parts are mounted on a very thin insulated (bakelite) disc. The resistance element is of the composition type, and the ends are riveted to soldering tabs for connection purposes, the heads of the rivets acting as stops at the ends of travel in either direction. The moving contact is of the light spring

type and contact with the resistance element is made by means of a small graphite stud. This provides a very smooth movement practically frictionless, and at the same time removes the possibility of noises due to erratic contact. The connection for the moving arm, and the arm itself are well insulated from the control spindle, so that the component may be mounted direct on a metal chassis if desired. The component is very well made and should prove highly satisfactory in use. It is obtainable in five ranges, from 5 megohms down to 25,000 ohms, and the price is 3s. 6d.



The new Osram "K" type valves referred to last week. The valve base is of standard size, and the smallness of the bulb may therefore be judged. The prices for these valves are the same as for the standard types.

MAGNUM MIDGET SCREENED COILS

ALTHOUGH we are now accustomed to seeing tuning coils of very small dimensions, due to the introduction of the iron-core, the new Magnum coils are very interesting in view of the fact that they are of the ordinary air-core type. The illustration shows three of these coils from which full details of their construction may be gathered. The coil former is 1 in. in diameter and 2 1/2 ins. long. The windings are rigidly held in position by means of some compound which keeps the self-capacity low, and the ends of the windings are soldered to tags eyeletted to the lower end of the tube. The ends of these tags are left sufficiently long to project through the holes in the metal base and thus permit of the receiver wiring to be easily attached. A circular indent at the top of the screening can holds the coil former rigidly central in the screen and the base of the screen is similarly indented to ensure that the coil will not move and introduce short-circuits. The base and screen are held together by means of registered punch-holes, and they should not be separated as there will be a danger of the coil moving when they are reassembled



This view of the Magnum Midget coils shows the complete method of construction.

with the consequent risk of short-circuits between screen and connecting tags. A very complete range of these coils is obtainable, including super-het. coils and I.F. transformers, and the price of the coils is 6s. each and 8s. for the I.F. transformers. All coils are accurately matched on both wavelengths and the finish is in grey cellulose. A folder is issued by Messrs. Burne Jones and Co., Ltd., of Magnum House, 206, Borough High Street, S.E.1, describing these coils and the recently-described multi-contact switches, and readers who are interested should write for a copy.

THE
PRACTICAL MOTORIST
3d. every Wednesday.

Published by George Newnes, Ltd.,
8-11, Southampton Street, Strand,
W.C.2.

REVIEWS OF THE LATEST RECORDS

IMPRESSIONS ON THE WAX

By T. Onearn

A NUMBER of fine records are introduced this month by the British Homophone Company, of special note being a number of popular dance tunes by Teddy Joyce and his Band, who are now playing at the Kit-Cat Restaurant, and are recording exclusively on *Sterno* records. His records include such favourites as *In Town To-night*, composed by Eric Coates, and *Go to Sleep* on *Sterno* 1384, *In a Little Rocky Valley* and *Ol' Pappy* on *Sterno* 1383, and *Spin a Little Web of Dreams* and *Because it's Love* on *Sterno* 1385. The Casani Club Dance Band, ably directed by Charlie Kunz, also supply a number of up-to-the-minute numbers in *Who's Gonna Take You Home To-night* and *Gosh! I Must be Falling in Love*, *Sterno* 1376, *Doggone I've Done It*, with xylophone effects by Tommy Blades, and *Hells Bells*, *Sterno* 1377, and *It's Time to Say Good-night* and *Oceans of Time* on *Sterno* 1378. Each of the above six tunes have vocal refrains ably sung by Dawn Davies and Harry Bently, the well-known vocalists of Charlie Kunz's band.

Light Music

Mantovani and his *Tipica Orchestra*, who have made a number of very fine records for the above company, make yet another fine record, which you should certainly hear. This introduces two fascinating tunes from the film *Princess Charming*, these being *Near and Yet So Far* and *Brave Hearts*, *Sterno* 1399. The vocal chorus of each is sung by Parry Jones, the well-known tenor, who is often heard on the "air." That versatile composer Haydn Wood personally conducts Joseph Lewis's Orchestra in two of his own compositions—namely, *Prelude* and *The Unforgotten Melody*, on *Sterno* 1405. Andre Astan and his Orchestra give a fine recording of "Footlight Parade," which is a selection from the film of that name, introducing such popular tunes as *Sitting on a Backyard Fence*, *Shanghai Lil*, *By a Waterfall*, *The Moon is Here*, and *Honey-moon Hotel*. On the other side of this record is *Moulin Rouge*, which is also a selection from the film of this name, introducing *Boulevard of Broken Dreams*, *Song of Surrender*, and *Coffee in the Morning*. This record, which is *Sterno* 5015, is a long playing record, the playing time of which equals two 10in. discs.

Vocal Records

If you want to enjoy a good laugh you should certainly hear Leonard Henry, the well-known comedian, singing *The Turkish Bath* and *S'Painful* on *Sterno* 1379, and Harry Hemsley, the popular child impersonator, in his rendering of the *Drawing on the Slate* and *The Picture Book* on *Sterno* 1381. Kitty Masters, who styles herself as

the mask singer, records two popular numbers in *What is There to Get Its Place* and *Masquerading in the Name of Love* on *Sterno* 1403. Dan Donovan, the light baritone, who has made a number of fine records for the above company, gives a clever rendering of *In the Hills of Colorado* and *Am I Ever Remembered in Erin* on *Sterno* 1380. Other fine vocal records are *Old River Road* and *Wagon Wheels*, sung by The Singing Minstrel on *Sterno* 1482, and *Little White Church on the Hill* and *In a Shelter from a Shower* on *Sterno* 1404.

Pariophone Records

Those clever harmonists the Moderniques indulge in some amazing vocal impersonations of musical instruments on *Parlophone* R1802, the tunes on this record being *Your O.K.* and *After You've Gone*. Harry Roy and his Band, who are heard quite frequently over the radio, make a fine record in *Keep Young and Beautiful* and *Build a Little Home*, which are two numbers from the film *Roman Scandals*, on *Parlophone* R1795. For those who like pianoforte solos, Ivor Moreton and Dave Kay, the two pianists playing in Harry Roy's Band, give a good rendering on two pianos of *Kitten on the Keys* and *Nola*; *Polly* on *Parlophone* R1797. Also worth hearing is *Allotria* and *Lucy's Lips*, played by the Harmonica Dance Orchestra on *Parlophone* R1798.

