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Practical Wireless

3^D

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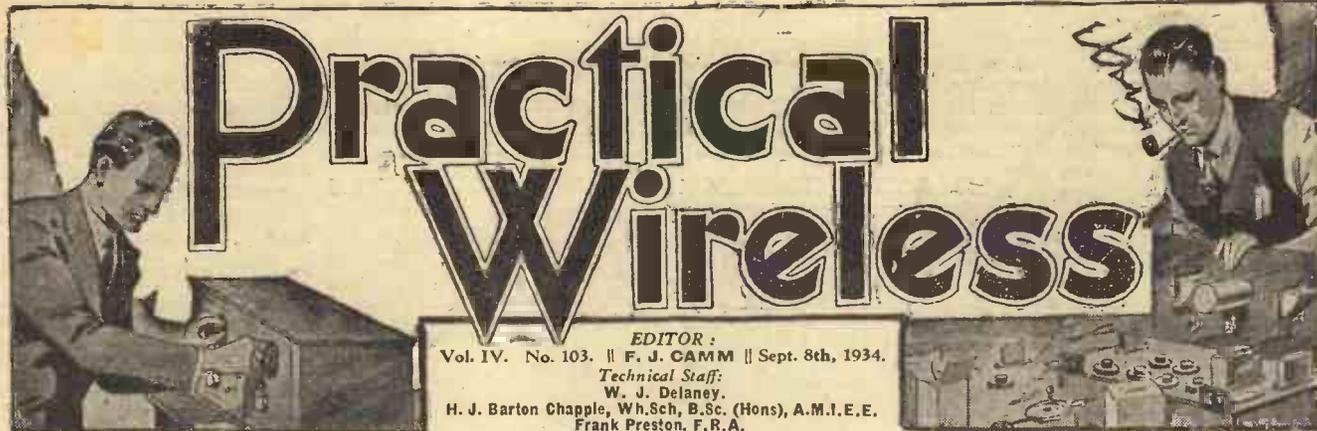
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AUTOMATIC PROGRAMME SELECTION

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ROUND *the* WORLD of WIRELESS

Concert from Midland Regional

IN a Midland Regional studio concert on September 10, Eveline Stevenson (soprano) sings two songs composed by Michael Mullinar, the Birmingham pianist, and four of Liza Lehmann's Cycle of Bird Songs. Later on in the evening The Three Knaves (Jack Wilson, Jack Hill and Basil Hempseed, pianists), with Gerald Martin as vocalist, will give a programme of tunes old and new entitled "At Random."

In the Scottish Regional Programme

ON September 12 variety will be broadcast to Scottish Regional listeners from the Empress Playhouse, Glasgow, one of the most popular variety theatres in the country.

The Scottish Military Band will give

the T.T. course (226 miles, completed in six laps) under T.T. conditions, they must needs do it for the fun of the thing alone, not for a living.

"Amateur Film Societies"

THIS is the subject of the talk which Mr. F. Heming Vaughan, Honorary Secretary of the Merseyside Film Institute

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Society, will contribute to the "Schemes" series on September 14. Mr. Vaughan's scheme is a simple one: he would like to see the establishment of more film societies working on similar lines to the Merseyside one. That is to say, they would confine themselves to "documentary" pictures—constituting valuable records of local life, scenery and customs—rather than vying with, as is the general practice, the productions of commercial film companies.

The St. Leger

A RUNNING commentary on the St. Leger race at Doncaster will be broadcast by Mr. R. C. Lyle on September 12. This race dates back to 1776, when Colonel Sir Anthony St. Leger instituted a sweepstake of twenty-five guineas each for three-year-old fillies and colts. Only six horses were entered, and no one can then have anticipated that from so small a beginning would result the famous "classic" of to-day.

Glanhowy Concert Party

A WELSH concert will be given on September 12, when the Glanhowy Concert Party, conducted by D. M. Williams, will sing choruses and glees. This concert party has broadcast on many occasions, singing both Welsh and English part-songs; it has also had special engagements for film productions. Tom Williams (baritone) will be the soloist at the concert, singing two groups of Welsh songs: he won the baritone solo competition at the Wrexham National Eisteddfod last year.

"Last Load Home"

AFTER-HARVEST celebrations in the Tithe Barn at Little Twittering will be broadcast in the National programme on September 22, producer Frederick Grisewood, of "Our Bill" fame. The customs in the British Isles associated with the end of harvesting are a curious survival of pagan rites. Mr. Grisewood will introduce just that touch of tradition to his programme to justify the description of "good old-fashioned harvest" as a sub-title to "Last Load Home."

Seaside Variety

A NOTHER programme of seaside variety will be broadcast to the Scottish Region on September 14th, relayed from the Winter Gardens, Rothesay, when a popular cast will include Charlie Kemble, Jack Anthony, Terry Wilson, Billy Oswald, Alan Montgomery, Hilda Meacham, Sylvia Watt, Janette Eadie, Mary Thomson, The Caledonians, and the Rothesay Entertainers' Band.

ROUND the WORLD of WIRELESS (Continued)

"Golden Dragon City"

THIS is the title of a play which will be broadcast on September 17th in the National programme. It is a fantasy typical of the manner of the author, Lord Dunsany, and has been written specially for broadcasting as were his previous plays, "The Use of Man" and "Bureau de Change." As there are only three characters in the production, it will be an all-star cast. The play will be produced by Lance Sieveking, who adapted for the microphone Dunsany's stage play, "If," and in which Henry Ainley played his original part in the broadcast version.

The Final Assault at Baku

IN the late summer of 1918 1,200 British troops, drawn exclusively from Midland and Northern units, and commanded by Acting Brigadier-General L. C. Dunsterville (original of Kipling's "Stalky"), defended the great Caspian oil centre of Baku for six weeks against repeated Turco-German attacks. One of the combatants, Mr. Leslie R. Missen (now Director of Education for Wigan, but formerly captain and adjutant in the 7th Battalion the North Staffordshire Regiment), will broadcast a description of the final assault and the subsequent evacuation, on its sixteenth anniversary, September 14th next.

H.M. Royal Marines Band

ON September 14th West Regional listeners will hear the Band of his Majesty's Royal Marines, Plymouth Division, conducted by Lieutenant F. J. Ricketts, which will be relayed from the bandstand, sea front, Paignton. Included in the programme will be the March Fantasia, "Colonel Bogey on Parade," which was written by Lieutenant Ricketts under the name of Kenneth Alford. In front of the bandstand there is a large awning under which the audience sit as a protection from the sun and rain; when the weather is bad the sides are covered with canvas so that it can become in effect a marquee.

Cabaret Concert from Burnham-on-Sea

"PLAYTIME," the original cabaret concert party presented by Nat. Day will be relayed from the Esplanade Pavilion, Burnham-on-Sea, to West Regional listeners on September 15th. This production has now played its tenth summer: it has been engaged for tenth summers at such popular centres as Folkestone, Ramsgate, and St. Leonard's.

Welsh Girls' Broadcast

FOUR girls will entertain in a Welsh programme which is described as an interlude—amusing and grave—on September 11th. The artists will be Mair Howells (song and satire), Dilys Griffiths-Davies (merry and serious), Amy Thomas (singing penillion) and Rhiannon James (harp). The programme has been arranged by Idwal Jones.

INTERESTING and TOPICAL PARAGRAPHS

Torquay Municipal Orchestra

WILLIAM PARSONS, the Bristol baritone, will be the vocalist at the

THE LATEST NORWEGIAN BROADCASTING STATION



The Marconi 20 kilowatt transmitter at the Trøndelag Broadcasting Station in Norway, which has just commenced operation. This transmitter embodies the "series modulation" system.

concert by the Torquay Municipal Orchestra relayed from the Pavilion, Torquay, on September 11th. The conductor, Ernest W. Goss, is not only Musical Director to the Corporation of Torquay; he is also Entertainments Manager, and he is considered to be one of the most versatile musicians in the country. He returned to his native Torquay after the War and formed the Municipal Orchestra, developing it by degrees until it now numbers thirty players.

Another Cabaret Show

FROM the Little Theatre on the Pier at Saltburn-by-the-Sea, Yorkshire, a cabaret show will be relayed on September 12th. The artists broadcasting are Harry Tollfree (baritone), Linda Love (comedienne and dancer), Fred Morris (comedian), Ivy Esta (pianist and entertainer), Jack Crosbie (entertainer), and Frances Grant (soprano).

"The Three Friends"

THIS is the title of an imaginative chronicle of certain events in the life of Omar Khayyam, poet and tent-maker, specially written for broadcasting by Dewan Sharar, which will be heard in the National programme on September 10th, and in the Regional programme on September 11th. The script is based upon stories in the original Persian, and it includes also selections from the celebrated translations of the "Rubaiyat" by Edward FitzGerald and Richard Le Gallienne. The music has been arranged by Robert Chignell, and the production will be by the author and Val Gielgud.

"Whistle Binkie"

THE collection of songs and verses known as "Whistle Binkie" had a long life of popularity during last century, and is not quite forgotten to-day in spite

of the strictures of modern critics such as Mr. John Buchan in his preface to "The Northern Muse." It enshrines Scottish sentiment, perhaps at a not very exalted level, certainly at its most typical. Many listeners of the older generation will welcome a broadcast of readings from this famous collection on September 10th, combined with the singing of some Scottish songs of the Victorian era equally simple, homely, and unaffected.

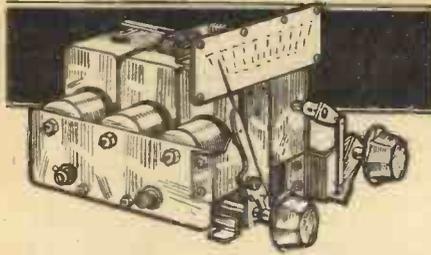
Concert from Bristol

A CONCERT will be given from Bristol on September 9th by the Lockier Grosvenor Sextet. This Sextet gave weekly concerts last season and on many occasions every seat was taken some time before the advertised time of performance. The usual home of the Sextet is the Little Theatre, Bristol, and West Regional listeners who have missed their performances during the vacation will take a special interest in the broadcast. The artist at the concert will be Hilda Blake (soprano).

"The Pigeon"

A PLAY with an unexpected ending called *The Pigeon*, by Ian Priestly Mitchell, is to be broadcast from Belfast on September 7th. The story concerns a confidence trick which fails, and its moral is that a Northern Ireland accent does not always denote a simple mind.

SOLVE THIS!



The Varley three-gang permeability tuner, which has proved so efficient in its new form.

It is less than two years ago that iron-cored tuning coils were placed on the market in this country, and it is rather interesting to study the wave of popularity which they have achieved in the intervening period. At first they were hailed as being revolutionary, it being claimed that they were many times more efficient than their air-core predecessors. After being widely used for some months, however, their popularity began to wane, and several designers went back to the old type of tuning coils. Now, at last, iron-cored coils appear to have settled down in the place they are entitled to occupy as the most efficient forms of tuning device available. There is no doubt whatever that iron-core tuning is here to stay, and that tuners embodying this feature must eventually oust all others—for long and medium-wave reception at all events.

One might well ask why, after being so warmly received at first, the new types of coils later fell into comparative disfavour. The reason was no doubt largely due to the fact that intending users had been led to believe rather too much of the coils, and to expect impossible improvements. Another reason was that the manufacture of iron-cored coils presented many mechanical difficulties which could only be solved effectively when the coils were in the hands of as many users as possible. At least this was the case where the larger and reputable manufacturers were concerned, but the matter was made worse by so many "back-street" firms without initiative or experience who placed so-called iron-core coils on the market. Instead of using core material of the proper type—which consists of countless extremely small particles of soft iron, all insulated from one another and pressed into a composition with a suitable insulating material—many of these disreputable firms simply used cores consisting of ordinary iron filings made into a solid mass by means of sealing wax or similar material.

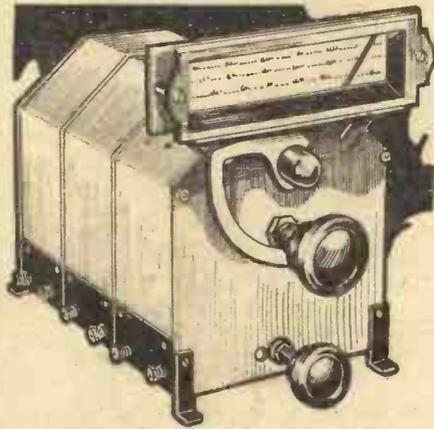
By a process of evolution, most of these "back-street" manufacturers have now been "shaken out," whilst the "teething troubles" experienced with properly-designed coils have been overcome. In addition, reliable manufacturers have now found it possible to produce really efficient and fool-proof iron-core tuners at very modest prices. So efficient have the better makes of iron-cored coils proved to be, that there are now a number of receiver manufacturers, who have previously pinned their faith to ordinary air-core coils, who now use nothing else but the later iron-core type.

A Moving Core

Permeability tuning seemed to be an obvious application of the iron-cored principle because, if the core had the effect of increasing the inductance—and hence

PERMEABILITY AND OTHER MODERN TUNING SYSTEMS

The Design of Tuning Circuits has been Considerably Improved of Late, and Some of the Latest Principles are Described Below. By FRANK PRESTON



Another new permeability tuner—the Morley "Morlicore."

the wavelength to which it would tune—of a coil, it should be quite possible to secure a uniform variation in inductance by sliding the core into, and out of, the windings. When experiments were first taken in hand, however, it was immediately realized that many serious difficulties existed. Not the least of these was that of so designing the shape of the core and of the former upon which the windings were placed that a uniform variation in frequency or wavelength could be produced by a steady movement of the core. It is not necessary to point out all the various troubles which were encountered, but it is sufficient to say that they have all been solved by at least two coil manufacturers. The solution has been found in the use of two cores and a conically-shaped tubular coil. The latter statement is not quite correct because one of the ferrous "cores" can more correctly be described as a shell, since its position is outside the windings.

Uniform Efficiency and Selectivity

The advantages of permeability tuning are many, although the mere fact that the tuning condenser is entirely dispensed with is of little significance. The chief advantages are in respect of the far greater efficiency and uniformity of results which the condenserless tuning system gives. It is well known that the efficiency, and also the selectivity, of an ordinary coil-and-condenser tuning system varies appreciably between the extents of its wavelength range. For example, the dynamic

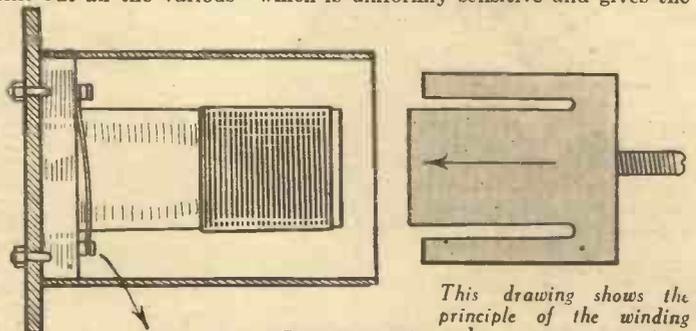
resistance (which is a measure of tuning-circuit efficiency) of a coil-and-condenser combination is roughly inversely proportional to the capacity in circuit. In other words, efficiency falls off as the wavelength is increased by advancing the condenser setting.

On the other hand, the magnification afforded by the circuit, which is a measure of selectivity, varies in the opposite manner; that is, the degree of selectivity provided becomes less as the capacity in circuit is reduced, or as the combination is tuned to a lower wavelength.

Both of the objections just referred to are almost entirely obviated by employing a permeability tuner, in which the capacity remains sensibly constant regardless of the wavelength to which it is adjusted. Besides having these important advantages, the permeability tuner also possesses the advantage of the increased efficiency given by the iron core, which permits the use of far fewer turns of wire for any given inductance value.

The Effect of Permeability upon Receiver Design

The benefits to be derived by the use of permeability tuning which have just been referred to are of particular importance in the case of a "straight" circuit, whilst they are by no means insignificant even in a superhet. They make it possible to design a "straight"-circuit receiver which is amply selective for all purposes, and which is uniformly sensitive and gives the



This drawing shows the principle of the winding and core arrangement in a permeability tuner. The arrangement used in the latest tuners is somewhat different from this, since the coil is on a tapered former and the core and outer shell are independent. The pre-set condenser shown is for the purpose of trimming various coils in a matched set.

same degree of selectivity over the whole of both wavelength ranges. Bearing these facts in mind, it is safe to speculate that, despite the firm hold which the superhet has now obtained, the popularity of the multi-H.F. receiver might increase very considerably during the coming months.

Permeability tuning is extremely beneficial in any receiver which has band-pass tuning, because it makes it a far simpler matter to obtain a constant band-width over the whole range of wavelengths.

(Continued overleaf)

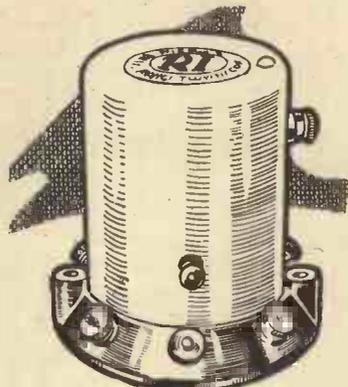
(Continued from previous page)

With other more conventional tuning systems it is common to find that, although the band width covered at, say, 200 metres is 9 kilocycles, it is reduced to, perhaps, 5 kilocycles at 600 metres. This means that if the receiver is adjusted so as to give good quality reproduction at one wavelength, its performance will fall short at another. It might be argued that such irregularities could be overcome by the use of tone control, but that involves further complications, and does not prove so efficient; after all, it is only a case of curing, rather than preventing, the trouble.

Permeability I.F. Transformers

Not only has permeability tuning been applied to circuits of the high-frequency type, but also to intermediate-frequency transformers used in superhets. It has been the custom to design these to give a certain band width of between 4 and 9 kilocycles, but such a fixed frequency was often found to be unsuitable in many instances. The narrow band width was required in order to obtain the degree of selectivity necessary in certain instances, whilst a wider band was to be preferred when good quality reproduction was desired. Certain makers overcame the trouble in some measure by winding the primary and secondary I.F. coils on separate formers which could be moved in relation to each other, but this was not an ideal arrangement, because it necessitated the removal of the screening cans when adjustments were to be made. This difficulty has been completely overcome by adopting

permeability principles, and providing an adjustable coupling between the primary and secondary, the variation being secured by the movement of a small ferrous core. When the core is passed through both coils the coupling is at a maximum, but when



The R.I. "Micron" coil, which was one of the first to employ a system of permeability tuning. Sliding cores are used to match up various coils and to secure correct matching over the wavelength range.

it is moved along, the coupling is diminished and the band width narrowed.

While on the subject of I.F. transformers, mention should be made of the latest idea of employing an L.F. frequency of 475, instead of about 110 kilocycles. The higher frequency almost entirely overcomes

second-channel interference and in many instances makes it possible to dispense with the usual band-pass input filter. Provided that the I.F. transformers are carefully designed and made—on strictly low-loss principles—it is actually possible to secure increased efficiency by their use.

Variable Selectivity

Because of the extreme selectivity provided by the superhet, this type of receiver has been open to the criticism that it could not possibly provide "quality" reproduction. The band-pass input filter was designed in many cases to respond to a band of frequencies no wider than about 5 kilocycles in order to ensure the greatest possible freedom from interference. Although this was good enough in the case of long-distance reception, the reproduction was by no means as good as many desired. Several superhets are now fitted with a variable-selectivity device, by means of which the band width of the input filter can be varied at will. In one example, in which the band pass coupling is inductive, the coupling coil is tapped so that portions of it can be short-circuited by means of a rotary switch. This is an idea which can easily be tried out by the constructor who makes his own coils, whilst the similar one of varying the capacity of the coupling condenser in a capacitive filter can also be experimented with. In the case of inductive coupling, the larger coupling coil gives a greater band width, and with capacitive coupling the band width is reduced by increasing the capacity of the coupling condenser.

GRID-BIAS DIFFICULTIES

OUR post-bag always contains a large number of letters from constructors who are not satisfied with the quality of output from their receivers, and when we go carefully into these complaints we often find the causes are usually unsuspected by the owners and all sorts of tricks are tried but the right one.

One of the commonest complaints is that the volume is poor, and when the volume control is turned anywhere near the maximum point there is a continual procession of crackles and sibilant sizzles in the loud-speaker. In several cases the constructors have endeavoured to overcome the difficulty by fitting lower impedance valves using higher plate voltages and necessarily higher grid-bias because they have read somewhere, or an expert has told them, this would be the remedy for their trouble. After wasting lots of time and a considerable amount of money, they find the defect persists and are then at a complete loss to know what to do.

Measuring the Current

The first thing the Sherlock Holmes of radio would do would be to buy, purloin, or borrow a milliammeter to assist in the research, and then remember that it is no use going to a considerable amount of trouble with the output stage until you are sure the preceding valves are behaving themselves and doing the work which they are called upon to perform correctly. For instance, what is the use of having an output valve which will deal with a big grid voltage swing when the first low-frequency valve is being overloaded? No amount of correction in the latter

stage will overcome the trouble if the preceding valve is suffering from such a bad complaint. If it is passing bad material on to the next valve the only thing that valve can do is to make the best of a bad job.

It is, of course, quite an easy thing to find out whether such a fault is taking place in the first L.F. stage. First of all, connect the milliammeter in series with the plate lead of the valve and watch carefully the movement of the needle. It will generally be found that when certain notes are sounded the pointer will give a big kick. Should this occur you may be quite sure in your mind that the valve is not capable of handling the big changes in grid swing, because the adjustments you have made with the grid-bias are incorrect and prevent the valve from doing its work advantageously. Try various tappings in the G.B. battery, and if you find it is impossible to correct the fault in this way then you can rest assured that a valve with a lower impedance is required to work satisfactorily in this particular stage. It is always wise to keep the characteristic curve sheet given by the manufacturer with a new valve because this helps the novice quite considerably in his endeavour to trace faults. Incorrect grid-bias will move the working point of

the valve to either a too low or too high a working point on the grid-volts plate-current curve shown on the sheet. When a valve is over-biased the milliammeter will have a tendency to kick upwards, and shows bottom bending is taking place, while if the meter moves in the opposite direction too little grid bias is being employed. If, after carefully experimenting in this direction it is impossible to get a steady reading of the meter, then you can rest assured that the correct valve is not being used in that position and one should be chosen with a lower impedance. There is one very interesting point in employing a milliammeter for this purpose, and that is it not only draws your attention to the fact that distortion is taking place, but it permits you to adjust the voltage.



A neat display of valves on the 362 Radio Valve Company's stand at Olympia.

AUTOMATIC PROGRAMME SELECTION

How a Receiver Can be Converted for the Automatic Selection of Alternative Programmes

AS it is possible to receive alternative programmes in most parts of England, it is convenient to construct a receiver which will be automatic in its selection of these programmes. Of course, battery adjustments and adjustment of volume will still have to be carried out "by hand," but the actual tuning-in can now be dispensed with, and a "fool-proof" receiver made up which can be operated by the lady of the house or the youngest member of the family with the very simplest of movements.

Semi-variable Condensers

The necessary accessories to convert an existing receiver into an automatic one are—for a two-station selection—one single

TO COIL. TO GRID CONDENSER.

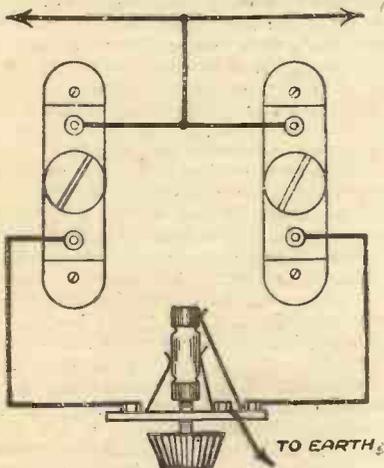


Fig. 1.—How to convert an existing receiver into an automatic one.

pole change-over switch (of the push-pull type) and two pre-set condensers. These latter are sometimes known as semi-variable condensers and are quite small, being adjusted by means of a small knob on one side of the component. The switch and two condensers will, of course, take the place of the usual tuning condenser, and in the majority of cases the switch can be affixed to the panel in the hole previously used to hold the tuning condenser. These components usually have a three-eighths fixing bush if they are of the one-hole variety. The two small condensers may be screwed to the baseboard in any convenient spare place, provided that they are not too far removed from the actual tuning coil. One terminal on each of the condensers is joined to the longest and shortest arms of the switch, and the remaining two terminals are connected together and then taken to the grid condenser. The medium arm of the switch is connected to earth. Particular attention should be paid to this method of connection, or troubles may be experienced in accurate tuning. The sketch, Fig. 1,

should make the arrangement perfectly clear.

To Operate

Place the switch in one position and then carefully adjust the condenser which is in circuit. This should be done with a long, thin strip of wood having one end sharpened in the manner of a screw-driver, or some other device which enables the knob to be adjusted from a distance to avoid hand-capacity effects. Tune in one of the stations to its loudest (ignoring, if possible, for the time being, the reaction control, if the receiver is fitted with one). When perfectly tuned in, change over the switch and do exactly the same thing with the other condenser, this time tuning-in the alternative station. The operation of the switch will now enable either of the stations to be heard, and the tuning of each condenser is entirely independent. The reaction control, in receivers where such is fitted, may be operated simply as a volume control, being turned in the required direction to bring



Fig. 2.—Plug for automatic switching.

the volume of the received signal to the desired strength. If you do not own a receiver at present, but contemplate building one, and wish to use this method of tuning, simply ignore the tuning condenser shown in the wiring diagram of the receiver you intend to

TO COIL. TO GRID CONDENSER.

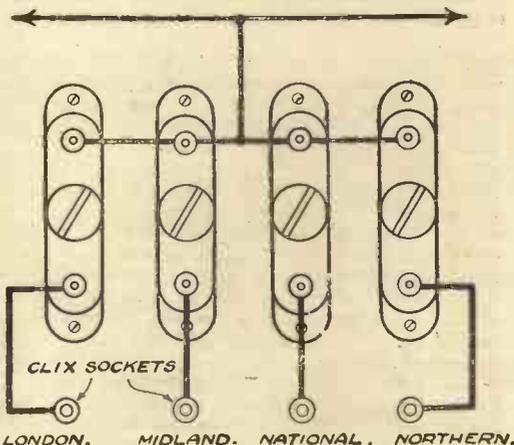


Fig. 3.—The wiring arrangements for plug-in switching.

construct, and substitute the two pre-set condensers and the switch.

Automatic Switching

If more than two stations can be clearly received in your locality, and you desire to employ automatic switching, the simplest way to arrange matters is to use Clix sockets and a Clix plug, as shown in Fig. 2. The sockets should be arranged in any desired pattern on the panel, each socket being connected to one side of the pre-set condensers and the plug being connected to earth. The free terminals of the condensers are then all connected together and connected to the grid condenser. Fig. 3 shows this arrangement, whilst Fig. 4 shows how to gang a pair of push-pull switches.

TO COIL. TO GRID CONDENSER. TO H.F. CHOKE.

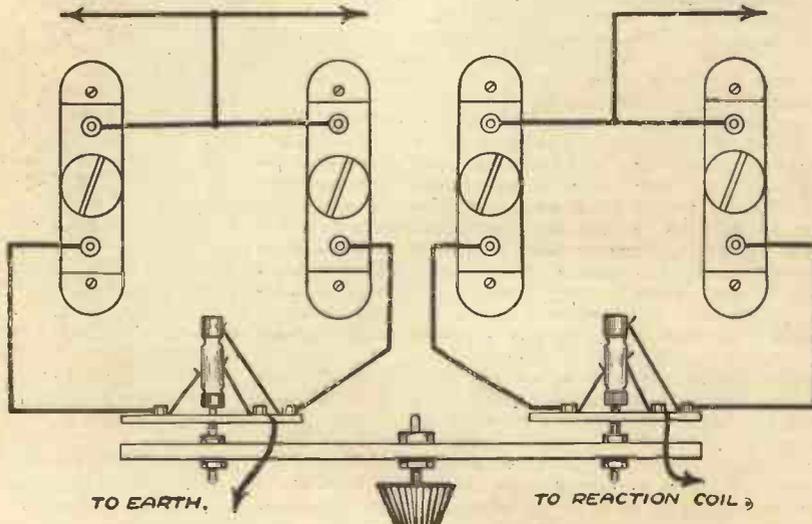


Fig. 4.—How to arrange a ganged switching system.

A QUESTION of LAYOUT

Some Interesting Details Concerning the Subdivision of Receiver and Amplifier, and other Points Relating to Controls

By W. J. DELANEY

IT has been the custom in the past to look upon the wireless receiver as a chassis or baseboard upon which all the essential parts are screwed or otherwise mounted, and in which those which have to be controlled during the operation of the apparatus are mounted at the front edge so that the control spindles may

Eliminating Hum

The main trouble with receivers which are operated from the A.C. mains is hum, and although smoothing circuits may be fitted to reduce the amount of hum, there

is always the possibility of hum being introduced through the medium of induction, and the only cure for this type of hum is complete and adequate screening, or wide separation of the components which carry alternating currents. Therefore, by using a separate small chassis for the mains equipment this may be widely separated to prevent hum being picked up by the H.F. or detector stage. This is done in the Armada Mains Three, where the mains unit is stood above the receiver chassis. We may go farther than this, however, as the low-frequency stages are very unlikely to suffer from the induction of A.C. currents, although, should they do so, the subsequent amplification is not sufficient to make the hum troublesome. The receiver may, therefore, be quite comfortably

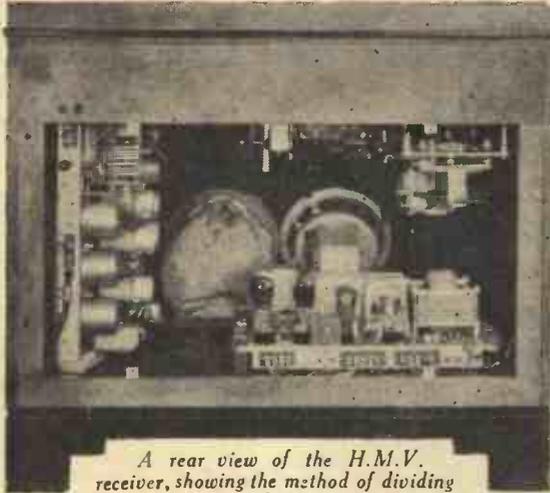
split after the detector stage, so that one chassis will contain the H.F. stages and the detector valve with its associated anode load, whilst the second chassis will contain the L.F. stages and the mains equipment. In this condition the experimenter has a very valuable arrangement, as he may try any type of circuit by building it on a separate chassis, connecting the finished apparatus to the amplifier, and, knowing the performance of this part of the complete equipment, he will be in a more favourable position to judge the performance of the experimental apparatus.

Easier Accommodation

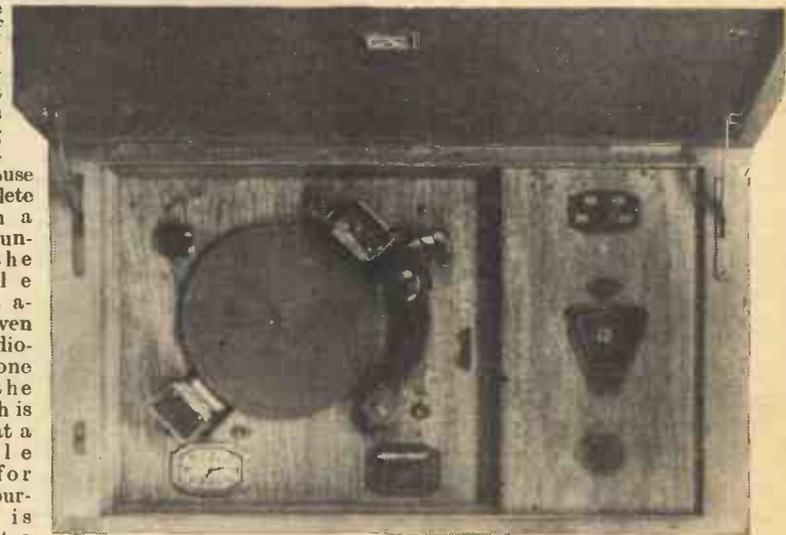
project through the front panel. Is it necessary, however, that this more or less "slave of fashion" scheme should continue? In wireless practice we find the same thing occurring as has been experienced in practically every other art—namely, something is done or ordered in the beginning, and then henceforth everyone follows in the same path, any deviation being looked upon as bad because it is unorthodox. If an examination is made of the receivers which have been described in our pages it will be seen that many unorthodox practices have been introduced. The efficiency of the receivers bears tribute to the fact that it is possible to be unorthodox and yet produce an improvement on standard systems. When a mains receiver is to be constructed we may look upon the receiver as consisting of two complete parts—the valves and associated equipment which are used for the wireless signals, and the accessories which are generally referred to as the "power pack." During the course of an experimental career it is highly probable that a constructor will wish to try out a number of different types of circuit in which more or less valves may be utilized. For each complete circuit he will, however, require power derived from his mains, and thus, although the circuits may take many different forms, the power pack could remain unaltered, provided the dividing point was correctly chosen. This arrangement is utilized in our Luxus Superhet, and in the more recent Armada Mains Three. It gives the constructor a mains unit which can be used with any type of set up to the capacity of the rectified output, but this is only a part of the advantage which the divided scheme provides.

In these days of multi-valve receivers it becomes something of a problem to house a complete chassis in a cabinet, unless the double scheme is adopted. Even with a radio-gramophone cabinet the shelf which is provided at a suitable height for control purposes is generally too narrow to accommodate a

really substantial chassis, and therefore the subdivided arrangement has to be adopted, with the result that the mains section, together with the L.F. equipment, is placed on the floor of the cabinet and this spacing undoubtedly does much to eliminate hum troubles. The question of the controls may also be considered, as it is obvious that the majority of people to-day do not like the appearance of a range of knobs on the front of a cabinet. Apart from the difficulty of the uninitiated knowing how to adjust more than three controls, there is the untidy appearance which results from vari-sized knobs, with white-filled lettering and the cut-out tuning scale which is seen on the majority of receivers to-day. By way of illustration concerning all the above-mentioned points, the two pictures on this page will give the reader a good idea of how these various points have been carried to a really logical conclusion. The receiver is the new H.M.V. radio-gram, and it will be seen that not only has the complete equipment been divided as mentioned above, but a further novelty has been introduced by mounting the H.F. and detector stages (this is a superhet) in a vertical position on the side of the cabinet. Another departure from accepted practice is to be found in the fact that the tuning and other controls are operated from one end of the chassis, and thus they protrude in an upward direction, and as the apparatus is a radio-gramophone, a space has been provided at the side of the turntable for the control panel. Here also are to be found the radio-gram switch, the on-off switch, and all other essentials, except the volume control. Thus, the lid is raised to tune in a station or place a record into position for playing, and the lid is then closed. Thereafter, if any modification in the volume of sound is required, one small knob situated on the front of the cabinet may be adjusted, and this is ganged to operate on both radio and gramophone.



A rear view of the H.M.V. receiver, showing the method of dividing up the complete apparatus.



This view shows the motor-board of H.M.V. Model 800 with the radio-control panel on the right.