Homochord Records

Best and Best, the two popular duettists who have made a number of very fine records for the British Homophone Company, make yet another big success on *Homochord* H.R.93. They sing on this record *My Mother's favourite hymn* and *Springtime is here*—you should certainly hear this as it is a fine piece of recording by these artists. They also appear on *Homochord* H.R.94 singing *You're just unfair*, and on the other side is *So Sky*, sung by Syd Kennedy (baritone). If you like dance music then I suggest *Wagon Wheels* and *It's time to say good-night*, played by Dick Rose and his Band on *Homochord* H.R.86, *I have had to change the words* and *Swaller-tail coat*, played by the same band on *Homochord* H.R.87, *How can I believe in you?* and *After to-night* on *Homochord* H.R.89, and *Jimmy had a Nickel* and *Annie doesn't live here any more* on *Homochord* H.R.90, these last two records being played by Al Gold and his Band. All these tunes are equally good and will certainly appeal to readers.

50 Tested Wireless Circuits

Edited by F. J. CAMM
Obtainable at all Booksellers, or by post 2/6 from Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2.

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PRACTICAL 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).

Schedule of Interesting Foreign Transmissions

SIR.—The following information may be of interest to readers of PRACTICAL WIRELESS:—

YVIBC, Broadcasting Caracas, Apartado 290, Caracas, Venezuela, works on 312.3 m., 960 kc/s, 5 kW., and on 49.08 m. (6,112 kc/s) and 25.65 m. (11,695 kc/s), 200 watts, daily, 11.0 a.m. to 1.30 p.m., Caracas time. On Sundays, 9—11 a.m., 2—6.30 p.m., 7.30—8.30 p.m., and 8.30—10.30 p.m., Caracas time.

YV3BC, Radiodifusora Venezuela, Caracas, works on 1,200 kc/s, 6,150 kc/s., and occasionally, on 9,510 kc/s.

VE9GW, Canadian Radio Commission, Bowmanville, Ontario, works on 6,095 kc/s with 500 watts. Mon., Tues., and Wed., 2—11 p.m., E.S.T.; Thurs, 3 p.m. to midnight, E.S.T.; Fri. and Sat., 7 a.m. to midnight, E.S.T.; Sun., 11.30 a.m. to 8.0 p.m., E.S.T.

PRA3 (via PSK), Radio Club do Brazil, Rio de Janeiro, is S.B. on 860 kc/s and 8,185 kc/s.

W8XAL, Crosley Radio Corporation, Cincinnati, Ohio, works on 49.5 m., 6,060 kc/s, with 10 kW. power, and chiefly relays WLW and WSAI from 11.30 a.m. to 10.45 p.m., and from 3.0—5.30 a.m., G.M.T. (temporary schedule). They state that W8XO operates on 700 kc/s with 500 kW. The transmitter is at Mason, Ohio, and the aerial is vertical and rises 831ft.

ZSB, Transmitting Station, Klipheuveel, C.P., S. Africa, operates on 33.7 m., 18,660 kc/s—used for C.W. and occasional 'phone—and also on 8,900 kc/s, used at night for C.W. and occasional 'phone; power 10 kW. This is the beam transmitter to Bridge-water, Som., ZSB (both waves). It is in daily use. They also use:—

ZSR, 9,180 kc/s, for telephony (not often). **ZSI**, 9,305 kc/s and **ZSL**, 18,290 kc/s, for facsimile (fairly frequently but not at present). **ZSS**, 18,890 kc/s, for commercial telephony to London (daily).

HAS, Research Labs. for Electrical Communication of the R. Hungarian Post, Gyáli Str. 22, Budapest: Located at Székesfehérvár, 30 m. S.W. of Budapest. Wavelength, 43.86 m., quartz-controlled. Power, 5 kW. Aerial directed West. Schedule. 05.45 to 23.00, G.M.T., "if any." They also use **HAT**, 21.92 m., 13,685 kc/s, 5 kW.

The above information comes direct from the stations, and is, presumably, accurate. —BRS 1330 (Misterton, Somerset).

A Wallasey Reader's Suggestions

SIR.—Having been a reader since No. 1, I feel I am now in a position to write you a letter offering what I think are some good suggestions for improvements in your pages. To begin, I suggest that pictorial diagrams of circuits, unless they be in the form of a particular layout, be discontinued. From a beginners' point of view they are uneducational and, from that of one more experienced, meaningless. Further, unless the components are "ghosted" connections are difficult to follow, and, especially in

coils and transformers, the disposition of terminals varies with different makes.

Also, could not the space occupied by such meaningless illustrations as, "A receiver in which the valves are not square pegs in round holes" or, "A power pack which makes no pretence of being niggardly with the volts" be occupied by something more useful and interesting, such as additional "Topical Technicalities" or "Do You Know"?

After these little criticisms, here is a bouquet! The inauguration of a Television Supplement is purely a master-stroke, and another instance of PRACTICAL WIRELESS being first in the field.—W. N. H. JARVIS (Wallasey).

An Australian Reader's Appreciation

SIR.—I have taken PRACTICAL WIRELESS ever since the first copy appeared here, and the bound volumes are a great help in time of trouble! I have abandoned three other magazines in favour of PRACTICAL WIRELESS, which gives me all I want in the way of up-to-date information, understandably written.

It is a pity that American valves have such a strong hold here. It seems that our local set manufacturers are so well served with circuits, sample chassis, and technical service by American agents that every new set has American sockets as standard, and American or replica valves as first equipment. What are English manufacturers doing about it?—N. K. STRACK (Sydney, Australia).

[English radio manufacturers, please note.—Ed.]

CUT THIS OUT EACH WEEK.

Do you know

—THAT an indirectly-heated rectifying valve removes the necessity for fitting a thermal-delay switch.

—THAT images in natural colours have been successfully televised.

—THAT hum may often be cured by providing an artificial centre-tap to a mains-heater winding.

—THAT when fitting a mains-aerial condenser both leads to the mains should be tried in order to select the quietest lead.

—THAT when fitting wave-change switches to short-wave receivers high capacity between adjacent contacts should be guarded against.

—THAT a vertical aerial often proves more efficient than a low short horizontal wire.

—THAT the capacity of the anode by-pass condenser in the detector stage will affect the reproduction of high notes.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL 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 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 Lamp Unit for Television

SIR.—In an article on the use of ordinary neon lamps for television purposes which appeared in the April 21st issue, I noticed that the writer recommended readers to use a "beehive" lamp.

Now the area of the neon disc is small, and the fact that the lamp must be placed at an angle is a great drawback. Therefore, I would like to point out that I use a Phillips neon lamp with the wires wound in cylindrical form. These lamps work on from 100 to 130 volts, so that by using 200 volts high tension in the output stage of the receiver it is possible to obtain a good degree of light from the lamp. Another advantage is that it can be used upright and quite close to the scanning disc, and also that the light area is approximately square in shape.—J. W. HOBLEY (Wellingborough).

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8/11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.

LISSEN RECEIVERS

A FINE range of Lissen receivers, including the popular "Skyscraper" series, is displayed in an attractive folder issued by Lissen Limited. There are sets to suit varying tastes and purses, and from which the most discerning listener should have no difficulty in choosing a receiver to suit his requirements. There is model 8080, a high-class six-valve all-mains superhet. Equipped with A.V.C., band-pass tuning, and an electro-dynamic loud-speaker, this high-class instrument is priced at £14 14s. Other models include A.C. and D.C. models with moving-coil speakers, and battery-operated portable and table sets, all housed in handsome cabinets of modern design, and at prices ranging from £4 4s. to £12 12s. Full particulars of all the receivers are given in the folder, copies of which can be obtained on application to Lissen Limited, Lissenium Works, Worpole Road, Isleworth, Middlesex.

CHARGING FOR PROFIT

A USEFUL handbook by H. W. Gambrell and T. W. Price, bearing the above title, has just been issued to the trade by the Edison Swan Electric Co., Ltd. The purpose of the book is to give practical suggestions and advice on the questions of layout of battery charging stations, and the choice and operation of suitable equipment.

COSSOR BOOKLET ON CLASS B AMPLIFICATION

LISTENERS who are users of battery receivers will find Messrs. A. C. Cossor's book B.21 on Class B amplification of special interest, as it explains how to incorporate a Class B valve in a receiver to obtain an output comparable with that of a mains receiver. Several circuits are given, together with advice on how this latest form of output may be most successfully used and added to suitable existing receivers.

Certain precautions may have to be taken and refinements added to ensure satisfactory results, and this book clearly explains what these additions are and how they are best utilized. A copy of the booklet is available free to readers of PRACTICAL WIRELESS on application to Messrs. A. C. Cossor, Ltd., Highbury, N.5.

"LESDEX" MICROPHONES

VARIOUS types of microphones, from pocket voice amplifiers to stand instruments, are listed in a folder issued by Electradix Radios. Included in the comprehensive range are microphones for home recording, band repeating, and public address work. Also included in the folder is a range of microphone transformers, telephones, and microphone parts. Copies of the folder can be obtained from 218, Upper Thames Street, London, E.C.4, by enclosing a stamp for postage.

HIVAC VALVES

FULL particulars with characteristic curves of the full range of Hivac valves is given in a booklet of data strips. These valves are the result of several years of intensive research work, and no pains have been spared to produce a high-class valve at a reasonable price. They embody the latest and most advanced methods of construction, and great care has been taken to ensure that individual valves are up to characteristics. Comparative tables of equivalent valves, from which can be seen at a glance the characteristics and prices of Hivac valves in comparison with similar valves of other makes, is given in a neat folder, copies of which can be obtained on application to the High Vacuum Valve Coy., Ltd., 113-117, Farringdon Road, London, E.C.1.

REPLIES TO

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS



If a postal reply is desired, a stamped addressed envelope must be enclosed. Every query and drawing which is sent must bear the name and address of the sender. Send your queries to the Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.

QUERIES and ENQUIRIES by Our Technical Staff

The coupon on this page must be attached to every query.

SPECIAL NOTE.

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.

Please note also, that all sketches and drawings which are sent to us should bear the name and address of the sender.

MODIFICATION NOT POSSIBLE

"I enclose a sheet showing details of two coils which I have got. I also have two separate .0005 mfd. condensers, and should like to incorporate these parts in the 'Leader.' Can you show me the connections?"—J. H. B. (Limerick).

We regret that your coils would be unsuitable for use in this circuit. Further, as pointed out on many occasions, departure from the specified parts and arrangements will not enable us to guarantee the performance of a receiver, and you can, therefore, only make the change at your own discretion.

A MATCHING PROBLEM

"A 3-valve set has been brought to me, viz., S.G., det., and pentode. The receiver is quite intact, but the speaker was originally meant for Class B or Q.P.P., and requires approximately 3 watts. The pentode valve has an output of 1 watt. Will a 3 to 1 step-up L.F. transformer be necessary in the output to match the valve and speaker?"—S. A. K. (Bridgend).

The question of matching is not concerned with the strength of the input signal, but with the impedance. The fact that the speaker will handle 3 watts simply means that a signal greater than that value should not be passed to it. The pentode, which only delivers 1 watt, may be coupled to it (through a suitable impedance matching device) and will work satisfactorily. You will probably find that by using the two outside terminals on the speaker, and connecting these direct in the anode circuit of your pentode valve, the matching will be approximately correct, as the usual load of a Class B stage is in the neighbourhood of 8,000 to 12,000 ohms, and this is also the normal load of a pentode. You should, therefore, ignore the centre terminal on the speaker and use it in the ordinary way.

CINEMA INTERFERENCE

"I have a three-valve straight three, but when I tune-in to the local station I get a terrible noise, something like falling bricks. I have got all good components, but the house is situated fifty yards from the main road and three cinemas are close by. Can these be responsible for the trouble?"—J. H. (Oldham).

It is quite possible that either apparatus in the cinemas, or electric signs fitted to these places are responsible for the noise. This could be verified by removing the aerial from the aerial terminal. If the

noise is reduced or entirely removed, then you should fit a screened aerial lead, or endeavour to obtain satisfactory results with a small indoor aerial arranged in such a direction that the interference is reduced to a minimum.

A WET RECTIFIER

"Can you supply me with details of a wet rectifier for use in a trickle charger to use in place of a metal rectifier? I should like to know the nature of the electrolyte, ratio of the ingredients and the plates."—E. V. T. (Tottenham, N.)

A wet rectifier for your requirements could be built up by using a solution of ammonium phosphate in which plates of lead and aluminium are immersed. The strength of the solution is approximately 2½ lbs. of salt to the gallon of water, and it is preferable to use a rod of aluminium with a plate of lead cut to fit round the inside of a half-gallon jar. Full details will be found in "Accumulators, Charging, Maintenance and Care," published by this house and obtainable from any bookstall or newsgate, price 1s.