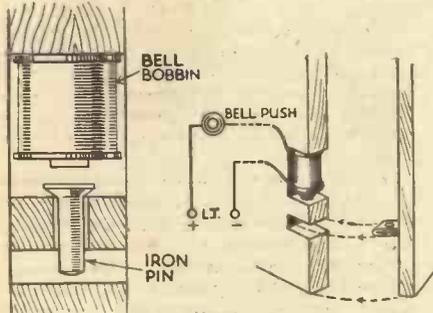


READERS' WRINKLES

THE HALF-GUINEA PAGE

A Novel Electric Lock

AN electric lock for a wireless cabinet can easily be constructed from a few odds and ends, as shown in the accompany-

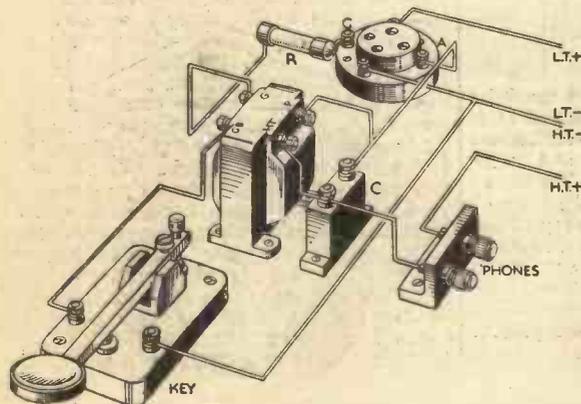


A novel electric lock.

ing sketches. The parts required are a small bell coil, one bell push-button, two strips of brass, one metal pin or nail. In the edge of the cabinet two slots are cut, in the upper one of which the bell bobbin is mounted. In the piece of wood separating the slots a hole is made to take an iron pin or top part of a stout nail, as shown. On the edge of the door a bent piece of brass, with a hole through it, is screwed in place so that when the door is closed the brass piece enters the lower slot, allowing the iron pin to enter the hole, so locking the cabinet. The winding of the bell bobbin is connected to the L.T. supply, a bell push being inserted in the circuit, as indicated. On pressing the push the iron pin is raised thus allowing the door to be opened.—R. HUGHES (Wallasey).

A Valve Oscillator for Morse Practice

THE use of an old interval transformer forms the basis of the idea described below. The transformer was used in a valve oscillator built for morse

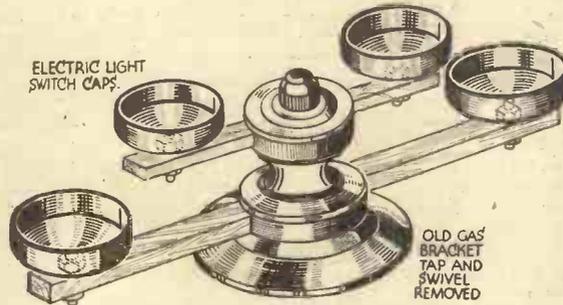


A valve oscillator for morse practice.

THAT DODGE OF YOURS!

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

practice, the circuit used being as shown in the accompanying diagram, in which R is a high resistance (a 4-megohm leak). If the valve still oscillates when the key is raised the value of R should be increased. The condenser C shorted across the primary of the transformer is optional; the larger the value of C the lower the note heard in the telephones. It is essential



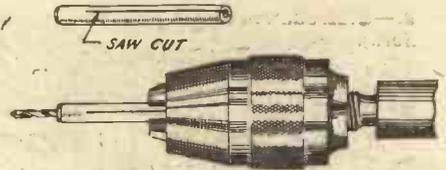
A holder for small screws.

that the transformer is connected up in the correct way. An old power valve was used with perfectly satisfactory results. If it is found that the note heard is too low, the core should be removed from the transformer and the strappings replaced one at a time until a suitably pitched note is heard. The core can then be built up with cardboard if it is desired to place the transformer back in its casing.—T. B. LANE (St. Albans).

A Handy Holder For Screws

THIS easily-made holder will be found very handy on the workbench. It is made with an old gas bracket, four electric light switch caps (either brass or bakelite) and two pieces of stripwood. I have used white bakelite covers, and washers large enough to cover the threaded holes are used to clamp the covers to the wooden rods by means of 6B.A. nuts and bolts.

Small screws, nuts, bolts, etc., can be kept always at hand in this simple holder, and small labels can be stuck on the side



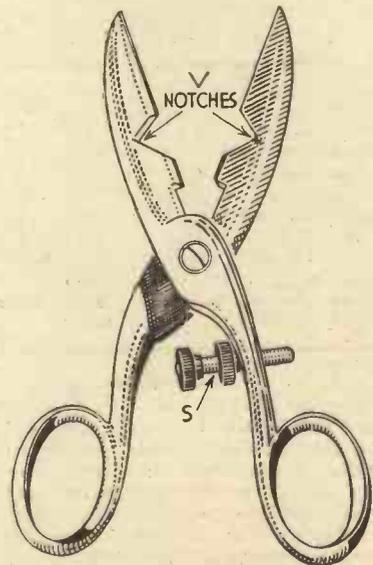
A useful device for safeguarding small drills.

of each "tray" to indicate the contents.—F. SANDERS (Paignton).

An Adjustable Wire Stripper

THE accompanying sketch shows a pair of buttonhole scissors converted for wire stripping. The "V" notches, which are bevelled to provide cutting edges, were formed with the aid of a triangular file. The gauge screw (S) limits the movement of the blades. To set the screw the scissors are lightly closed on a bared portion of the wire in use. The screw is then adjusted to restrict further movement, and locked by means of the milled nut. In the wire stripping operation the wire is placed in the "V" notches, and the blades closed as far as the screw will permit. The wire is then rotated and pulled, when the insulation will come off in the form of a tube. By suitably filing the edge of the blades, other uses may be found for these scissors.—STEENSON RAINEY (Wishaw).

(Continued on next page)



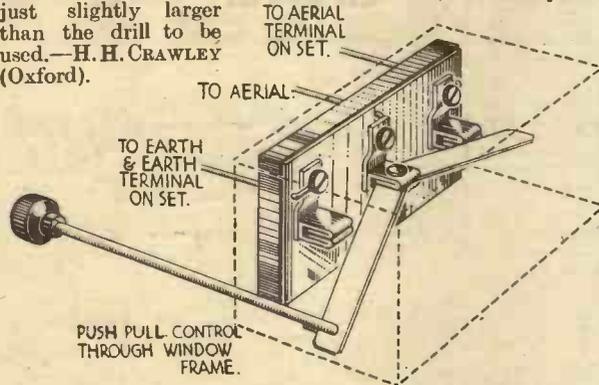
A handy adjustable wire stripper.

READERS' WRINKLES

(Continued from previous page)

Safeguarding Small Drills

UNLESS great care is taken when using small diameter drills breakage is almost certain owing to the drill bending and then snapping off. This can be obviated by using a short, hard brass sleeve having a longitudinal saw cut, as shown, to within a quarter of an inch of one end. The saw-cut enables the sleeve to grip the drill when the whole is assembled in the chuck. The bore of the sleeve should be just slightly larger than the drill to be used.—H. H. CRAWLEY (Oxford).



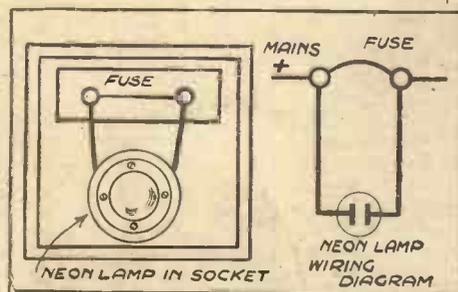
A novel aerial-earth switch.

An Improved Aerial-Earth Switch

FIRST of all remove the knife blade and insert a strip of copper after bending it at an angle of about 14 degrees. Drill a hole in one end and attach a 2 B.A. rod with an ebonite knob at the other end (the length of the rod will vary according to the size of the window frame). Drill a small hole through the window frame and insert the rod, then fix the switch outside, as usual. The knob, of course, operates from inside the window frame and the switch can be cased in, as indicated, to make it weather-proof.—D. A. GREEN (York).

Self-indicating Fuse

A RATHER novel self-indicating fuse can be constructed by shunting a neon lamp across a fuse board. A standard 220-260 volt neon lamp can be purchased through any electrical dealer for about 3s. Fix a bulb socket beside the fuse and



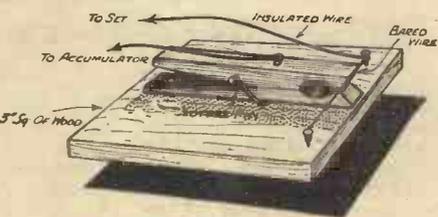
A self-indicating fuse.

connect the terminals of the latter to the socket as illustrated, and insert the neon lamp. As it contains no filament inside it offers no resistance and consumes no current so long as the fuse remains intact. But on the fuse burning out the current will pass between the electrodes inside the lamp and impart a soft red glow.

An Easily-constructed Wireless Switch

THE only materials required for this novel switch are: one wooden spring clothes-peg, one piece of wood 3in. square by 3/16in. thick, two lengths of copper wire, and four 1/2in. nails. Use two of the small nails to fix the clothes-peg to the 3in. square of wood, then drive into the square of wood the other two nails, one on each side of the jaws of the clothes-peg. Attach one length of the insulated copper wire to one of the nails, then across the lower jaw of the clothes-peg, and attach to other nail. Next, attach the other length of insulated wire to the top of clothes-peg, then bring it over the front and underneath the top half. Bare the copper wire where it touches the other wire, which must also be bared, i.e., in the jaws of the clothes-peg. Now bare the other ends of the insulated wires and attach one of them to the positive terminal of the

accumulator and the other accumulator terminal (L.T.) to the wireless set. Switch the set on, and it can then be switched off and on either by hand, or by placing the switch on the floor and working it with the foot (a method which will probably greatly mystify listening friends).



A novel switch which has some useful applications.

A Turntable for a Portable Wireless

THE sketch shows how a turntable can be made for a portable wireless. All the parts that are required are given below.

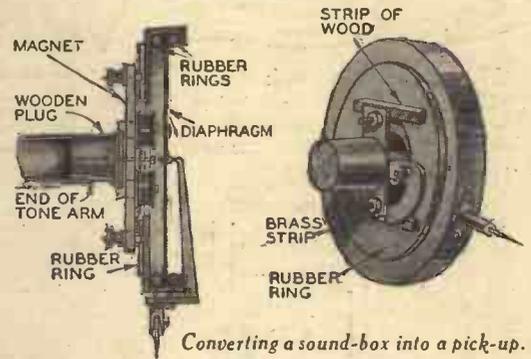
- 2 pieces of wood 15in. long 1ft. wide and 1/2in. thick.
- 2 pieces of wood 15in. long, 1 1/2in. wide and 1/2in. thick.
- 2 pieces of wood 9in. long 1 1/2in. wide and 1/2in. thick.
- 1 cotton reel with 1/2in. flange.
- 1 1/2in. screw.
- Half-a-dozen 1/2in. nails.

Take one of the large pieces of wood for the stand and nail the four smaller ones around the top edge. Saw the cotton reel through 1/2in. above the flange and screw this in the centre of the stand. The top of the boards which are around the edge of the stand must be level with the top of the flange of the cotton reel. A hole is then made in the other large board so as to enable the cotton reel to pass through it. The flange of the cotton reel now acts as a turntable for the top board, upon which the set is placed.

Home-made Pick-up

MOST amateurs have in their "junk-box" an old telephone ear-piece and possibly possess a portable gramophone

whose sound-box is no longer a thing of value. The diaphragm and needle-arm are removed from the sound-box, and the cylindrical piece which fits into the tone-arm is sawn off and the hole enlarged by drilling, or filing, until the pole-pieces and coils of the earphone magnet (previously removed) can pass freely through it.



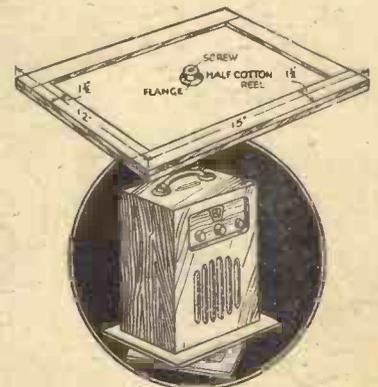
A ring of rubber is then cut from an old motor tube, having the same outside diameter as the sound-box, the inside diameter being slightly larger than that of the hole made in the sound-box.

Near the edge of the hole in the sound-box two 1/2in. holes are drilled diametrically opposite each other.

A piece of stout brass plate is then cut, 1 1/2in. long and 1/2in. wide. This is then drilled with three holes, the two outside ones being exactly the same distance apart as those in the sound-box. A wood screw is passed through the central hole into a slightly tapered cylindrical piece of wood about an inch long to fit tightly into the tone-arm.

Two 1in. screws are then passed through the holes in the sound-box and the rubber ring placed in position on the back of the sound-box. The magnet is then placed in position resting on the rubber, and made stable with small strips of wood. The brass plate is then placed over the screw ends, and nut screwed on to clamp the magnets tightly in position. These nuts provide a means of adjusting the distance between the magnet poles and the diaphragm. The mica diaphragm of the sound-box is then replaced by the iron one of the earphone, which is drilled with a central hole for the purpose.

Leads from magnet coils go to the usual points on the set. The heaviness of the unit can be overcome by arranging a counterpoise on the tone-arm.



A simple turntable for a portable receiver.

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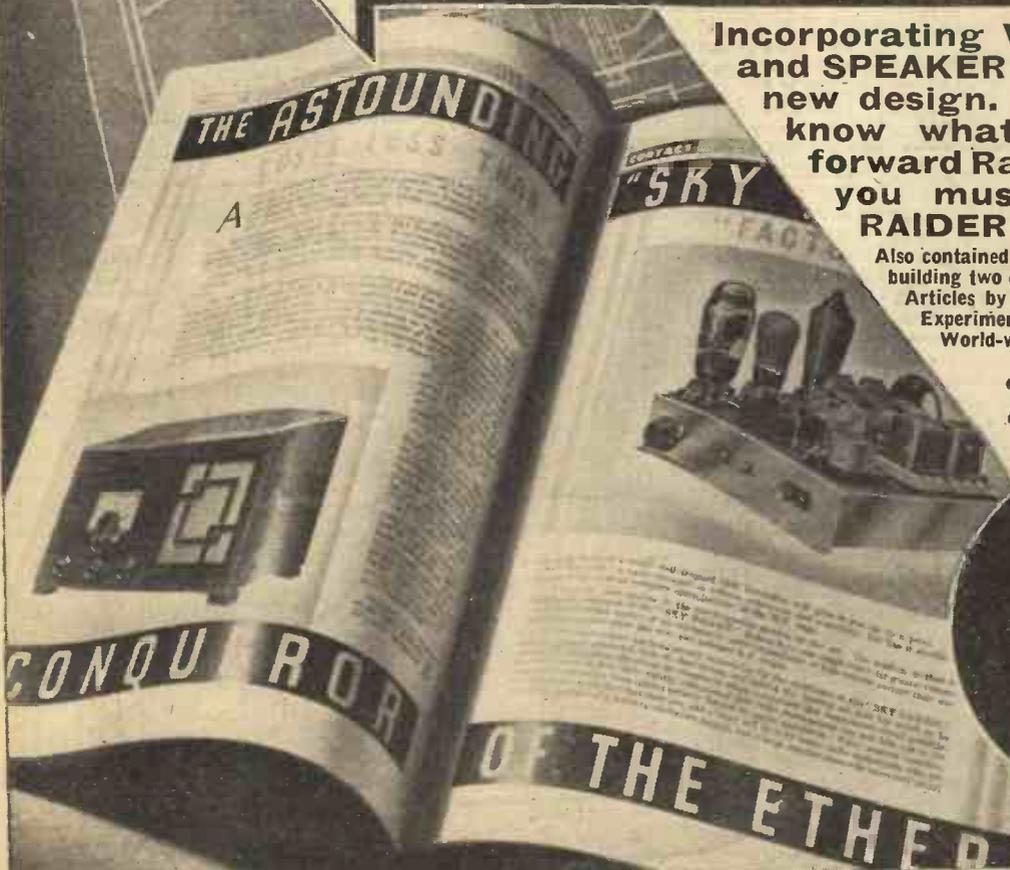
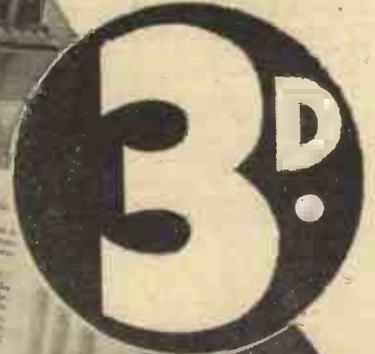
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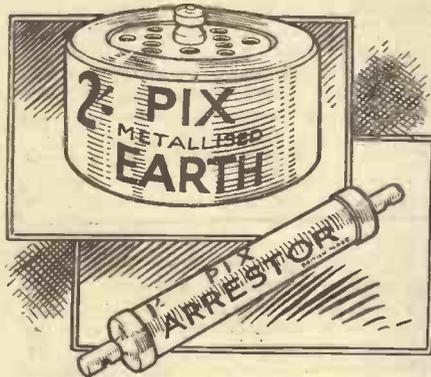
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NEW COMPONENTS AT OLYMPIA

Some Details Concerning a Number of Interesting Components which appeared at the Recent Radio Exhibition

ALTHOUGH the recent exhibition featured radio receivers as the main portion of its exhibits, there were several stands upon which components specially designed for the home constructor were to be seen. It was noticed that of these many were shown for the first time, and low price was one of the principal points of interest. On this page may be seen some sketches drawn by our artist during a tour of the exhibition, and no doubt constructors will be very interested in details concerning them. The British Pix Co. had two new items, both designed for improving aerial and earth efficiency. The importance of a low-resistance earth connection has been many times stressed in these pages and various suggestions



Two useful aerial-earth accessories.

have been made by readers, and a number of firms have produced commercial forms of chemical earth. The Pix metallized earth consists of a small can with a perforated top to which is attached a substantial terminal. The earth wire is attached to this terminal and the can is buried. Moisture in the earth renders the chemical active, and in a short while the whole of the surrounding earth is rendered moist, and remains in this condition almost indefinitely. The only point which requires attention is the attachment of the earth wire to the terminal and it will obviously be necessary to periodically inspect this connection unless a soldered joint is made, painted, and wrapped with insulation tape or some similar medium. The can is of copper, and is thus rot-proof, and the constituents of the earth are guaranteed harmless to plants and animals.