DATA SHEET No. 79

Cut this out each week and paste it in a notebook

GRAMOPHONE RECORD CLASSIFICATION

SIZE	LABEL	TYPE NO.	PRICE	NAME
10in.	Black	—	2s. 6d.	Brunswick
12in.	Blue	—	2s. 6d.	—
10in.	Blue	—	1s. 6d.	Panachord
10in.	Orange	AS	1s. 6d.	—
10in.	Plum	B	2s. 6d.	—
12in.	Plum	C	4s. 0d.	—
10in.	Black	E	4s. 0d.	—
12in.	Black	D	6s. 0d.	—
10in.	Red	DA	4s. 0d.	His Master's Voice
12in.	Red	DB	6s. 0d.	—
10in.	Buff	DJ	7s. 0d.	—
12in.	Buff	DK	10s. 0d.	—
12in.	Pale Green	DM	11s. 0d.	—
12in.	Pale Blue	DO	13s. 6d.	—
12in.	White	DQ	16s. 0d.	—
10in.	Red	E	2s. 6d.	Parlophone
10in.	Blue	E	2s. 6d.	—
12in.	Dark Blue	E	4s. 0d.	—
				(1000 series)
9in. 1/2	Red & White	—	1s. 0d.	Broadcast
10in.	Red	—	1s. 6d.	Broadcast Super Twelve
10in.	Red	—	1s. 6d.	Broadcast Four Tune
10in.	Blue	—	2s. 6d.	Broadcast Twelve

THE MAINS UNIT?

"I have recently built a three-valve receiver exactly to specification, but I can only get a loud buzzing noise. I am working from the mains with a good mains unit. Aerial, earth, and unit are in good order, as they work with my old set."—F. L. (Mitcham).

In all cases where a mains unit is employed and the set proves unstable it is worth while trying a dry battery in place of the unit, in order to check that the wiring and components of the receiver are in order. If results are then satisfactory and instability is introduced when the mains unit is connected, it proves that the unit is unsuitable. The reason may be that the unit will not deliver sufficient current for the set

and is seriously overloaded, or it may be necessary to employ separate voltage supply leads for each valve. In some cases it may be necessary to incorporate extensive decoupling in the receiver. The exact cure will depend both on the receiver circuit and the mains unit wiring.

TELEVISION AND A 4-VALVER

"My set is a four-valve S.G., det., power, and pentode, and it is used with an A.C. mains unit. Could I work television from this? I am very keen to try out some experiments in television."—W. M. (Ashington).

We see no reason why you should not be able to obtain good results from your receiver, provided you can obtain a really good loud signal from the London National station, which transmits the television signals. If this station provides you with a signal which is very comfortably audible, you could build up a disc receiver and obtain quite good results. If, however, the signal from that station is weak, you would probably need a further H.F. stage to give you sufficient strength to obtain a well-modulated picture.

A CLASS B ELIMINATOR

"I am thinking of building an eliminator for my present set, which is an ordinary S.G., detector, and power circuit. Later I am going to add Class B. Will it be satisfactory to build a Class B unit now, or will this not work with my present set?"—F. S. (No address).

It would be preferable to build the unit as it will be required for the Class B conversion. It will work quite satisfactorily with the straight circuit and will not then require alteration when you modify your set.

SPARK FROM SPEAKER LEADS

"My set is working wonderfully, but I am puzzled by having noticed a spark when the set is working and I make-and-break the negative loud-speaker lead. The set is working from the mains through an eliminator and has a choke output. Is it in order, and am I safe in taking the negative of loud-speaker to earth at some distant point?"—A. J. R. (Roche).

It is quite in order to connect the speaker to any earthed point, but you should not disconnect this whilst the receiver is switched on. You break the anode-load when you disconnect the speaker and this causes a surge which gives the spark as the connection is made and broken. It does no harm in itself, but may damage the valve or even cause a breakdown of the filter condenser due to the surge.

THE FURY FOUR

"Could you let me have particulars for obtaining wiring details of the set known as the Fury Four (battery-operated)? I have seen the circuit in a valve manufacturer's booklet, and it is described as an efficient and selective set."—P. M. (Dublin).

The circuit you referred to was described in 1933 in PRACTICAL WIRELESS Nos. 19 to 21. This receiver has, however, been modified and brought entirely up to date, using iron-core coils and variable-mu valves, and the battery version was described in PRACTICAL WIRELESS Nos. 71 and 72. Copies of these issues are obtainable from our Back Number Department, price 4d. post free.

FREE ADVICE BUREAU.

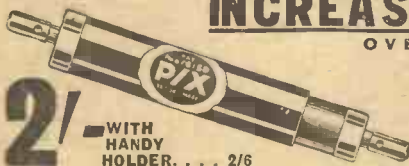
COUPON

This coupon is available until May 26th, 1934, and must be attached to all letters containing queries.

PRACTICAL WIRELESS, 19/5/34.

INCREASE THE SELECTIVITY OF YOUR SET!

OVER 1,500,000 LISTENERS USE A



to separate those stations that overlap each other. Get rid of that annoying muzziness that spoils local reception. Just FIX A PIX in your aerial lead. You will be surprised how sharply your set tunes, and delighted at the number of new stations you can hear clearly. Try one to-day. Send us 2/-. If you are not completely satisfied, return it to us within 7 days for full refund.

BRITISH PIX CO., Ltd., LONDON, S.E.1.

PIX

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word prepaid - minimum charge 3/- per paragraph - and must reach this office not later than Tuesday for the following week's issue. All communications should be addressed to the Advertisement Manager, "Practical Wireless," 8 Southampton Street, Strand, London.

PREMIER SUPPLY STORES

offer the following Set Manufacturers' Surplus New Goods at a fraction of the original cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra (Ireland, carriage forward).

PREMIER SUPPLY STORES announce the purchase of the entire stock of a world-famous Continental valve manufacturer. All the following types of standard mains valves at 4/6 each. H. H. L. Power. Directly heated 0-watt Pentode. Directly heated 9-watt Pentode. High magnification Screen-grid, low magnification Screen-grid. Variable-Mu Screen-grid. 250 volt 60 milliamp, full-wave rectifiers.