As a safety precaution many listeners prefer to have some form of lightning arrestor in the aerial circuit, and the neat arrestor shown with the Pix earth is designed to link the aerial and earth wires, which are simply passed through small holes in the ends of the device. Signals are unaffected by this connection, but a powerful static discharge will pass through the lower resistance circuit to earth, and thus prevent damage to the tuning coil or other parts of the apparatus. As may be seen from the sketches, these two devices cost 2s. and 1s. respectively, and with the latter device a full insurance is provided.

Bulgin Accessories

The Bulgin stand formed a most attractive display, and it was noted that several

components had been reduced in price, and amongst the new lines were some very interesting items shown in the sketch at the foot of this page. For switching purposes various suggestions have been made, and various types of contact have been devised from time to time to avoid the difficulty of noises and poor contacts caused by weakened springs and other defects. The rotary stud switch (1) is a panel-mounting device of the normal one-hole fixing type, and it will be seen that a spring arm bears on small tags, and thus cleans the contact points as it is operated, and is similar in this respect to the old-fashioned selector switches which graced the panels of the early wireless receiver. Connection to the contact points is made highly satisfactorily owing to the fact that the wires have to be soldered, and a switch of this nature should give years of service. It is available in three types, three-way, four-way, and five-way, the prices being 1s. 6d., 1s. 9d., and 2s. The toggle switch, provided with a rotary movement instead of the familiar dolly action, is also shown (2), and this forms a very neat method of mounting a switch on the panel in order to maintain symmetry in control layout. This is obtainable in all the usual types, such as on-off, D.P.D.T., 4-point, wave-change, etc. A switch of more complicated form is shown in (3), and this is designed primarily for wave-change purposes. The action of this switch is very definite, and again a trouble-free type of wiping contact is provided, and the contacts are so designed that the switch may be used with practically any type of coil.

When constructing a mains receiver, it is generally found that a number of resistances have to be connected to the voltage supplies, and it is often convenient to connect these resistances together at one end in order to simplify construction. The illustration (4) shows a device which Messrs. Bulgin have termed a "group board," and this has spring clips provided with solder tag ends, and is designed to hold resistances or tubular condensers, and will be found of great use in both mains and battery receivers for simplifying the connection of these parts. The base is constructed from bakelite, and is attached to the chassis by two screws. It is obtainable in five-way and ten-way types.

The suppression

of interference from the mains is usually carried out by connecting two fixed condensers across the mains with a centre-point earthed, and although several suppressors specially designed for this purpose are obtainable, the connection of the device is rendered exceedingly simple in the new Bulgin Suppressor shown at (5) in the sketch. As may be seen, this consists simply of a plug which is fitted with pins on one side and sockets on the other, and it is interposed between the receiver plug and the mains socket, and thus connects the suppressor condensers in circuit without any difficulty. The addition of an earth wire is all that is required.

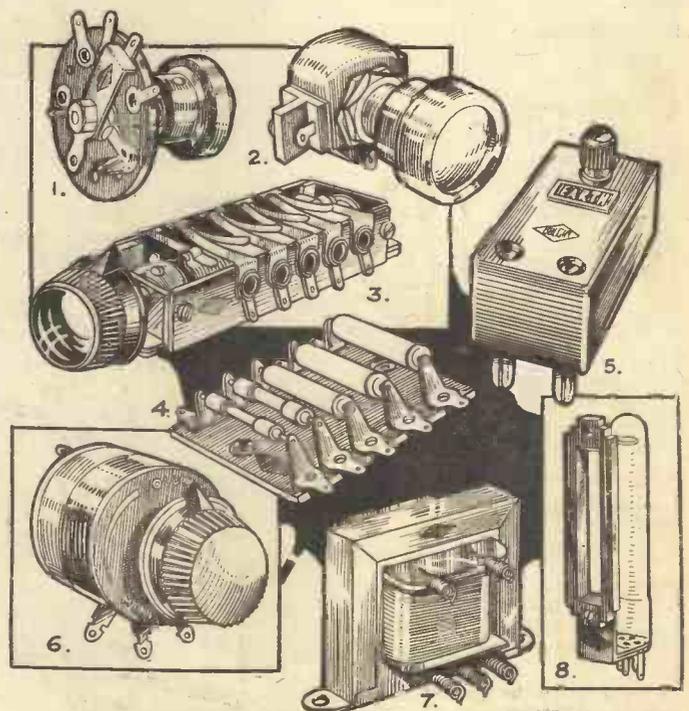
Volume controls have previously been dealt with, and the model shown in (6) is one of the three-watt type controls manufactured by Messrs. Bulgin, and may be used for various purposes in mains receivers.

A skeleton Q.P.P. transformer is also obtainable in the new Bulgin range, and this is provided with leads instead of terminals, and consequently is obtainable at low price.

For visual tuning, the new Corsor neon will no doubt prove very attractive during the coming season, and a special holder with a small escutcheon has been designed by Messrs. Bulgin, and is shown in (8). This will add to the appearance of home-constructed receivers as well as providing a useful indication for tuning purposes where A.V.C. is fitted.

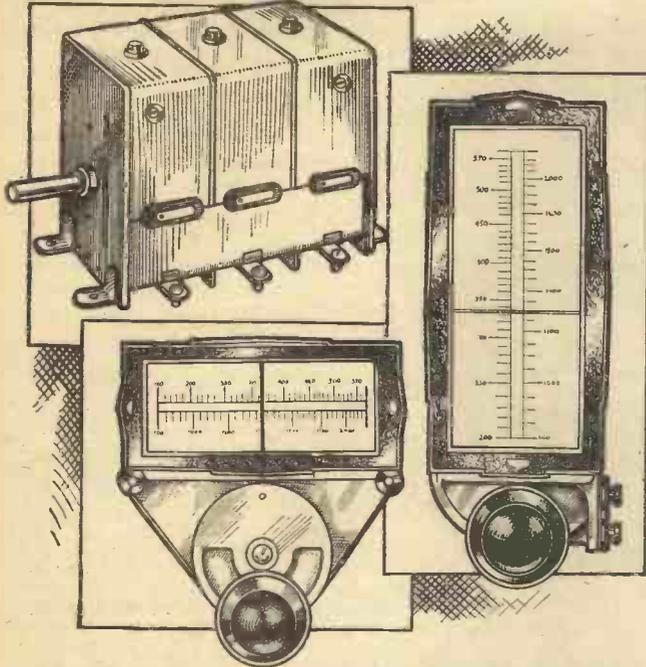
Some New Polar Devices

We have already mentioned the Polar Midget Variable condensers, and the three-gang model shown on the facing page is only approximately 2in. wide by 3in. high by 5in. deep. It will thus be seen that



A collection of Bulgin accessories which will be found very valuable for the experimenter.

it enables a very compact receiver to be constructed when modern iron-core coils and other midget accessories are employed. For tuning indication purposes the drives shown with this condenser are very satisfactory, and these provide a full vision

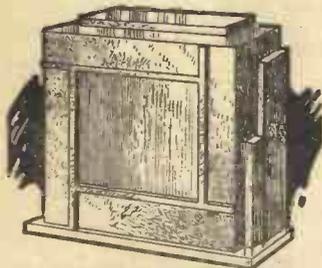


A Midget condenser and two drives from the new Polar range.

scale with a very smooth action and a pointer which is clearly visible, and thus provides a very accurate reading of the condenser setting. The escutcheons are of moulded bakelite, and are attached to the panel by bolts which are fixed to the moulding, and thus no difficulty is experienced in giving a receiver a really finished appearance.

Baker (Selhurst) Radio

A new type of speaker was produced by Messrs. Baker for the coming season,

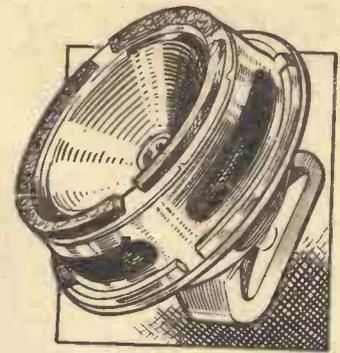


The new Fydelitone speaker produced by Baker (Selhurst) Radio.

and was seen at the Exhibition for the first time. This is known as the Fydelitone and is obtainable in two models, the major (45s.) and the minor (35s.). A matching transformer is included in the cabinet, which is of modern design, moulded in bakelite and obtainable in walnut or black and chromium. The overall dimensions are only 8½ in. by 8½ in. by 3 in., and a new type of permanent magnet manufactured from nickel aluminium steel gives very high efficiency in a minimum of space. If it is desired to use the speaker with an existing output transformer, it may be obtained without the transformer for 37s. 6d. and 29s. 6d., respectively.

The Sinclair Speaker

A loud-speaker of very novel and striking appearance is shown at the top of this page, and this is a matched two-in-one speaker, manufactured by Sinclair Speakers, a firm which, of course, specializes in speaker manufacture. A 9 in. cone operated by a special cobalt steel magnet (or an energized field where desired) is mounted in such a manner that an extension chassis may be bolted to it, and this extension has a ring magnet which operates a special high-impedance speaker coil attached to a 5 in. or 7 in. cone, the common output transformer being connected to act as a choke for this second speaker. The construction is very novel, and the speaker may be obtained with one permanent magnet and one energized or with two permanent magnets for 84s.



A very original loud-speaker. The new Sinclair Dual 2-in-1.

Belling Lee

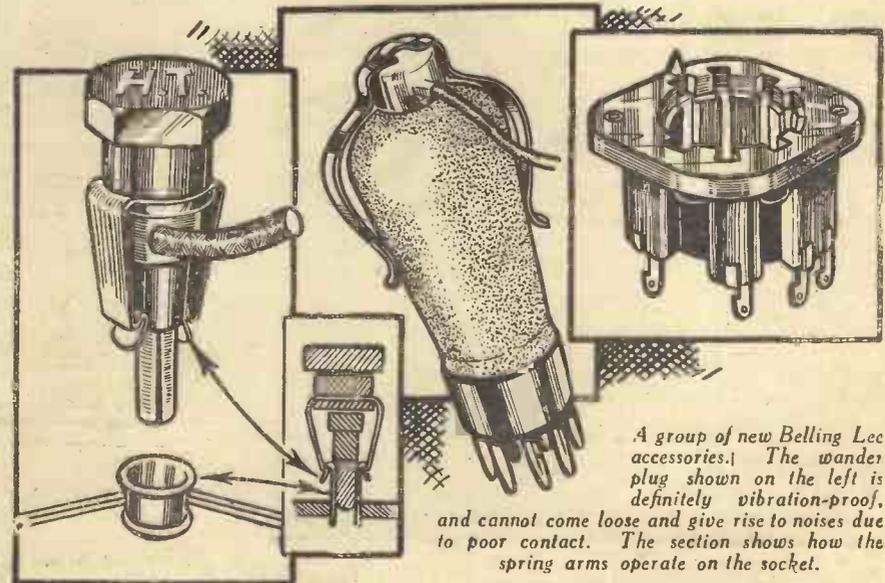
We have already mentioned in our pages the novel valveholder which has been

developed by Messrs. Belling Lee for the new side contact valves designed for universal mains working. The sketch on this page gives a very good impression of the method in which the contacts are embedded in slots in the moulded space, and it will be seen that this method of construction renders the valveholder very efficient and removes all the solid material from inside the pins and thus reduces the capacity. Connections are made by means of soldered joints to the lugs, which may be seen at the bottom of the holder, and these are actually continuations of the contact strips.

A wander plug may be the cause of very much trouble, although being a small

component it very often does not receive the attention which is warranted by its use. The plug illustrated in the Belling Lee group is known as the Air Force wander plug on account of the fact that it has been developed especially for use in the Air Force where vibration would be likely to loosen an ordinary type of plug. In addition to the normal pin which makes contact in the socket, two spring-arms are provided and the socket with which the plug is used is provided at its upper surface with a lip. Consequently when the plug is pushed home, the springs grip the top of the socket and it is thus impossible to move the plug without opening the arms which requires some force. The small section of the plug will give a very good idea of the complete arrangement.

For making connection to the top tap of the screen-grid valve, a novel combined device has been developed which also makes connection with the metallized coating of the valve, and thus renders much quieter working possible. The lead is passed through a small opening at the side of the plug and a spring contact enables it to be instantly placed into position. By using a metal screened lead, the screening also may be earthed through the medium of the cap and the spring arms. This top cap connection problem requires a certain amount of care in view of the fact that now certain valves are being made with the grid connected to the top of the valve instead of the anode.



A group of new Belling Lee accessories. The wander plug shown on the left is definitely vibration-proof, and cannot come loose and give rise to noises due to poor contact. The section shows how the spring arms operate on the socket.

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AN ALTERNATIVE STATION CONTROL

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THE one outstanding disadvantage of the modern D.C. all-mains wireless set is that it cannot be easily moved from room to room. This means that most listeners have to content themselves by installing the instrument in the place where it is likely to be used most, and running loud-speaker extension leads to the other rooms.

It is not a very satisfactory arrangement. Even if some form of battery-operated relay switch has been rigged up so that the set can be switched on and off from the extension, it does not help the listener when he wants a change of programme. Then he has no alternative but to walk back to the other room, taking the loud-speaker with him, if he has only one, to do a little tuning.

Often he thinks what a difference it would make if he could only install some device that would give him a choice of programmes from the extension room at the touch of a switch, but up to the present no satisfactory arrangement of this sort has been suggested.

Now the solution of the problem is here. The alternative station control herein described has been designed not only to overcome this difficulty, but also to simplify the operation of the set for those members of the family who are not very expert at tuning in. Once fitted, it enables anyone to switch on either of two previously-determined stations from any room in the house to which the extension is run. No batteries are required, and only a length of double lead-covered cable and a single wire need be run from room to room; in fact, it is just as easily wired as an ordinary loud-speaker extension.

The Working Principle

The principle of the alternative station control is quite simple. When it is in action, each essential tuning condenser in the set is supplemented by a small pre-set condenser, adjusted to bring the wavelength up to that of the station required when the former is left at zero. One of the mains leads is left connected to the set, but the other feeds it through one of the extension wires, from the room in which the loud-speaker is being used. The

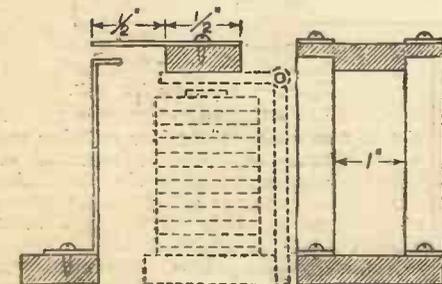


Fig. 2.—The automatic switch contacts.

second extension wire is also used to feed the set in the same way, but in this case the current is first made to pass through an electro-magnet which operates an automatic switch. The engagement of this switch brings into circuit another set of pre-set condensers which boosts up the wavelength to that of the second station available.

A pair of ordinary tumbler switches, fitted in each room to which the extension

Pre-set Condenser

A modern three-valve set having one tuned H.F. stage, may demand only the same number of pre-set condensers—two to cover the aerial tuning and two the H.F. tuning—for probably no reaction need be used to get either of the two local stations at full strength. But if the alternative

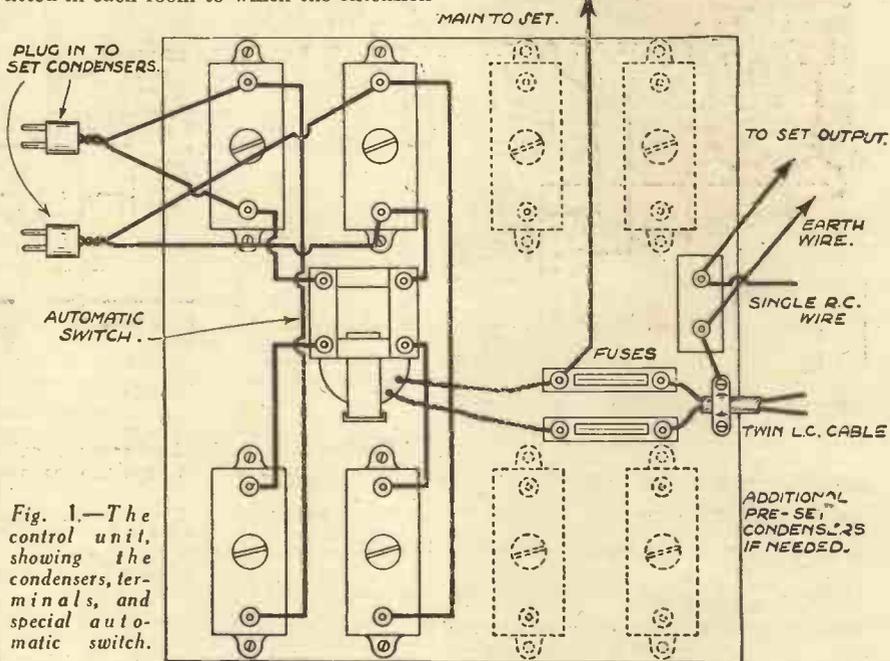


Fig. 1.—The control unit, showing the condensers, terminals, and special automatic switch.

runs, allow the current to be passed through either wire to the set; therefore, either of the two stations can be switched on or off at will. The single wire feeds the loud-speaker, whose return circuit is completed through the lead-covering of the cable.