The following type 5/6 each. Indirectly heated Pentode, 350 volt 120 milliamp, full-wave Rectifier. 500v. 120 ditto, 6/6. Dario Battery Valves 4v. filament, Set of 3, consisting of Screen-Grid, Detector and Power or Super-Power, 6/6 the lot. Power or Super-Power, 2/6.

ELLIMINATOR Kits, including Transformer, choke, Westinghouse metal rectifier, Dubilier condensers, resistances and diagram, 120v, 20 m.a., 20/-; trickle charger 8/- extra; 150v. 30 milliamps, with 4v. 2-4 amps. C.T. L.T., 25/-; trickle charger 6/6 extra; 250v. 60 milliamps, with 4v., 3-5 amps. C.T. L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps. C.T. L.T., 37/6; 150 volts 50 milliamps, 27/6.

AMERICAN Triple Gang 0.0005 Condensers, with trimmers, 4/11; Premier chokes, 25 milliamps, 20 henries, 2/9; 40 milliamps, 25 hys., 4/-; 65 milliamps, 30 hys., 5/6; 150 milliamps, 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6.

HARLEY Pick-up, complete with arm and volume control, 12/6.

BRITISH RADIOPHONE Wire Wound Potentiometers, with mains switch incorporated, 10,000 ohms, 3/6.

PREMIER British-made Meters, moving-iron, flush mounting, accurate, 0-10, 0-15, 0-50, 0-100, 0-250 m.a., 0-1, 0-3, 0-5 amps.; all at 6/-.

SPECIAL offer of Mains Transformers, manufactured by Phillips, input 100-120v. or 200-250v. output 180-0-180 volts 40 m.a., 4 v. 1 amp., 4 v. 3 amp., 4/6; 200-0-200v., 4v. 1a., 4v. 3a., 4/6.

All Premier Guaranteed Mains Transformers have Engraved Terminal Strips with terminal connections, input 200-250v. 40-100 cycles, all windings paper interleaved.

PREMIER H.T.S. Transformers, 250v. 60 m.a., rectified with 4v. 3-5a. and 4v. 1a. C.T. L.T., screen primary, 15/-; with Westinghouse rectifier, 25/-.

4 v. 3a. C.T., 6v. 2a. C.T., 0v. 1a., 12v. 1a., 7/6 each; 4v. 3-5a., 22v. 1a., 8/6 each; 10v. 3a., 14v. 4a., 10/- each.

PREMIER H.T.9 Transformer, 300 v. 60 m.a., with 4v. 3-5a. and 4v. 1a. C.T. L.T., and screened primary, 15/-; with Westinghouse rectifier, 26/-.

PREMIER H.T.10 Transformer, 200v. 100 m.a., rectified with 4v. 3-5a. and 4v. 1a. C.T., L.T. and screened primary 15/-; with Westinghouse rectifier, 26/-.

PREMIER Mains Transformers, output 135v. 80 m.a. for voltage doubling, 8/6; 4v. 3-4a., C.T., L.T., 2/- extra; Westinghouse rectifier for above, giving 200v. 30 m.a., 8/6.

PREMIER Mains Transformers, output 250-0-250v. 60 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a. (all C.T.); with screened primary, 15/-.

PREMIER Mains Transformers, output 350-0-350v. 90 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a. (all C.T.), with screened primary, 15/-.

PREMIER Mains Transformers, output 400-0-400v., 100 m.a., 4v. 4-5a., 4v. 2-3a., with screened primary, 15/-.

PREMIER Auto Transformers, 100-110/200-250v., or vice versa, 100-watt, 10/-.

MULTI Radio Output Transformers, 4/6. Twin Screened Wire 3d. per yard.

CENTRALAB Potentiometers, 50,000, 250,000 half meg., any value, 2/-; 200 and 400 ohms, 1/-.

RELIABLE Canned Coils with Circuit, accurately matched dual range, 3/- per coil. Please state whether Aerial or H.F. required. Ditto iron core, 3/6.

PREMIER L.T. supply Units, consisting of Premier Transformer and Westinghouse rectifier, input 200-250v. A.C., output 2v. 1 amp., 11/-; 8v. 1 amp., 14/6; 8v. 1 amp., 17/6; 15v. 1 amp., 19/-; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C. 152 Magna, 2,500 ohms, 37/6; all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M., 7in. cone, 18/6. Ditto 9in. cone, 20/6.

POLAR 3-Gang STAR, .0005, manufacturers type. Fully screened, with trimmers, 7/6.

WESTERN ELECTRIC Condensers, 250v. working, 2 mfd., 1/-; 1 mfd., 6d.; 4 mfd., 2/-; 1 mfd., 400v., 1/-; 2 mfd., 1/0.

B.T.H. Truespeed Induction Type (A.C. only) Electric Gramophone Motors, 100-250v., 30/-; complete. Type YH 100/250v. A.C. or D.C., 42/-.

SPECIAL Offer of Wire Wound Resistances, 4 watts, any value up to 10,000 ohms, 1/-; 8 watts, any value up to 15,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms, 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

CYLDON Capacitors (Double Trimmer), 1/- Utility .0005 2-gang Bakelite Condensers, concentric Uniknob Trimming and Disc Drive, complete, 3/6.

EDISON BELL Double Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

AMPLION Cone Loud-speaker Units, 1/9, complete with 12in. cone and chassis, 3/11 each. Worth treble.

ORMOND Condensers, 0.0005 2-gang, semi-shielded, 2/6; brass vanes, with trimmers, 3/6.

WIRE Wound Potentiometers, 15,000 ohms, 1/6; 50,000 ohms, 2/-; 500,000 ohms, 3/6.

LARGE Selection of Pedestal, table, and radio-gram cabinets, by best manufacturers, at a fraction of original cost for callers.

WESTERN ELECTRIC Mains Transformers, 300-0-300v. 60 m.a., 4v. 1-2 amp., 4v. 2-3 amp. 8/6. 500-0-500v. 150 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 2-3a., 4v. 1a. C.T., 4v. 1a. C.T., 19/6.

RELIABLE Intervalve Transformers 3-1 or 5-1, 2/- Dubilier, .05 mica, 1/9.

T.C.C. Condensers, 250v. working; 2mfd., 1/9; 1,000 ohm, 150 m.a., variable resistance, 2/-.

T.C.C. Electrolytic Condensers, 440 volts working, 4 mf. or 8 mf., 3/-; 15 m.f., 50 v. working and 25 mf. 25 v. working, 1/3.

KOLSTER-BRANDS Mains Transformers, Input 200-250 volt, output 350-0-350v. 100 m.a., 4v. 1 amp., 4v. 2 amp., 4v. 3-4 amp., 10/-.

ORMOND Brass Variable Condenser, .0005 complete with knob-dial 2/-.

H.M.V. Block Condensers, 400v. working; 4 x 4 x 1 x 1 x 1 x 1 x 0.1 x 0.1 x 0.1, 6/-; 4 x 2 x 1 x 1 x 1 x 0.5, 4/8.

DUBILIER Condensers, 2 mf. 1,200v. working, 4/-; 8 mfd. dry electrolytic, 450v. working, 3/-.

The Following Lines 6d. each or 5/- per dozen—Chassis valve holders, 5 or 6 pin, screened screen-grid leads, any value 1-watt wire end resistances, wire end condensers, 0.0001 to 0.1, trimming condensers, T.C.C. 6 mfd. 50 v. electrolytics.

PLEASE mention PRACTICAL WIRELESS when ordering.

PREMIER SUPPLY STORES
20-22, High Street, Clapham, S.W.4, MACaulay 2188.
Close 1 o'clock Wednesdays; open to 9 o'clock Saturdays. Nearest Station, Clapham North Underground.

The following unused Set Manufacturers' Surplus; all goods guaranteed perfect; immediate delivery.

FERROCART coils, G1, G2, G3, or G1, G2, G8 with switch, 27/6. G11, G12, G13, G14, with switch, 34/-. Colverdys (Ferrocart), 7/6.

DUBILIER or Erie resistors, 1 watt type 7d., 2 watt type 1/2, Marconi K19 pick-ups 22/6. Radiophone IF transformers, 110KC or 117.5KC, 6/6.

WESTINGHOUSE rectifiers, HT8, 9/6, HT9, HT10, HT14, LT5, 11/- Regentone transformers for HT8 or HT9 with 4v4a LT winding, 7/6.

MAINS transformers, 350-0-350v., 60ma., 4v4a, 4v2a, 12/6. Eliminator, outputs, 150v, 25ma, S.G. and detector. A.C. type with Westinghouse rectifier, 25/- D.C. type, 12/6. Collaro gramophone motors, 100-250v A.C., 34/-.

DUBILIER dry electrolytic condensers, 5mf or 4mf, 500v working, 50v, 50mf, 3/6.

ROTOROHM volume controls with switch, 2/6. BTH pick-up tone arms, 3/-.

All types of brand new American valves in stock, A first-class makes, guaranteed. 247, 235, 551, 89, 18, 10, 46, 59, 647, 15, 42, 41, 38, 30, 78, 75, 57, 58, 24, 44, 36, 43, 12/- UX171A, UX199, UX280, UX245, UX226, UY227, 8/- UX250, UX281, UX210, 18/-.

BTH-RK speakers, 6v field, suitable for P.A. work, 27/6. A.C. type with field rectifier, £27/6.

MAGNAVOX speakers complete with humbucking coils, output transformers, etc., 152 (9in. cone) 22/6. 154 (7in. cone) 15/9. Rola F6 (7in. cone) 17/6. all with 2,500 or 6,500 ohm fields. Magnavox PM254 18/- Carriage paid, cash with order or C.O.D.

WARD, 2nd floor, 45, Farringdon Street, London, E.C.4. Telephone, Holborn 9703.

BANKRUPT STOCK. Brand New. Including Valves. Guaranteed.

OSRAM Music Magnet Four Kit, £4. Cossor Empire Kits, £2/10. Burrell 5v.-A.C. Super-Hets, latest model, £8/8. Amplion Electravox A.C.A., 27. H.P. Available.—Blakey, 23, Holborn Street, Rochdale.

M.R.D. Co., offer following guaranteed surplus. Carriage paid or call. Dubilier 8 mfd. electrolytics. 450v. working, 3/6. Tubular 800v. test condensers, .01, .02, .05, .1 mfd., 6d. T.C.C. 1 x 1 buffer condensers, 450v. working, 1/4. Formo dual range aerial coils, new and boxed, screened, with ganged switch and circuit, list 7/6. 3/3. Voltron H.F. chokes, high inductance, 9d.—Mains Radio Development Company, 4-6, Muswell Hill Road, N.6, London. Tudor 4046.

ALL I ASK OF YOU

is to look into this Revolutionary Announcement:

All I ask of every individual 'Pr. W.' reader is to look into and read this announcement and details of what is quite the greatest bargain that has ever been placed before the radio public; and then to take advantage of the offer which enables you, without obligation and in your own home, to see the truth of this seemingly sweeping statement.

It is only through a combination of three of the most advantageous bulk purchases I have yet made that this bargain became possible. These were (1) Ultra 'Panther' Console cabinets—the most beautiful cabinets I have seen. (2) British Radiophone 6-stage super-het chassis with A.V.C. (3) A loud-speaker as good as any made—the W. B. Permanent Magnet.

That three lines such as these which are almost 'made to fit together' should have become available at the same time is a piece of good fortune, which can never reasonably be expected to repeat itself.

They are now offered to the home constructor at a ridiculous price as a complete outfit which is easily and quickly assembled into a Radio receiver which can have few or no superiors.

The obtaining and presenting of this bargain has called for opportunism on our part. It now calls for opportunism on your part to secure it while the going is good, and test it without any obligation in your own home.

You will be helping yourself and helping us.

Thank you.
G. DE C. TAYLOR (General Manager, L.E.C. Trading Co.)

THE BARGAIN OF THE AGE

A 22 Gn. Super-het with A.V.C. for £619.6 or 15/- down.

ON FREE APPROVAL

THE CHASSIS BY BRITISH RADIOPHONE.

A six stage super-heterodyne with Class B output and Automatic Volume Control, for use with batteries or with a suitable eliminator (see below) off A.C. or D.C. mains.

THE VALVES BY MULLARD. A complete set of Mullard valves are supplied with the chassis.

THE SPEAKER BY "W.B." a permanent magnet speaker of the highest class with universal matching transformer. List price 35/-.

THE CABINET AN ULTRA "PANTHER." A table model polished walnut cabinet of superb finish and design. Must be seen to be appreciated. A credit to any furnishing scheme. Worth 50/-.