The Control Unit

The control unit attached to the set costs very little to make, the chief item being a number of small-capacity pre-set condensers. These are quite cheap to purchase and, at the most, half a dozen are needed. The exact number required depends upon the design of the set and the strength of the two stations to be brought in. Actually, two pre-set condensers are wanted for every variable condenser in use on the set when either of these two stations is tuned in.

For instance, with any ordinary two- or three-valve set incorporating no tuned H.F. stage, reaction will probably have to be used to bring one of the wanted stations up to strength. In this case four pre-set condensers will be needed—two to take the place of the tuning condenser and two for the reaction condenser.

station chosen is a distant one and reaction becomes necessary, then two extra pre-set condensers, making six in all, must be used. A powerful five-valve set, incorporating two screen-grid valves with tuned circuits, should require only the same number, for with an instrument of this sort reaction is seldom called for.

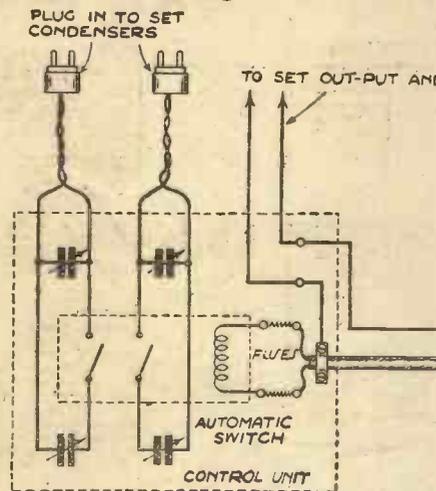
First, inspect your set, tune in the stations likely to be wanted, and decide on the number of pre-set condensers needed. Remember that the units of a ganged condenser must be considered independently in spite of the one-knob control. As near as possible, to each of the condensers affected, fit the base of a small two-pin plug, connecting the two sockets one to either terminal of the condenser. Be careful to keep the leads as short as possible and yet fix the plugs in an accessible position so that the pins can easily be withdrawn when it is desired to put the alternative station selector out of action, and use the ordinary tuning controls.

The control unit is built up on a base-board large enough to carry the requisite number of condensers, the special auto-

matic switch, and six small terminals (See Fig. 1). For the average set, where two tuned circuits are to be controlled, a base-board 6in. square will do nicely—or a standard-size cigar box will accommodate the whole thing.

The Automatic Switch

This is the variable quantity, so it is best to get this rigged up first, and then mount the condensers and terminals in the most convenient positions. It will facilitate matters if an old car-lighting cut-out from some local garage can be obtained. Any type will do, and its condition doesn't matter as long as it includes a "heavy-wound" electro-magnet in working order, and a soft-iron armature for it to pull down. If this is not forthcoming, an electric bell will serve just as well when the small electro-magnets have been re-



placed by one with a much heavier winding—capable of carrying at least half an ampere.

The Winding

The size of this winding is most important, so before going ahead it is as well to test it out. Hook it up in series with the mains running to the set by breaking a connection at some convenient point—the wall plug—in either of the leads and joining it in between. Directly you switch on the magnet should pull down the armature, which is normally held a little away from it by the action of a spring.

If the magnet works but the set will not function properly, this proves that the winding offers too much resistance, and must be replaced by one for which a heavier gauge of wire has been used. With too heavy a winding, the magnet will not become sufficiently energized to attract the armature. Should this state of affairs arise, make certain, before you go in search of another magnet, that the trouble is not being caused by the return spring being unreasonably strong. It need only just lift the armature away.

For each pair of pre-set condensers in use a pair of contacts will be needed on the automatic switch (see Fig. 2). In the case of the average set, that will mean two pairs of contacts. They can all be conveniently made from thin 1/16in. brass strip. The moving contacts fixed to the armature are simply inch lengths of this strip mounted 1/16in. apart on a 1/8in. wide strip of ebonite, so that they project over the edge. A single screw will serve to hold each strip in position

if the back edge is bent over to prevent it from swivelling. The ebonite is mounted on top of the armature right at the end so that the contacts form extensions to it.

The Fixed Contacts

Before making the fixed contacts it is best to mount the electro-magnet on the baseboard—in an upright position, of course. Another piece of ebonite, exactly the same size as the first, is now screwed down on to the baseboard, parallel with its partner but 1/4in. in front of it. This ebonite carries the fixed contacts, which are simply suitable lengths of the brass strip cranked so that they will meet the moving contacts when the armature is drawn down. Only a small clearance, say 1/16in., is necessary. Small contact points can be riveted in if desired, but they are not essential.

Next secure the pre-set condensers on the baseboard, grouping them in such a way that a clear space is left at one of

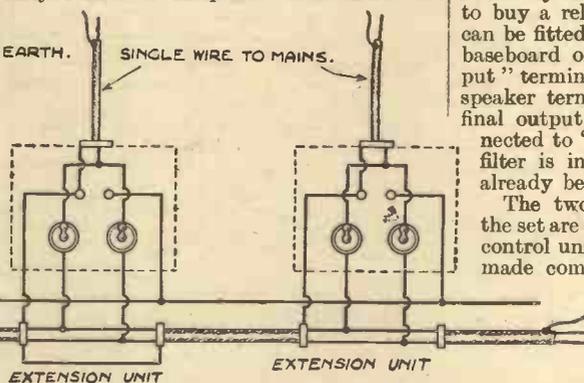


Fig. 3.—The wiring diagram.

the edges where the lead-covered cable can be brought in. As both the leads of this cable will be connected to the mains, a pair of safety fuses will be needed. These fuses are easily made by mounting two terminals—the insulated type are best—1 1/2in. apart, on a 1/4in. ebonite strip. Distance pieces keep the fuses clear of the baseboard, and they are fitted an inch or so away from the edge at right angles to it. The remaining two terminals, which will be used for the loud-speaker connections, can conveniently be mounted on ebonite in a similar way and fixed parallel to the edge of the board.

The Wiring

This is shown in Fig. 3. One of each pair of pre-set condensers is fitted with a twin-flex lead of suitable length, terminating in a two-pin plug which will engage one of the sockets fitted in the set. In addition, one of its terminals must connect it to its partner, and the other to a fixed contact on the automatic switch. The corresponding moving contact is coupled to the unoccupied terminal of the partner.

The cable is secured at the edge of the baseboard by means of a small clip, which must make good connection with the lead covering. The two leads are taken, one to either fuse, the second terminals of the fuses being attached to the two wires from the automatic switch coil. In both cases, the circuit is completed through a piece of 2-ampere fuse wire joining the two terminals. From either of the fuse terminals carrying the coil

wires a lead is taken off for subsequent connection to the mains input of the set.

Only the two output terminals remain, but before dealing with them it is necessary to inspect the set again. Most D.C. all-mains instruments are provided with a suitable output transformer, or filter, which obviates the necessity of connecting the loud-speaker direct to the high-tension supply. Actually, when a loud-speaker extension of any sort is installed, such an arrangement is essential to comply with I.E.E. regulations.

An Output Transformer

Make sure that the output terminals of the set are fed from a transformer or through condensers. If you find that one of them runs direct to the plate of the last valve, and the other to L.T., an output transformer must be added. There are plenty of suitable ones on the market and they are not expensive—but it pays to buy a reliable brand. The transformer can be fitted either inside the set or on the baseboard of the control unit, the "input" terminals being connected to the loud-speaker terminals of the set. One of the final output terminals must then be connected to "earth"—if the transformer or filter is included, this connection might already be made.

The two final output terminals from the set are joined to their partners on the control unit, the earth connection being made complete by a wire running from the appropriate terminal to the lead covered cable. So the lead covering, besides acting as one of the loud-speaker feed wires, is earthed, and the wiring automatically complies with the I.E.E. regulations in this respect. The unearthed output terminal on the control unit takes the single wire which accompanies the lead-covered cable on its extension trip. Ordinary bell wire will do, but single rubber-covered flex is much better. Incidentally, this is the best material to use for wiring the control unit and extension units.

The Extension Unit

Presumably, an extension unit will be wanted in the same room as the set, so that full advantage can be taken of the alternative station idea. These units con-

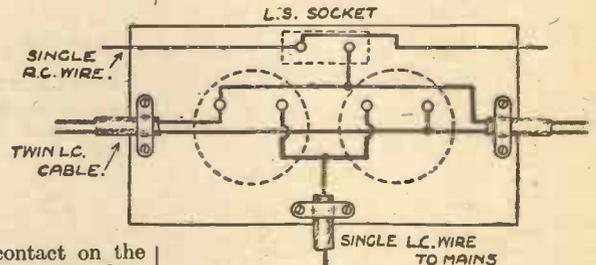


Fig. 4.—The extension unit.

sist of two ordinary tumbler switches and a loud-speaker plug-socket mounted on standard blocks, as used for electric lighting (see Fig. 4). Before going ahead with the extension wiring, it is best to get this first extension unit in action. The block can, of course, be fixed in any convenient spot in the room, not necessarily anywhere near the set. Probably the most convenient place to put it is on the skirting board, in which position it is

easily wired and can be tucked out of the way—the switches being operated with the foot.

With all extension unit wiring, provision should be made to run the lead-covered cable and single wire right through the block where possible, looping in the required connections. Where this is not convenient a tapping can, of course, be taken off the extension cable at any point by fitting an ordinary lighting junction box and off the loud-speaker feed wire.

Where the lead-covered cable runs into the block it is again secured by a clip connected to one of the loud-speaker sockets. The other loud-speaker socket is fed from the single wire. The two cable leads run out to each switch, the other two switch connections being joined together. If the cable is being continued through the block, another clip is used at the outlet and connected to the first one, so that the earth connection will be maintained.

Last comes the feed cable from the mains. This is a single lead-covered cable—if none is available some of the double variety can, of course, be utilized, running from the inter-connected switch terminals to the nearest suitable plug or switch. The covering is earthed on entry to the block by the usual clip connection.

The question of a suitable pick-up point for this feed cable is rather an important one. If the set is being run from the power mains, only a power plug will serve. But where the lighting current is being used—as it is in most cases—almost any lighting plug or switch will meet the case.

Let us take it that the control unit and first extension unit are in position—the only wires remaining disconnected being this feed wire to the block and the mains lead from the control unit to the set. Just plug the loud-speaker into the block and switch on the set to see that it is alive. Now for a few experiments.

Experimenting

If you intend to feed all the extension units from plugs where either main can be picked up, there will be nothing to bother about. You need only disconnect one of the existing feed wires to the set and replace it by that from the control unit. Then, with one of the tumbler switches down, try the single cable from the extension unit first in one socket and then the other of the nearest plug—taking care that it is lighting or power, as the case may be. In one case the set will come alive—and it only remains to make the connection permanent.

But if you want to pick up from a switch anywhere, you must make certain that the right main will be available. Generally, only one of the mains runs to the switch, but if the house wiring has been carried out systematically, it will always be the same one. Proceed exactly as before, and try the single cable on the nearest switch terminals—with this particular switch off—instead of in the plug sockets.

You will find that the set will probably come alive in one case—if it doesn't, the lamp will probably light dimly. This is a sure sign that the wrong main is the only one available, but, fortunately, it is easy enough to change over at the set. Simply replace the feed wire you discon-

nected and put the lead from the control unit in place of the other one. Then try again.

The Setting of the Control Unit

The extension leads are continued and the other extension units wired in exactly the same way, the single cable being tried on either terminal of the nearest switch or plug. But when you are testing out, make certain that the only extension unit switch in action is the one from which you are working. If another switch has been left on and you pick up the wrong main, you will get a "dead short" instead of the usual "no effect." Of course, in carrying out this part of the work you must be careful to switch off from the main whenever necessary, and keep an eye on the lead-covering of the cable when making temporary hook-ups. It must not make any stray contact with a plug or switch.

Finally comes the setting of the control unit. See that all extension unit switches are off, plug the loud-speaker into the block near the set and try the two switches in turn. The set will come alive in either case but the automatic switch on the control unit will only click down in one instance. With the automatic switch out of action, tune in—by means of the pre-set condensers plugged into circuit—one of the stations you want, the one working on the lower wavelength. The variable condensers on the set should, of course, be at zero.

When the station is obtained satisfactorily, change over to the other circuit, bringing the automatic switch into use, and with the second group of pre-set condensers increase the wavelength, and adjust the reaction if necessary for the second station required. After a little readjustment, you should be able to get either station immediately at just the right strength by putting down the appropriate tumbler switch.

Switching on from Any Room

From any room you will now be able to switch on either station—if several switches are on at the same time any low wavelength one will take predominance. Only one loud-speaker is needed, but if others are left plugged in they will be in circuit whenever the set is alive. No tuning will be necessary, so you can hide the wireless set away in a cupboard if you like.

If an outside station is wanted at any time, and the wavelength is above that of the lower wavelength "chosen" station, you will be able to tune it in with the variable condensers on the set—switched on and off from any low wavelength switch. Alternatively, the plugs can be removed in an instant and the set tuned normally if you feel like station hunting. In this case any extension switch will serve.

Be careful after any expedition of this sort to replace the plugs and set the variable condensers to zero.

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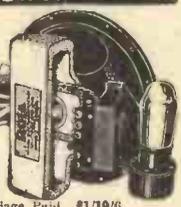
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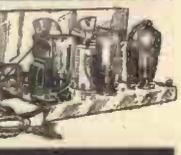
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FURTHER NOTES ON GANGING

Some Hints Regarding the Adjustment of Tuned Circuits

WHEN several tuned circuits in a receiver are used the set constructor more often than not experiences considerable difficulty in ganging the circuits properly. There are so many conditions that must be satisfied before such operation is accomplished correctly. Certainly, many carefully designed circuits, both factory made and home constructed, do give satisfaction, but it is not always found that they are as selective as they might be, and while they might be quite all right at one point on the tuning dial they fail at other points.

Correct Condenser Design

It can safely be taken for granted that the first condition which must be satisfied is equality of the rate of change of the capacities of all the condensers comprising the gang. This would not mean, of course, that all the condensers must be equal, although if they are equal the condition is more likely to be satisfied. Equality of the rate of change of the capacities does not alone depend on the construction of the condensers, but the distributed capacities of the circuits have to be taken into account. The distributed, or zero, setting capacities can always be equalized so that this condition really depends upon the construction. High quality condensers, rigidly constructed, made of plates of equal thickness and spacing are usually sufficiently alike to satisfy the condition. If condensers of different types are used it is practically impossible to use them satisfactorily. The corresponding plates of the condensers should have been cut with the same tools, out of the same stock, and in jigs made with the same tools. Not only is this a definite requirement but each set of rotary plates must be mounted in the same manner with respect to other conductors, such as shields, frames, and coils. If we assume that all the condensers in the gang are equal with respect to the rate of change of capacity when the gang condenser unit is mounted in the receiver, not counting the effect of distributed capacity, several means can be found of effecting equality of the tuned circuits right through the tuning range. Shields around or near a coil will change its effective inductance, and this change will depend on frequency. The effect is usually to decrease inductance because of the bucking effect of induced currents in the shielding. Essentially, the remedy for this defect is to mount every coil in the same manner with respect to the shielding, and since it is a fact that different metals will react differently, the shields should be of the same type and thickness of metal. Another reaction effect is that of the primary of a coil on the secondary coil winding. The mutual inductance between the primary and the secondary will change the effective inductance in the secondary, and, therefore, the required capacity to tune the secondary to a given frequency. This demands not only that the primaries be equal, but they should be correctly placed and spaced in relation with each other and the secondary coils. Care should also be taken to choose the same type of valve to precede each primary winding.

Choosing Coils

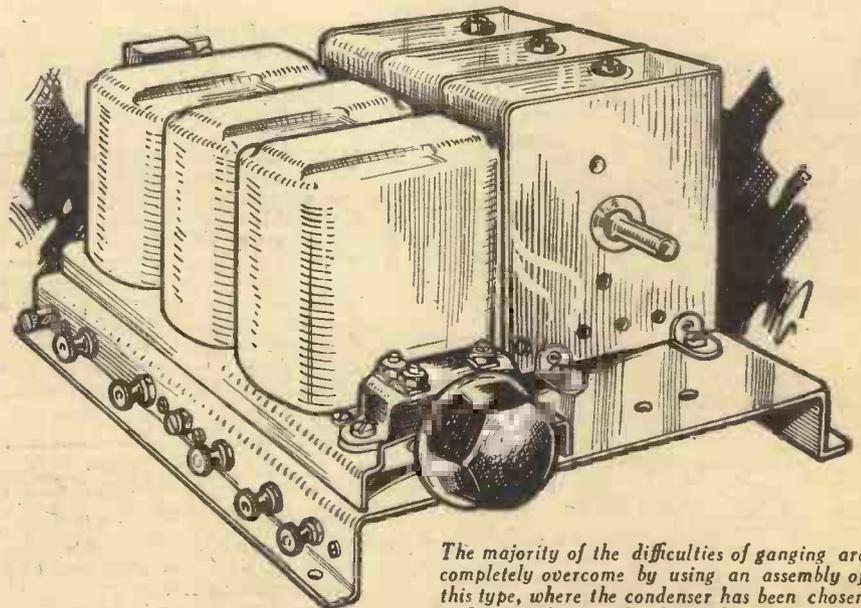
When choosing coils and carefully examining them, it is not easy to tell when the inductances are equal because there is no simply way of measuring them in the circuit. They can be compared outside the receiver with a standard, but there is no assurance that the effective inductance will be the same when the coil is put in the circuit. For the purpose of this article it has already been assumed that the tuning condensers are of equal value and have the same rate of capacity change throughout their range before they are put in the circuit. But the rate of change is affected by the various distributed capacities in the circuit, such as the capacity of the grid circuit of the valve, the capacity of the secondary winding of the coil, the capacity between the two windings, and other stray capacities. All these may be considered as one fixed capacity, usually called the zero setting capacity of the circuit. It determines the highest frequency to which the circuit can be tuned or the lowest wavelength.