THE COMPLETE OUTFIT comprising British Radiophone Chassis, Mullard Valves, W.B. speaker, and Ultra "Panther" cabinet together with simple fitting instructions and full scale straight line illuminated tuning drive. Offered on free approval against Cash or C.O.D. Price £6 19 6d. OR BY DEFERRED PAYMENTS. If required on deferred payments send 20/- deposit only with order, remainder payable 15/- monthly.

FOR BATTERY, A.C. or D.C. USERS. Complete set of high capacity batteries, price extra 15/- (or add 1/3 monthly). Specially designed large output Class B eliminators for above set, A.C. model 35/-; D.C. model 21/- 60 amp. accumulators 6/9 each. Trickle chargers, A.C. 12/6; D.C. 7/9. Please state mains voltage when ordering mains units.

THIS WEEK'S SPECIALS!

Supplementary to the May 'RADIO GOLD-MINE.'
1/- EACH, LOTUS DIFFERENTIALS, also .0001, .0003, .0005 mfd. variables, 11d.

1/3 BROWNIE DUAL RANGE COILS. Screened, 2/2; Lucerne Coils, Aerial or Grid, 2/4.

1/8 EACH. AMPLION CONE SPEAKER UNITS (well worth 7/6).

2/6 IRON CORED DUAL RANGE COILS. Dubilier 8 mfd. Electrolytics, 2/10.

2/11 COLUMBIA L.F. TRANSFORMERS (list, 10/6. S.M. Extensers list, 18/6, 2/11).

3/4 CLASS B. DRIVERS and Output Transformers.

3/6 IGRANICORE, IRON CORED COILS, with switch (list, 10/6).

8/6 SHORT WAVE ADAPTOR KITS, with full instructions in sealed cartons.

10/6 St.3-VALVE KITS, complete in sealed cartons.

12/6 SHORT WAVE III KITS, in sealed cartons, complete.

18/6 CLASS B. III KITS, absolutely complete in sealed cartons.

3d. EACH, FIXED CONDENSERS, 1 watt resistances and Grid Leaks. ALL valves. Edson Bell 4pt. jacks and switches (list 4/-) 9d. H.F. Chokes 9d. Mansbridge condensers 1 mfd. 9d., 2 mfd. 1/4, 4 mfd. 2/8.

THERE ARE HUNDREDS UPON HUNDREDS of equally attractive bargains in the new May issue of the 'Radio Gold-Mine,' the most comprehensive surplus radio lists published in Great Britain. You CANNOT afford to be without them.

LONDON EAST CENTRAL TRADING COMPANY (Dept. M.112), 23, Bartholomew Close, London, E.C.1 (telephone NATIONAL 7473). Goods over 10/- value, postage free. Under 5/- value—cash only. Over 5/- cash or C.O.D.

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For Everything Surplus in Modern Radio

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VARIABLE Condensers.—Lotus. All 0.0005. Complete with dials, escutcheons, knobs. Fully screened with trimmers. 3-gang, 12/6; 2-gang, 8/6; single, 4/0. (List 9/6). Igranlic 0.0003, 1/9 (list 7/9). Hydra block condenser, 16 mfd. (2+2+8+2+1+1), 1,000v. D.C., 7/-. Dubilier 4 mfd. (2+1+1), 1,000v. D.C., 2/9; 4.5 mfd. (2.25+2.25), 1,000v. for mains noise suppression, 3/-; fixed 4 mfd., 2/3; 2 mfd., 1/6; 1 mfd., 1/-; Utility Midget 2-gang, variable condensers, 0.0005, with concentric trimmers, 4/6.

T.C.C. 0.1 0.1 Condensers, 450 working, 1/3 each (list 4/6).

SPEAKERS.—Blue Spot permanent magnet, universal transformer for power, super power, pentode and Class B, 23/- (list 30/6); Celestion Soundex permanent magnet, 17/6 (list 27/6); Celestion P.P.M./W., 25/- (list 49/6).
E.C. Stork, speaker in cabinet, 19/6 (list £3/15).

BLUE Spot, genuine 100U, inductor speaker on chassis; 18/6 (list 30/6).

T.400 Kits, all specified proprietary components; £2/19/0 (list £4/17/6).

IGRANIC Coils, set of four (1 osc., 2 I.F. with pigtailed, 1 I.F. plain), 12/6 (list 50/-).

IGRANIC Band Pass 3 Coils Unit, iron-cored, screened on base, with switch; 16/- (list 33/-).

LISSEN Super-het. 3 Coils Unit, screened, ganged on base with wave-change and filament switches; type LN5181 for battery or mains, 12/6 (list 30/-).

L EWCOS Coils.—Types O.S.C./126, T.O.S., I.F.T., T.B.F., 3/3 each; B.P.F. band-pass filter B.P.F., 4/- (list 12/-); all brand new in original cartons.

VARLEY Constant Square Peak Coils, complete with all accessories, new, boxed; BP5; 3/9 each (list 15/-).

VARLEY H.F. Inter-valve Coils, BP6, 3 3 (list 8/6); Varley power transformers, EP0, 12/- (list 45/-).

5-VALVE Class B Superhet. Chassis by Plessey, wired ready for use, with 5 Mullard valves, new, in sealed cartons, £3/17/6; (list £12/12); valves alone are priced £3.

LISSEN Base Revolving Turntables, 1/6 (list 5/-).

SPECIAL Offer of Leweos Spaghetti Resistances, all sizes, in original sealed boxes, 4/- per dozen, assorted; special price to trade, 36/- per gross.

MAINS Transformers.—Full list of mains transformers and chokes sent free; specials can be supplied in 3 days; transformers and chokes guaranteed 12 months.

MISCELLANEOUS.—Rotorohm and Radiophone volume controls, all values, 3/- switch, 3/3 (list 10/6); Westinghouse metal rectifiers, H.T. 6, 7, 8, 9/3 each; Ferranti chokes, 20 henry 60 m.a., 6/0 each.

LL Goods Guaranteed and Sent Carriage Paid.

BRANCHES at 271-275, High Rd., Willesden Green, N.W.10, and at 46, Lisle St., W.C.2. Please send all post orders to 323, Euston Rd., N.W.1.

SOUTHERN RADIO, 323, Euston Rd., London, N.W.1 (near Warren St. Tube). 'Phone: Museum 9324. [5540

Vauxhall. Magnavox Permanent Magnets universal, suitable for Class B power or pentode. 7in. cone 17/6, 10in. cone 23/-.

ENERGISED 2,500 or 6,500, 10in. cone 23/-, 7in. cone 15/3. Brand new, with humbucking coils; state power or pentode.

RADIOPHONE Radiopaks R.F. or Band-pass superhets, 117-110 k/c, with Lucerne station named, scales and metres, complete with volume controls and switch. 35/-.

RADIOPHONE I.F. transformers, tapped with terminals, 6/-.

Volume controls with switch, 3/6. Radiophone trimming condensers, various values, 1/-.

Tubular fixed condensers, 0.1, 0.005, 8d.; 0.002, 7d.; 0.001, 5d.

STATION named scales and metres for radiopaks, new Lucerne wavelengths, 1/0. Valve holders, chassis type W.B., 4-5 pin, 4/4d.; 7 pin, 7d.

DUBILIER Resistors, 1 watt, 7d.; 2 watt, 1/2

GRAMOPHONE motors, A.C. only, B.T.H. Tru-speed 100-250 volts, 30/-. Collaro, 35/-. Anything you need for radio we can supply. Valves, etc. Lists free.

BAND-PASS superhet G-valve A.D.C. mains, Lucerne wavelengths, stations named, £9/12/0.

CLASS B. 3 valve, £1/10. 3 valve battery, £3/15. Permanent magnet Magnavox.

MULLARD Valves, complete, ready to switch on, and guaranteed.

Vauxhall UTILITIES, 163a, Strand, W.C.2.

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100, Bishopsgate, London, E.C.2. All bargains guaranteed new goods. Cash or C.O.D. Carriage Paid.

POLAR 2-ganged Screened Condensers, with trimmers, pilot lamp holder, calibrated scale and escutcheon; list 27/6, our price 8/11. Several of our bargains as advertised in previous issues, still available. FREE. Send postcard for Pearl & Pearl Bargain List "B."

WOBURN RADIO offer following new and Bankrupt stock:—

WESTINGHOUSE Rectifiers: H.T. 7, 8, and 9, 9/-; H.T. 10, 9/6. L.T. 2 and 5, 10/6.

UNIVERSAL A.C./D.C. Eliminators: with three positive H.T. tapings, 25 m/a, 30/-.

A.C. Eliminators as above. D.C. Eliminators 11/6.

ALL the above guaranteed for one year, and manufactured specially for us.

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Tubulars: 0.1, 0.01, 0.02, 0.05, 6d.; 0.25, 0.5, 9d.

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Chokes, 30h. 30ma. and 40h. 40ma., 4/6.

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Class B 3 Kit with plymax chassis and iron-core coils, 25/-.

S.T.300, 37/6. ST. 400, 47/6. St. 500, 55/-. Quotations for any other kit by return.

SPEAKERS: Sinclair P.M., Power, Pentode or Class B, 10/6 (carr. 1/-). Guaranteed 12 months.

ALL goods guaranteed, if not satisfied money back. H.P. terms on goods over 40/-, excluding valves and batteries.

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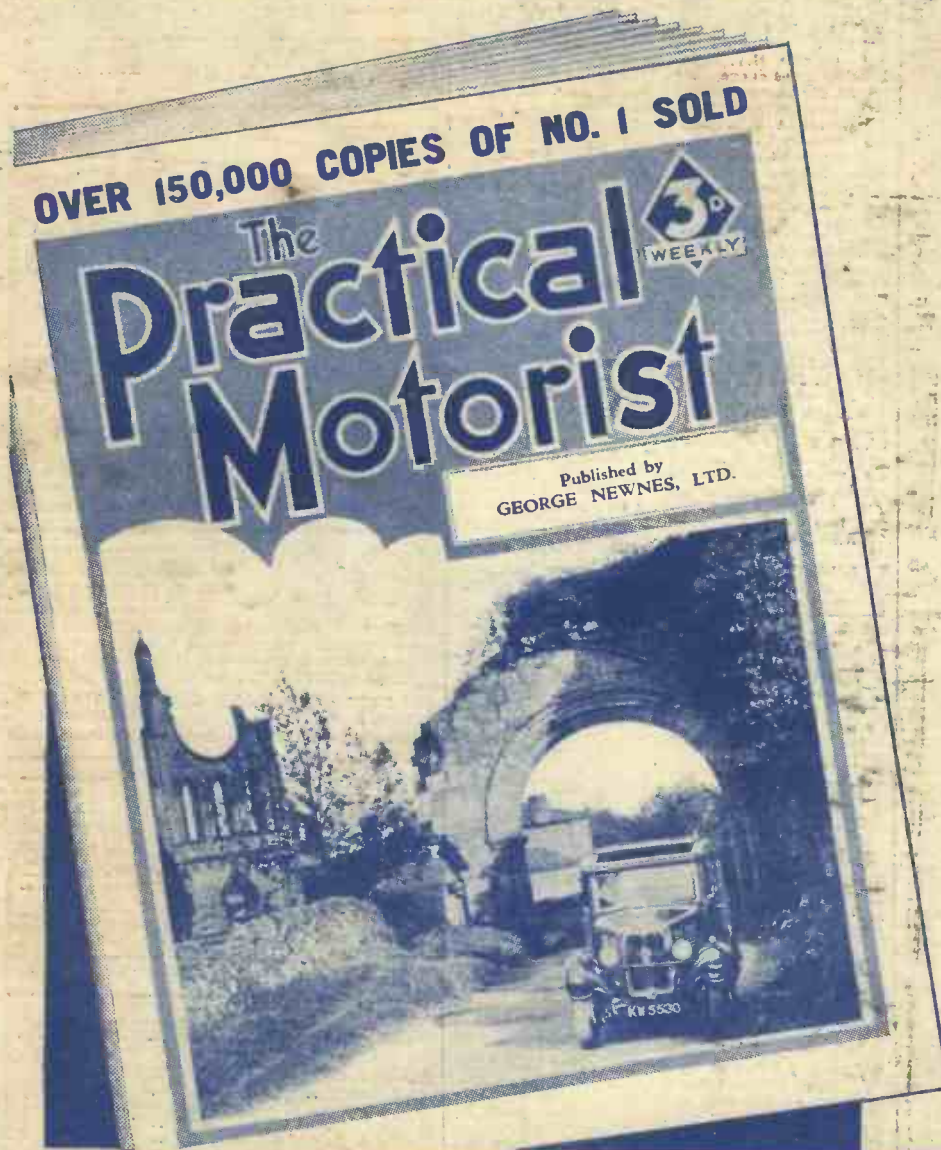
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