Most condensers are mounted in gangs and provided with small trimming condensers. The object of these condensers is to equalize the zero setting capacities of the various tuned circuits. If the normal zero setting capacity in a given circuit is smaller than those in the others, more of the trimming capacity is used in that circuit and conversely, if the normal zero setting capacity in a circuit is higher than those in the other circuits, less of the trimmer capacity is used. Just as it is difficult to tell when the inductances in a circuit are equal, so it is difficult to tell when the zero setting capacities are equal and for the same reason.

How to Match Circuits

Generally speaking, the difficulty of

"trimming" a circuit arises from the fact that both the inductances and the rates of capacity change may be different. Suppose the trimming condensers are adjusted at a low wavelength (high frequency) end of the dial until a given station comes in with the loudest possible signal strength. Then, when the condensers are turned so that the tuned circuits will resonate with lower frequencies (longer wavelengths), they will pull apart because neither the inductances nor the capacity rates of change are equal. The result is, the circuit will not be selective at the lower frequency end of the scale. Neither will there be sensitivity. It is quite possible that a given station will come in at two different settings. The same thing exactly can be done at the other end of the tuning dial (longer wavelengths), and it will be found as soon as the condenser is moved for the shorter wavelengths (higher frequencies) the tuned circuits will pull apart. The set again loses its selectivity and sensitiveness. Now the low-wave stations may come in at two or more points on the dial or they may come in with practically the same signal intensity over a large portion of the dial. Some radio experts recommend that the trimming should be done on a distant station which comes in on the middle of the tuning dial. Some improvement in the circuit can be effected in this manner because any de-tuning effect that may result on turning the dial is cut in half as compared with the de-tuning effects resulting from either of the other two adjustments. But no matter where the trimmers are adjusted there will only be one point at which the set works as it should and that is the point of adjustment. The best way is to set the control at the short-wave limit and then adjust the trimmer condensers until the lowest-wave station can be tuned in with the greatest strength.



The majority of the difficulties of ganging are completely overcome by using an assembly of this type, where the condenser has been chosen to accurately match the coils. A further advantage is that a wavelength-calibrated scale may be fitted.



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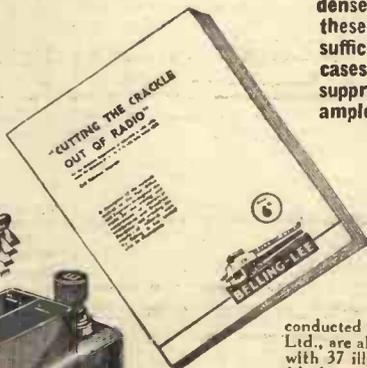
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SUPPLEMENT TO "PRACTICAL WIRELESS"

AMATEUR TELEVISION

TELEVISION AT OLYMPIA

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

EACH year, as the time for the annual radio exhibition at Olympia approaches, rumours and stories are current concerning the exhibits which will be shown dealing with radio's newest ally, namely, television.

One item which undoubtedly had a marked bearing on any proposals which were advanced concerning possible exhibits was the fact that the Television Committee, appointed by the Postmaster-General some four or five months ago, had not yet completed its report, and in consequence the nature or form of the television service to be recommended was not known. The television exhibits which were featured in the main, therefore, served the purpose of indicating the progress that had been made to date.

The Plew Apparatus

On a few of the stands could be seen the familiar disc television receiver, "dressed" up in various garbs but having the three essentials of a thirty-apertured scanning disc, driving motor, and neon lamp as light source. This could be seen on the stands of Wolsey, Exide, and *Practical Television*. In addition, Plew Television, Ltd., attracted large crowds with their disc machine. This company were featuring a receiver having a solid apertured scanning disc, neon lamp, and lens magnifier, but the most novel feature was the method of driving the disc. The motor was fed from the mains to form the actual drive, but to maintain the steady speed a phonic wheel attachment was included on the end of the shaft. This consisted of two relatively large field magnets mounted diametrically opposite to one another, and between the poles of the magnets revolved an eight toothed phonic wheel (something like an enlarged gear wheel). This combination functioned as a phonic motor and, being connected to 50 cycle time-controlled mains, kept the speed steady at 750 revolutions per minute.

The drive between the motor and the disc was a friction one, with the disc at right angles to the motor. To compensate for any speed differences that inevitably arise when true automatic synchronism functioning from the incoming television signal is not incorporated, provision was made for adjusting the relative position of the drive on the disc.

On both the Cossor and Ediswan stands the cathode-ray tube exhibits created considerable interest, since it was known that they had been employed for television reception both with low- and high-definition transmissions. In addition, several stands displayed amplifiers and mains equipment suitable for television reception on the 30-line B.B.C. television service.

Bush Radio

It was on the stand of Messrs. Bush Radio, Ltd., however, that the most complete exhibit was arranged. First of all, the mirror-drum receiver suitable for 30-line reception and similar to last year's model was included, but undoubtedly the greatest interest was created by the new

cathode-ray tubes and cathode-ray tube "Televisor" complete.

To give the public an idea of the nature of the results to be expected on the ultra-short waves, an untouched photograph of a 180-line image received by this method was incorporated in the normal screen aperture. The detail observed on this picture was outstandingly good and represented real entertainment value.

Concerning the complete receiver itself, the apparatus was of a dual character, that is to say, both sound and vision sets were incorporated in the one cabinet. On the sound side was a three-valve straight set covering a waveband of five to nine metres with a frequency band of 15 kilocycles, the only controls being tuning and volume. For the vision receiver a six-stage superhet, covering the same waveband but suitable for the large frequency band of 1,200 kilocycles, had been included. The dual receiver also incorporated the necessary time bases and rectifiers, the A.C. or D.C. input being rated as 200-250 volts, 80 watts.

The picture measured 8ins. by 6ins. while the colour could be described as warm black on cream. Picture repetition was double the B.B.C. service standard, namely, 25 pictures per second, arrangements being included to allow for a 180- to 240-line horizontal scan with a resultant picture brightness of 0.024 lumens per sq. cm. Three controls were available, namely, tuning, picture brightness (that is, the average brightness of the image on the cathode-ray tube's fluorescent screen), and picture contrast, which in effect signifies light modulation. This last named control does not in any way affect the synchronizing which is wholly automatic, but, of course, tuning the receiver does bring about an alteration, and the normal method of working the set is to set the contrast control at a low value, tune in until the synchronizing signal takes charge and holds the picture perfectly framed and phased, when the contrast and brightness controls can be altered to suit individual taste. The set featured was in the nature of a deluxe model in a figured walnut cabinet, but as it was not for sale no price was given. It is anticipated, however, that the equipment would include the necessary di-pole aerial and feeder to the set.

The largest television cathode-ray tube in the world was also on view, and this was of the high intensity type suitable for large demonstrations similar to those staged recently by the Baird Company at Film House. The screen was 12½ins. in diameter, giving a resultant television picture size of 10½ins. by 8ins. which, owing to the considerable brightness and nature of the image, could be enlarged with a suitable lens arrangement to give a picture large enough for an audience of 150 people.

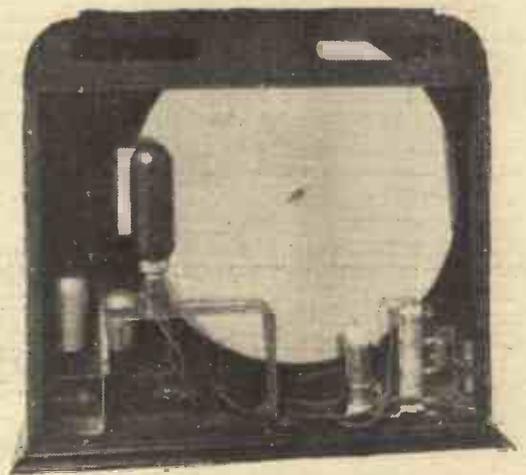
A direct viewing tube of unique shape, as embodied in the new "Televisor" just described, was also shown. The fluorescent screen in this case was 11½ins. in diameter, giving a resultant television picture 8ins. by 6ins. Finally, there was shown a small type tube suitable for monitoring or measurement purposes, the screen size of 7½ins. diameter producing a 6in. by 4½in. picture. A tube of this nature would be eminently suitable for the home constructor or experimenter, and no doubt arrangements will be made to market this tube for that purpose. As the electrode assembly for each of the three tubes is the subject matter of some important patents, no details could be learned concerning the actual construction and operation, but judging from the crowds which assembled throughout the period of the Exhibition, the exhibit was one of considerable and topical interest.

THE TELEVISION COMMITTEE

THE task confronting the Television Committee set up by the Postmaster General to investigate the present television situation is a very big one. Evidence from all quarters has been given to the members either as a written communication, a personal appearance, or as special demonstrations. Anyone who felt they had some form of constructive criticism to make was able to state his case, and in consequence the volume of evidence that has to be sifted and sorted must be enormous. It will therefore be some weeks before the report of the committee can be expected.

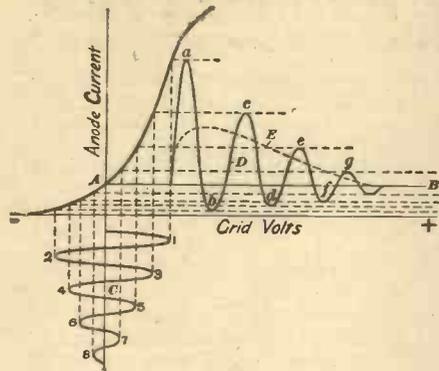
One very striking fact emerges, however, and that is subsequent to the committee's appointment a very large number of so-called new television systems came to light. Prior to this nothing was heard of methods for producing images except those sponsored by one or two large companies. Now the news columns of the daily Press have been giving details of so-called new methods which claim to revolutionize the whole science.

This state of affairs is no doubt inevitable, but readers are warned against expecting anything epochal in character at the moment.



This is the new Plew Television Receiver, which attracted considerable attention at Olympia. Note the solid-disc.

Do You Know What This Graph Means?



The man who can analyse these curves and understand what they indicate knows his job. But if they do not convey to him perfectly definite information, it would appear that he needs more training than he has had. He is not competent to fill a responsible position in wireless.

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REVIEW OF THE LATEST RECORDS

By T. Onearm

LAST month we introduced readers to a particularly fine record by the Seven Singing Sisters, which was also their first recording for the British Homophone Company. Owing to the undoubted success of this record, the above company release two more records this month by the same artists which are both equally good. Their rendering of Selections from "Lilac Time" by that world-famous composer Schubert, on *Sterno* 1467, is a clever piece of voice blending. They are also heard to advantage singing "International Selection," which is on the other side of this disc. The other record by the above artists is *Sterno* 1480, on which they sing "Parlez Moi D'Autre Chose" and "Tyrolean Song." You should not fail to hear these two records.

Admirers of Charlie Kunz, the popular dance band conductor, are well catered for on *Sterno* 1470. He personally records yet another brilliant syncopated pianoforte solo—"The Kunz Medley No. 8." This record introduces such old-time favourites as "Annie Laurie," "On the Bonny Banks o' Loch Lomond," "Coming thro' the Rye," "Auld Lang Syne," "Can't we Talk it Over," "Oh! You Beautiful Doll," and "Dinah." Charlie Kunz at his best. Kitty Masters, the popular lady crooner of Henry Hall's Band, who is often heard over the ether, and who was seen by many readers at this year's Radiolympia, croons with great success on *Sterno* 1478. She sings two popular numbers in "When day is Long" and "Fresh as a Daisy." If you like accordion bands, then *Sterno* 1477 and *Sterno* 1468 will have a special appeal. The French accordion ensemble, the Ten Apaches, record four excellently played tunes on these two discs, namely, "Saving up my love for you" and "Titine" on the former and "Café in Vienna" and "Sweet Dreams" on the latter. I can personally recommend these two fine records. All the latest popular dance numbers appear in the British Homophone Company's list for this month, a few being "Happy" and "All I do is Dream of You," played by Teddy Joyce and his Band, on *Sterno* 1475. The same band also play "Love thy neighbour" and "Madame, will you walk" on *Sterno* 1465; "It's all forgotten now" and "A Little Church round the Corner," *Sterno* 1466—a fine trio of records. Billy Merrin and his Commanders also give some fine dance tunes in "Over my Shoulder" and "When you've got a Little Springtime in Your Heart," from the film "Evergreen," on *Sterno* 1474, and "Every time I look at you" and "Oh! Muki Muki Oh!" on *Sterno* 1473. The Casani Club Orchestra, directed by Charlie Kunz, add to their many successes with

"I'll String along with You" and "Fair and Warmer," both tunes being from the film "Twenty Million Sweethearts," on *Sterno* 1472, and "Dreamy Serenade" and "So Help Me" on *Sterno* 1471. A fair selection of dance tunes from which to take your choice.

Light Music

If your taste turns to light music, then I recommend the following discs from which to make your selection: "Sylvia Ballet" and "Coppelia Ballet," played by Joseph Lewis and his Orchestra—a really fine performance; Eric Coates' "By the Sleepy Lagoon" and "London Bridge," two fine tunes by an equally fine composer on *Sterno* 1469, played by the above orchestra; and "Snowflakes" and "Song of Paradise," played by Reginald King and his Orchestra, on *Sterno* 1476.

Parlophone Records

Richard Tauber, the world-famous tenor, makes a very beautiful record this month on *Parlophone* RO 20256, which is undoubtedly a masterpiece. He sings two songs from his recent film success "Blossom Time." "Love lost for ever more," from the church scene of this spectacular film, shows Tauber at his best, accompanied by the organ and choir of St. Joseph's Retreat, Highgate, and on the other side of this disc he sings "Once there lived a Lady Fair." Both songs are sung in English, and I have no hesitation in recommending this record. Another beautiful record is *Parlophone* R1891, on which the famous tenor Joseph Schmidt gives a fine rendering of Verdi's "Il Trovatore" ("Di Quella Pira" and "Rigoletto" (La Donna é Mobile), both of which are sung in Italian.

Sophie Tucker needs no introduction, and "That's Something to be Thankful For" and "Lawd you made the night too long," on *Parlophone* R1869, is just another record that may be added to her long list of successes. If you like that clever quartette, the Moderniques, then you can hear them this month on *Parlophone* R1886. "Chinatown my Chinatown" and "Don't let your Love go Wrong" shows them at their best.

THE WIRELESS CONSTRUCTOR'S ENCYCLOPAEDIA

(2nd Edition)

By F. J. CAMM
(Editor of "Practical Wireless")

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RADIO GOLF

A New Game for the Winter Evenings.

I HAVE just become acquainted with a new game. A provincial radio society secretary explained the game to me and says it has created a considerable amount of interest among the members during the last few months. The golf course of the radio fan occupies all space, and is known as the ether. The game is best played at night and anyone with a radio set can play it, though those people with a short-wave receiver appear to get in the longer shots. The idea is to tune in as many stations as possible. The society in question gives a valve as prize every week to the member who tunes in the most stations. The game has its hazards and breaks caused by interference of all sorts due to commercial land stations, spark stations of small shipping, other broadcasting stations, amateur transmitters, oscillating receivers, static, fading, and even thunder storms.

Patience Required

When a broadcast listener gets a mental picture of the radio golf course, it is a wonder to him that a radio receiving set can distinguish anything at all from the great mass and variety of speech and music moving in the ether. The difficulties of obtaining a good score in radio golf can be more clearly understood when the player thinks of the ether as a pond of water after thousands of stones have been thrown into it. The winner of the game is the one who can distinguish and understand the largest number of the waves or ripples. Skill in tuning is, of course, a leading factor in being a really good radio golfer. Some sets receive more distant stations than others because the operator knows how to handle his set, and I have known many a young man who was able to get more out of a straight two set than another from a superheterodyne. Can you imagine the excitement of the newcomer into radio playing the game. In the still watches of the night he sits before his set, turning the dials to bring in the different wavelengths, and writing up a log of his achievements. He will seldom listen to a complete song or talk, but will wait patiently, or impatiently, for the announcer in order to identify the station. He then finds a new station and, as a cat waits for a mouse, he will sit quietly waiting for the station call. Then he hunts around for another. There are several aggravating incidents in the game which are just as bad as missing the hole, or losing a ball. To sit for ten or fifteen minutes listening to a speaker, orchestra, or song, and then have the announcer fail to tell what station is broadcasting or give a clue to identity—well that is enough to raise the ire of any ardent fan. There is no doubt a great amount of excitement to be got out of the game, and much experience in the manipulation of a receiver. I think the secretary of the radio society is to be complimented in introducing the idea to his members. Still, as I told him, I prefer to have the book of answers in front of me rather than wait for an announcer to tell me who he is. This is easily accomplished if you are fortunate enough to have a well-calibrated heterodyne wavemeter in the wireless den.—C.K.

"You have surpassed yourselves" says Mr. F. J. Camm!

(Editor, "Practical Wireless")



"You have surpassed yourselves with this new 'Stentorian' speaker. I thought you had reached the apogee when you introduced the 'Microlode' last year; but to this present speaker, which I have submitted to test, I unhesitatingly accord full marks for a rich and entrancing quality in tone, and for an even greater sensitivity for a given input than was obtainable from your past high standard of speaker. I feel that your Engineers must always be at work striving after the apparently unattainable and attaining it!"

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FREE ADVICE BUREAU COUPON

This coupon is available until September 15th, 1934, and must be attached to all letters containing queries. PRACTICAL WIRELESS, 8/9/34.

SAVE POUNDS ON H.T. "115 volts after 12 months' use." writes R. G. H., Newcastle. Write for details of the money-saving Standard Wet Battery. Lasts years. Replenish at long intervals—that's all! 120v. 12,500 m.a., £2 complete. Carr. pd. All Standard H.T. Spares supplied. Wet H.T. Battery Co., 26, Lisle St., London, W.C.2.

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All the new valves supplied on the lowest terms. Please state requirements and we will be pleased to quote you.

Full Specification and illustrated list of any of the above will be sent with pleasure.

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All Carriage Paid.

To avoid delay, will customers kindly send first payment with order.

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LONDON RADIO SUPPLY COMPANY

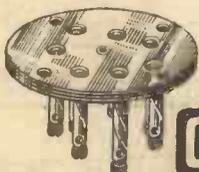
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WHEN BUYING A HORSE YOU LOOK AT ITS TEETH



WHEN BUYING A RECEIVER LOOK AT ITS VALVEHOLDERS

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THE FUTURE OF RADIO

Some Interesting Points Concerning the Growth of Radio and its Development in the Home

IN all the technical arts no particular branch has given a greater opportunity to the inventor than radio. Every branch of technical engineering has provided its own eminent specialists, who have created most of the new things that has been done in their particular sections, but the peculiarity about radio is that it has become the playground for all, both young and old, and male or female. It seems to be the favourite child of all the other technical arts and sciences, and a general meeting ground for the exchange of ideas and mutual inspiration. In its scope there are at least three generations of radio-minded people. It behoves those of us who are of the second and third generation to pay a rightful tribute to those who gave us our original inspiration and prepared the path for the advancement which has already taken place.

The originators were the most advanced thinkers in physical science and electrical engineering and they opened a new field of human endeavour. But the most significant fact is the unprecedented rapidity with which this new knowledge has spread. Much has been done in this direction by the technical press of this country in putting before the public the rudiments of its intricacies in such simple language and pictorial form. In the now growing generation almost every school boy, thanks to the popularity of wireless, has some intimate knowledge of a complicated art which not long ago could only be grasped by the very few. As our civilization marches on its onward way it makes inventions with an inevitable necessity. Inventors by habit and profession are only the scouts who march ahead and become aware of new technical developments somewhat ahead of the general mass of people. A new event is usually seen by several of these scouts at nearly the same time. But these scouts are becoming more and more specialized and they are able to discern new phenomena only within the limited sphere in which they have been trained. The necessary training is in most cases an opportunity which has come only to a few among the many who might have accomplished the same.

The Future's Scope

If we should project into the future growth of the electrical science we can see the art of radio taking a central position. We think of radio now as a useful means of communication and a delightful form of entertainment, but its greatest significance in the future will be its educational influence. It will be the school of training which will educate the engineers, inventors, and scientists of to-morrow not by thousands, but by millions. If you will let your imagination loose, what may you not expect from generations so trained? The future great discoveries regarding the nature of matter, energy, and the universe will be made by those who have as boys been playing with electrons and probing the lengths and depths of space by radio waves. The forces of nature will be harnessed on a scale not yet imagined, in the form of electricity made into an indispensable servant in every town, village, and farm, but the engineers who invent, plan, and

operate these new developments are at present being trained in the radio playground. The creation of light by means of magnetic waves, transmission of power, a perfected system of television on an equality with the human eye, and heat or refrigeration for every home are but a few of the secrets lying in the path of these budding geniuses and awaiting development for the good of the human race.

House Builders and Radio

From one end of the country to the other during the last few years we have been experiencing a building boom which is unprecedented in our history. Both architects and building contractors have combined in producing dwellings which are models of inventive genius. Civilization has demanded central heating, electric light and power, sanitary plumbing, the telephone, and a host of other devices in the home as integral features to lighten the burden of household routine and irksome duties, thus making life more enjoyable. The wireless set, too, has taken its place side by side with the other products of industrial and scientific enterprise. Radio has firmly established itself and become an indispensable element in the home life of the family. This being so, it is a remarkable thing that attention has not been given by builders to installing indoor aerials under the roofs, and wiring every room so that wireless could be enjoyed in any part of the house. The detracting element of almost any of the new garden suburbs is the unsightly array of bent wireless poles and masses of wires running in every conceivable direction without any apparent study of the amenity of the situation.

Wireless having established itself in the homes of millions, its service has outgrown the confines of a single room, just as electrical service, once limited to a number of locations in the home, is instantly and universally available, so should provision be made for conveniently taking advantages of radio privileges. Wireless, not long ago, was confined to the attic or cellar of the home, there to be heard but not seen. To-day the art is face to face with the necessity of providing greater utilization of the broadcast radio programme fare. The home must be provided with ample facilities for enjoying them, more fully and conveniently than is at present the case. For example, radio has something to say to the housekeeper while she is about her daily work in various parts of the house; radio has music for the family and friends during the summer's evening spent in the garden; radio has dinner-time music to make the meals all the more enjoyable; there is the children's hour for the kiddies in the nursery; radio has plenty to do in whiling away the long hours of the sick member of the family in the seclusion of the bedroom. So radio is no longer a living-room variety of entertainment. Its place in the household is everywhere, rendering services from morning till night, to be heard by anyone at will and with the utmost convenience. It would be well if when buying or building a house you insisted on such provisions being made.

THE LISSEN BAND-PASS THREE

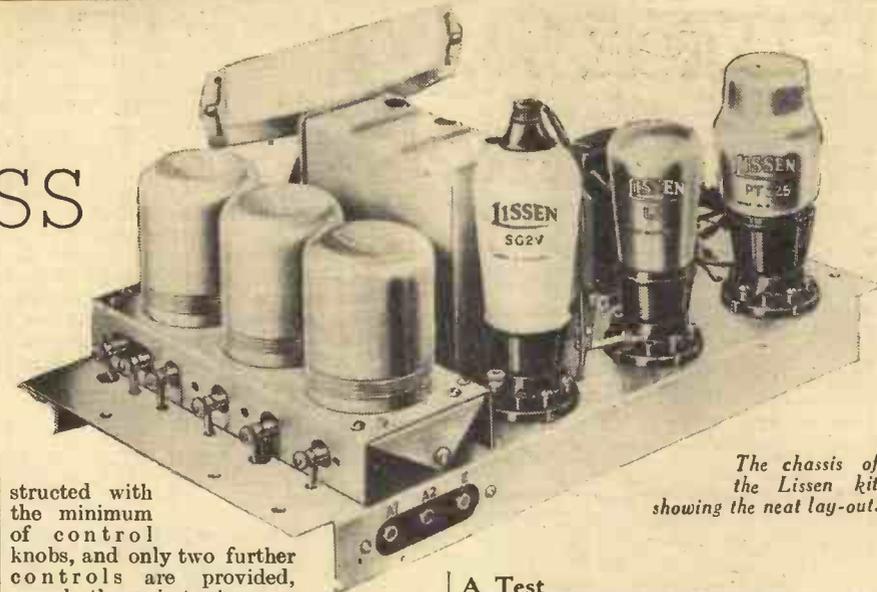
The New "Skyscraper Kit" which Provides a Novel Three-valve Receiver for the Home-constructor

THE latest home-constructor kit to be released by Messrs. Lissen embodies a number of very unique features, and enhances still further the range of "Skyscraper" receivers which have been issued by that firm. In the latest model an all-metal chassis is employed, and the standard S.G. detector and output circuit is utilised. These three stages are equipped with Lissen valves, the first being of the variable- μ type, the second a sensitive power detector, and the output valve is one of the economy pentodes, which is capable of delivering a really good output without distortion. The circuit is of the standard and well-tried arrangement and possesses no unusual details, but is thoroughly decoupled and has such important items as an H.F. stopper in the output grid circuit; alternative series aerial condensers; pick-up terminals, etc.

The Assembly

As may be seen from the illustration, the finished receiver possesses an attractive appearance and bears the mark of the factory-built article. This is due mainly to the pierced metal chassis which is provided, and to which the various components are bolted. The three coils are mounted on a separate base-plate, and this is provided with terminals to facilitate connections. The control knob on this coil assembly, in addition to changing the wave-band over which the receiver tunes, also brings the set into operation and switches it off. This combined control enables the complete receiver to be con-

structed with the minimum of control knobs, and only two further controls are provided, namely the main tuning control and a volume control. The tuning control is of the slow-motion straight-line full-vision type, attached to a substantial three-gang condenser. The volume control is of the dual-type which has previously been incorporated in the Lissen receivers, and it embodies a reaction condenser as well as a variable resistance. In addition to controlling the amount of feed-back, therefore, it also controls the bias on the H.F. valve and thus provides a most sensitive and smooth control of volume. The remainder of the components, consisting of fixed condensers, H.F. choke, valve-holders, etc., are either bolted to the chassis with the nuts and bolts provided, or are suspended in the wiring. The kit, as supplied, contains a number of envelopes or packets containing the appropriate fixing screws and nuts. The actual assembly is thus rendered exceedingly simple, and provided a child was old enough to read, the receiver could certainly be said to be simple enough to be constructed by the youngest member of the family. Yet it is of importance to note that this simplicity has been



The chassis of the Lissen kit showing the neat lay-out.

A Test

Mounted in the upper part of the neat walnut cabinet which contains this receiver is a moving coil loud-speaker, provided with a tone control and terminals for the addition of an external speaker when such is required. The batteries are housed on a shelf behind this speaker, and the battery leads, which are clearly identified, pass through a hole in the chassis and are joined to the accumulator and H.T., the grid bias being incorporated in the H.T. battery. The sensitivity is of a high order, and the receiver will provide a number of alternative programmes in practically any part of the British Isles. The volume control operates in the following manner. The H.F. bias operates over the first half of the volume control knob movement from minimum to maximum. At this point the SG2v is working at its highest amplification. When the volume knob is advanced beyond this point, the reaction condenser begins to play its part and further amplification is obtained until, of course, the detector valve starts to oscillate, which it will do if the knob is turned too far. The tone control may be adjusted to provide a more brilliant tone by removing it from the terminals to which it is attached, under which condition the full brilliance of the pentode stage is obtained. A slight high note cut-off exists when this is replaced, and no doubt to many this tone is more pleasing, although for good reproduction we prefer it removed. Battery consumption is fairly low and does not warrant the employment of a super-capacity type of battery, although the normal volume of the pentode valve is ample for normal requirements. Consequently there is no necessity to consider the fitting of a battery economiser or other device, and this is a very good point for the standard type of receiver. Selectivity is adequate for all normal requirements, and the choice of the band-pass couplings provides a satisfactory 9 k/c separation on all stations. For the constructor who prefers to obtain all the necessary parts for a receiver, complete in one box, and who is desirous of possessing a receiver of this type, the kit represents splendid value for money and should have an enormous success. Complete with valves, and all wires, screws, etc., the kit costs 99s. 6d. The walnut cabinet, complete with moving coil loud-speaker, costs £2 5s., or the speaker may be purchased separately for 27s. 6d.



Here is the Band-pass Three in the attractive cabinet. Note the neat opening for the speaker, in which no fret is employed.

attained without the omission of any of those details which contribute the efficiency of a factory-made receiver.



By Jace

Radio Instruments' New Signal Generator

RADIO INSTRUMENTS, LIMITED, have recently installed in their factory a complete signal generator of the latest type supplied by Messrs. Standard Telephones and Cables, Ltd. This equipment supplies five frequency channels to twelve testing cabinets, and when in full operation enables receivers to be calibrated for frequency performance and output. There is absolutely no interference between testing points, the frequencies and load remaining constant. The tester in each cabinet is in a position to check the uniform performance of every receiver over the complete range. When the installation is in full operation it will deal with the testing and calibration of 3,000 receivers per week.

The illustration on the right shows the frequency controls, screened conductors, and junction boxes. Each cabinet is fitted with an input attenuator, output meter, and isolating transformers and filter apparatus. The sets pass along a line and into the cabinets on one side and out the other. Uniform efficiency and performance is guaranteed with an up-to-date equipment of this type.

Grid Breakdowns Increase Battery Sets Sales

THE recent electric power breakdowns all over the country during the few weeks before the opening of the Radio Show appear to have had a remarkable effect in speeding up the sales of battery sets.

The Ever Ready Company stated recently that:—

"In spite of the introduction of the

all-mains set, the sale of battery sets has steadily increased. In 1930 there were produced and sold in this country 450,000 battery-operated receivers, and by last year this number had increased by some 200,000. Quite apart from the direct effect of recent electric power breakdowns

in making people reluctant to rely on all-mains sets—to which we must attribute at least one large order from an unexpected source—the battery set is popular on account of its superior purity of tone and its freedom from outside interference that characterizes the all-mains set."

Radio on Trains

IT is reported by the L.N.E.R. that 12,000 passengers have hired headphones to listen-in to broadcast pro-



The new signal generator installed in the factory of Radio Instruments Limited.

grammes while travelling on East Coast route expresses. The first train in Great Britain to be fitted with wireless receiving apparatus was an L.N.E.R. express between

King's Cross and Leeds, which was equipped in 1930. Owing to the running times not coinciding with the best broadcast period, this equipment has been withdrawn and two Anglo-Scottish expresses have been fitted instead. These trains leave King's Cross for Edinburgh at 1.20 p.m. and Edinburgh (Waverley) for King's Cross at 2.5 p.m., arriving at 9.10 and 9.55 p.m. respectively. An electric gramophone is also installed on each train so that passengers are entertained by means of gramophone records when the broadcast items are unsuitable.

Lithuania Orders Radio Sets

ACCORDING to reports from various sources a large volume of business, eclipsing all previous records, was done at Radiolympia last month. Another interesting point is the diversity of countries from which the orders came. The new trade agreement between Lithuania and this country has opened up an entirely new market and has already had a marked effect on export business, as reports from Messrs. Pye Radio show that large orders for sets of all types have been received from this country. The demands from the near East, Bombay, and South Africa are already well up on last year's returns.

1,000 Miles a Minute

LONDON, Paris, Muhlacker, Budapest —1,000 miles a minute—that was the record of the wireless express on Philips' stand at Radiolympia; yet since the total "mileage" of the track was no more than 200 feet, its speed was really only one mile per hour. The miniature line connected the broadcasting stations of Europe; and when the tuning knob was turned to the required destination on the dial, the aerial lit up, the train started off, and stopped at any one of fifteen stations selected.

Launching the New Cunarder

THE launching ceremony in connection with the new Cunarder 534 is to be broadcast in the National programme on September 26th next at approximately 2.50 p.m. Sir Percy Bates, Chairman of the Cunard Company, will welcome Their Majesties the King and Queen in a short speech. The King will reply and the Queen will then perform the naming ceremony. A descriptive commentary on the proceedings will be given by Mr. George Blake, and an electrical recording of the event will be transmitted subsequently to the Empire.

(Continued on facing page)

COSMOCORD
BALANCED TONE PICK-UP

Exceptional high volume, delightful balanced tone, entirely free from resonance are the qualities that make this pick-up so popular. All bakelite construction with swivel head for easy needle change. Complete with volume control, rest and 5ft. silk-covered lead.



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WIRELESS for the MAN-IN-THE-MOON

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2/6 NET
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"If you want a really gorgeous 'text-book' on Wireless do read **WIRELESS FOR THE MAN-IN-THE-MOON**," writes the *Manchester Evening News* reviewer. And referring to this book and its authors, the *Midland Daily Telegraph* says, "They succeed in imparting a real knowledge about Wireless. It is both good fun and sound theory." This book should be in the hands of all who are interested in wireless and wish to acquire a complete knowledge of "how it works."

At all Booksellers or by post from

GEO. NEWNES LTD., 8-11, Southampton St., Strand, London, W.C.2.

(Continued from previous page)

Belfast Radio Exhibition

PLANS are at present under discussion for the Belfast Radio Exhibition, to be held in October. This year the organizers propose to make the show the most important of its kind ever held in the city, and details are shortly to be available.

Scottish National Players

ON September 7th the Scottish National Players, now on their eighth annual autumn tour of the country districts of Scotland, will present two one-act Scottish plays. The first is "The Broken Fold," by George Reston Malloch, and the second, "The Miracle," a comedy, by Joe Corrie. The Scottish National Players, who began their chequered but triumphant career in 1921, have produced over a hundred plays in the past, of which more than seventy were original plays given for the first time on any stage. They have appeared before the King and Queen at Balmoral, and have toured not only Scotland, but England.

Roar in the Speaker

ONE of my correspondents is evidently making up receivers for his friends, for he tells me he has made many sets from a well-known and much discussed circuit, and satisfaction has been given in every case with one exception. Of course, it is for the "exception" which he asks my assistance. It is the only one in which he has met trouble, and this is spoken of as a "strong roar" in the speaker whenever he turns up the volume above bare audibility, and wishes to know the reason, as he has searched every avenue where he thinks he might have located the trouble.

Oscillation at some frequency is very often the cause of such a condition. The frequency at which this oscillation may take place may have any value from zero to millions of cycles per second. It may be due to "feed back" in the high-tension supply, if the frequency is within or below the audio range. If the frequency is a very high one, as is likely, it may be due to capacity feedback in the radio-frequency portion of the set, and not unlikely may be found between the elements of the valve or valves. The circuit should first be tested for oscillation by noting if the plate current increases when the roar starts. Then try to determine the frequency. If it is low, the decoupling and by-pass condensers should be examined. If the frequency is very high, two million cycles or more per second, use grid suppressors. For extremely high frequencies the suppressors may be a choke coil which can be made by winding a few turns of wire on a former the size of a lead pencil.

Existence of Ether

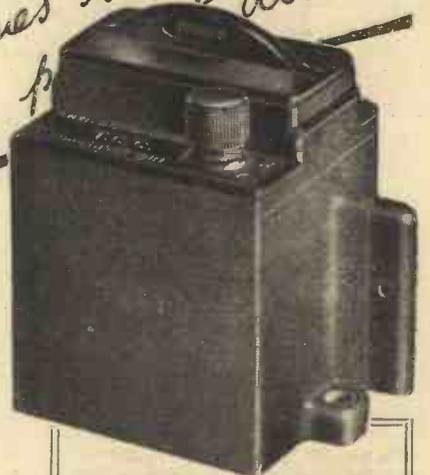
I AM called upon to settle two differences which have evidently been raised in the usual manner, that is, by arguments in the train on the morning journey to town. One question is, "If there was no ether, would we have daylight?"

Because I happened to be connected with the radio press, I suppose, the individual in question referred the question to me. Light is theoretically transmitted by vibrations in the ether which is supposed to exist. It may be well to recall to your mind that an ordinary electric light bulb has its filament in a vacuum (ether exists there, however) so as to prevent its oxidization or burning up. Of course, we know that light is emitted when the current flows through the filament. Presumably, without ether, there would be no light.

43940 Poiston Southamptn. Hauts

Mr. Sirs
Received the Anti-Interference Unit safe and I must tell you it is the thing I have been hunting for ever since I first had my all-ways set. The interference was awful in our district, but thanks to your unit it is a treat to listen to the programmes now. Thank you for the delivery

"A TREAT TO LISTEN NOW" with the



PRICE complete with Instructions 10/6

A nightmare of "crackles" and "buzzes" has ended for this Southampton listener who fitted a T.C.C. Anti-Interference Unit. Neon signs, motors and generators do not exist for him as far as his radio is concerned. "Don't let your listening be marred by such "man-made static"—this T.C.C. Unit will cut it out. Ask your Dealer to-day.

The Telegraph Condenser Co., Ltd., Wales Farm Road, N. Acton, W.3

T.C.C. CONDENSER

ANTI-INTERFERENCE UNIT

Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

Varley's New Programme

THE Varley range of coils has now been considerably modified, and the Duo Nicore coils form the latest addition to the range of iron-core coils. These, as may be seen from the illustration below, are of very small dimensions, and are not provided with the customary wave-change switch. Consequently they are much cheaper than the standard type of coil, and yet they retain all the essentials of



The new Varley Duo Nicore tuning coil.

the other type, including the special method of winding in which medium-wave breakthrough on the long waves is overcome. In addition, the method of winding has been designed so that very simple switching arrangements are required, a normal on-off switch sufficing with the majority of coils. The range in which this particular coil is obtainable is very comprehensive, and includes aerial or H.F. transformer (with reaction), oscillator coils for mains heptodes and battery heptodes, or for mains triode-pentode, the latter coils being obtainable for either 110 kc/s or for 465 kc/s. The price of any of these coils is 6s. I.F. transformers are also obtainable, on similar lines, for 8s. 6d. These components are provided with adjustable coupling for band width, and primary and secondary are each adjustable.

It is interesting to note that in the new season's catalogue Messrs. Varley announce the withdrawal of a number of items which have been popular in the past. These include the entire range of square peak

canned coils, as well as the square peak coil, and H.F. intervalve coil (with and without switch). The range of Nicore coils (BP 32 to 40) is also withdrawn, and is replaced by more compact types. The resistance-capacity coupling units have also been removed from the catalogue, whilst the push-pull output choke (DP 8), the double push-pull input transformer (DP 17), the pentode push-pull output choke (DP 19), and the Rectatone transformer are also now obsolete.

New Lissen Lines

A NUMBER of new components are now added to the Lissen range of components, and two interesting items are shown below. These are an Astatic H.F. choke and a lightning arrester. The choke has extremely small dimensions, measuring 2½ in. from end to end and has a total diameter of ¾ in. A slotted ebonite former is employed, and the windings occupy adjacent sections, so rendering the field extremely small and removing the necessity for screening. The total inductance is 150 millihenries, and the self-capacity only 3 µµF. The component may be recommended for H.F. coupling with S.G. valves, as well as for short-wave receivers where it is customary to insert a short-wave and a medium-wave choke in series. The price is 3s. 9d.

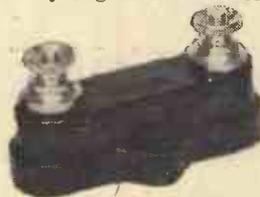
The second component which is illustrated is a lightning arrester, and this is totally enclosed in bakelite. Two terminals are fitted, and the letters A and E are engraved on the bakelite case to identify these terminals. Inside the case two brass arms are attached to the terminals,



On the left is seen the new Lissen Astatic H.F. choke.

and these are held apart in order to provide a suitable path for a powerful discharge, whilst offering a very high resistance to wireless signals. Thus there will be no loss of signal strength when the device

On the right is the Lissen lightning arrester.



is joined across the aerial and earth circuit, but ample protection is afforded in the event of a heavy static discharge across the aerial-earth system. The price of this component is 1s. 6d.

Hivac Valve Price Reductions

THE popular Hivac battery valves have now been reduced in price, and these valves represent a consider-

able saving to the home constructor. The following prices show the types of battery valve, together with the old and the new prices:—

Type No.	Use	Old Price	New Price
H210	H.F. Amplifier	4/6	3/9
L210	L.F. Amplifier	4/6	
D210	Detector	5/6	
Y220	L.F. Pentode	12/6	10/6
Z220	L.F. Pentode	12/6	
HP215	H.E. Pentode	12/6	
VP215	H.F. var-mu Pentode	12/6	

This range of valves has been augmented, as previously stated on these pages, by a complete range of A.C. mains valves, which range in price from 9s. 6d.

New Universal High Voltage Radio Programme

UNIVERSAL HIGH VOLTAGE RADIO LTD., of 28/29, Southampton Street, Strand, W.C.2, have announced their programme for their new season's models, and from the details given it appears that a very extensive range of universal receivers will be produced.

Three attractive features are common to all models:—
The Hivac Driver plus class B valve which is included in the Hivac range of valves.

(1) All receivers are suitable for operation from either A.C. or D.C. mains, from 100 to 250 volts, and in the case of A.C. they can be used on supplies from 25 to 100 cycles. Special models are also available, at a slightly additional charge, for 100-volt A.C. or D.C. mains only.

(2) All models, with the exception of the miniature model, cover not only the long and medium wave bands, but also one ultra-short-wave band, and in the case of the de luxe model two ultra-short-wave bands, thus making these sets truly "universal."

(3) All models are available as table radiograms, in entirely original cabinets, which are only slightly larger than the ordinary radio cabinets. A horizontal design of cabinet has been adopted in which the speaker is mounted beside the chassis, and the design is modern, without being ultra modern, thus blending well with existing furniture.

Other interesting points are to be found in the fact that the Ostar Ganz high-voltage valves which are being used in the sets are extremely economical in operation, as no barretters or dropping resistances are employed, and the filaments are connected directly across the mains. The sets are completely hum-free both on A.C. and D.C. mains. An accurate full-vision illuminated drive has been adopted, which is calibrated in metres, on all wave-



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. Neveles, 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.

GRAHAM FARISH COMPONENTS

ALTHOUGH mass production methods must be used to produce the vast quantity of radio components which are demanded by the public each year, such methods can be made to turn out parts as accurate as those made by hand. Such is the case with the popular Graham Farish components, which are well known for their efficiency in use. A varied range of these components, including the latest type valve-holders, screened chokes, fixed and differential condensers, and transformers, is given in a folder issued by Graham Farish Ltd.

COSSOR "SUPER-FERRODYNE" RADIO-GRAM

THE achievements of Messrs. A. C. Cossor's new season's programme have been greatly enhanced by the introduction of the Cossor "Super-Ferrodyne" radio-gram. The new model gives amazing selectivity, and the specification includes such refinements as super-selective low-loss coils, H.F. screened pentode detector, power pentode output, illuminated full-vision tuning scale, and silent running induction motor with fully automatic stop. The instrument is housed in a well-finished cabinet and is priced at the low figure of 18 guineas. Interested readers should obtain a copy of an attractive folder which gives full particulars of this remarkable radio-gram.

WEARITE COMPONENTS

READERS will be interested to know that behind all radio components bearing the name "Wearite" there is over fifteen years of specialized experience, which accounts for the excellence of the products manufactured by Wright and Wearite, Ltd. The reception given to last year's catalogue has encouraged this firm to include in their new season's list a more full and technical description of all "Wearite" products, including recommended circuits for various coils, such as Nucleon iron-core type, general purpose iron-core type, universal air-core type, etc., the circuits which are known as the "Wearite" Teamster L.P. have been carefully designed and thoroughly tested. They consist of detector, L.F., band-pass, Class B super-het, etc.

Amongst the other components listed is a Class "B" driver transformer, input and power transformers, smoothing and H.F. chokes, etc.

CLAUDE LYONS COMPONENTS

A "HELPING Hand to Set Constructors" is the title of a new season's catalogue just issued by Claude Lyons, Ltd. In it some new forms of variable resistances are introduced in the form of ultra-high-resistance potentiometers. The well-known "Hum-Dinger" and B.A.T. fixed resistors are also listed. There is also a range of "B.A.T." switches, to which have been added one or two new types. Included among the other components are "B.A.T." microphones, mains transformers, chokes, and the "Audax" pick-up, the construction and performance of which have recently been improved in accordance with modern requirements.

BROADCASTS TO SCHOOLS

THE B.B.C. have just issued the Annual Programme of Broadcasts to Schools for the year 1934-5. This annual, which runs to forty-eight pages, gives the school broadcasting programme for all three terms of the school year, beginning in late September. It contains notes on all the courses, and an easily read time-table which can be pinned on the classroom wall.

Three innovations are announced. A course on rural environment, called "Districts of England," will be broadcast on Thursday mornings between 11.30 and 11.50. This series is an experiment in a type of broadcasting already familiar in other countries.

The course on regional geography, called "Peoples of the World," is also new. This is a two-year course, planned by Dr. J. F. Unstead and Mr. G. J. Cons, which aims at providing a background for world citizenship. Experts will describe at first hand the manner of life of selected peoples, and will relate it to their environment. The third new course, "Music and Movement," is intended to help teachers with rhythm work for very young children. It is to be given by Miss Ann Driver, who has been working out the course in a London school. "Music and Movement" will be broadcast on Friday mornings at the same hour (11.30) as the "Districts of England" on Thursdays and "Peoples of the World" on Tuesdays.

Copies of the Annual can be obtained free on personal application to Broadcasting House; at Regional offices; at public libraries; or for one penny by post from the Publications Department, Broadcasting House, London, W.1.

RIGIDITY OF CONSTRUCTION

HIVAC

THE SCIENTIFIC VALVE

BRITISH MADE



HIDDEN VALUE

The consistency of the stated characteristics of Hivac valves is safeguarded at every possible point of construction.

Molybdenum wire is employed in the construction of Hivac grids because it possesses the exceptional quality of retaining its shape during changes of temperature. Sagging and warping which upset the characteristics are thereby eliminated; thus consistent performance is maintained and an exceptionally long working life guaranteed.

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MAINTAINS CHARACTERISTICS

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DOUBLE YOUR VALVE OUTPUT WITHOUT COST

This is now made possible by "TWINIL," a clever Valve-doubling Device which only costs 2/6. Highly praised by Wireless Papers as "something new to try out with very great possibilities." Post free with full instructions to make a 2-valve receiver equaling 3-4 valves, 2/6.

Eastern Radio Co., 40c, Waterloo Street, King's Lynn

RADIO SUPPLIES

Send your list of Radio needs for our quotation, Kits, Parts, Sets, etc. Everything in Radio stocked, prompt delivery, 7 days' approval. Catalogue free. Taylex & Standard Wet H.T. replacements stocked. N. TAYLOR, 9, GROVE RD., BALHAM, S.W.12.

PATENTS AND TRADE MARKS. KING'S PATENT AGENCY, LTD., 146, St. Victoria Street, E.C.4, offer "Advice Handbook" and Consultations free. 49 years' experience. Write, call, or phone. Phone: City 6161. Director: D. T. King, C.I.M.E., Reg. Patent Agent, G.B., U.S.A., and Canada.

tested. From 2/6. MAGNETIC CONTROL-LED METERS. Recommended by leading technicians for general radio and charging purposes. Guaranteed accuracy. In moulded cases, 2 1/2 in. overall, 2 in. hole in panel. From 7/6



USE METERS SIFAM ELECTRICAL INSTRUMENT CO., LTD., York Works, Browning St., S.E.17. Tel. Rodney 3573

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).

Local Experts

SIR,—A word in defence of the "local expert." Your correspondent of Margate hit the nail truly on the head when he said that "really good service men are few."

They are! So why condemn all "local experts"?

I would remind your correspondent that not all amateur wireless enthusiasts are the half-wits he fondly thinks they are. And not all are ignorant of the principles of even mains receivers. The aspersion regarding shocks is typical of the "service" man.

Your correspondent, after all, is merely blowing his own horn.—F. JACKSON (N. Ireland).

SIR,—I have been very interested in your correspondence regarding local experts. There is an important point, which deserves some consideration when dealing with the question of repairs to receivers by service men and wireless "dabblers." The dabbler has generally experimented and started from the very beginning, and his experience has been obtained from actual construction. On the other hand, the majority of service men have received a fairly good education, and as a result have attended either a technical institute or a school provided by a radio firm, and their experience is thus of a theoretical nature. Of course, the soundness of a theoretical training cannot be denied, but there is no school like experience, and whilst a service man may be an expert in understanding the wiring and peculiarities of a "named" set, he may not be quite so at home with another receiver built by a different firm. Consequently, when called in to see to troubles, he may spend longer, due to his unfamiliarity, than the local dabbler, who will probably locate the trouble at a first glance. I have heard a number of cases where the local service man has felt secure of his position and has charged exorbitant prices without doing a great deal of good. Everyone likes to save money, and therefore buys in the cheapest market, and the word is soon passed round when difficulty arises to "let Brown see to it. He will put it right in ten minutes," and this type of recommendation is always a sure guide to ability.—DABBLER (North Allerton).

Short-wave Set

SIR,—You have not yet published constructional details of a short-wave receiver covering all the practical short-wave bands, plus the medium-wave band. For colonial use this type of receiver is essential, and we outposts of Empire desire to hear the Daventry Empire transmissions as well as local transmissions which do not extend into the long-wave band. Could you not design a superhet for our especial needs?—R. GREEN (Kenya).

[We will bear the request in mind when setting out our winter programme.—ED.]

Our Free Gifts

SIR,—I have just received my Coronet D20 Camera, and am highly delighted with

it. The quality of the workmanship is excellent, and the camera worthy of your paper. This is the first time that I have taken advantage of your generous offers, and I have not been disappointed. I hope to avail myself of any further gifts, and regret my not having received any of your former ones. Again let me re-echo the praises of your wonderful paper.—J. A. ROBINSON (Cardigan).

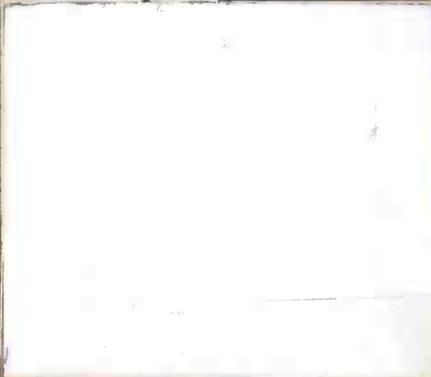
Quality Receivers

SIR,—As an experimenter of some standing, I should like to offer a suggestion. Practically every receiver which you have produced so far, although admirable from a technical standpoint, has been designed to cover a great range, and is thus of the type which cannot be stated to be a quality receiver. As I understand it, in order to obtain real quality, flat tuning is one of the essentials, and a flat-tuned set cannot receive foreigners. It is, therefore, not favoured by the majority of listeners. Having heard the Science Museum receiver and others which have been designed to receive only the local stations, with really admirable results, I think many listeners would be very pleased to construct a receiver on these lines if only you would show them how. Could you not give us a constructional receiver or, alternatively, furnish details to enable us to build a receiver of this type.—A. BOYD (Harrow).

(We agree that quality reception is a subject which requires treatment in a specialized manner, but we do not think there is sufficient

CUT THIS OUT EACH WEEK.

Do you know



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.

interest to warrant a description of a quality receiver designed to receive only the locals. We are, however, preparing an article on the subject which will be published in an early issue.—ED.)

An Exhibition Echo

SIR,—I should like to express my appreciation of the assistance which was given to me at Olympia by your staff. Although my questions covered a very wide range, and some of them were certainly not related to radio, I was treated with every courtesy, and received some very valuable information, which will prove of inestimable value in my daily work. I might mention that some of the points raised by me had already been carefully searched for in several public libraries, but I had been unable to find any detailed information, and only came to your stand on the off chance. Again thanking you.—D. VERNON (Bristol).

Impressions on the Wax

SIR,—I note that you do not devote a column each week to your gramophone record review. Although you cannot obviously give a full test report of the quality and so on of each record which is issued, the list of titles certainly enables the user of a radiogram to select records to add to his stock. I know that lists are issued by the companies periodically, but it is nice to be able to find the information in your book as a regular feature and to be guided by your advice.—R. WILSON (Peterborough).

"Practical Television"

SIR,—Whilst at Radiolympia I purchased a copy of your new monthly. Whilst I fully appreciate that the growth of this new branch of radio renders it necessary to devote a monthly to the interests of the science, I should very much regret to see a restriction in the amount of space in PRACTICAL WIRELESS which is devoted to television. You have not given much practical material concerning this subject in your recent issues, and I should not like to see the feature confined only to news. Please, therefore, remember the amateur who wishes to keep in touch without going so far into the subject that he requires to buy an extra magazine devoted only to the subject.—R. COX (Hampstead).

SIR,—Allow me to congratulate you on your new monthly. The amount of material contained in its pages surprised me, and I for one will certainly take up the study of this new branch of radio. I notice that the parts at present are still expensive, but presumably, as with radio, prices will fall as soon as the demand becomes sufficiently large.—K. STOKES (Nottingham).

SIR,—Congratulations on your new monthly. I can only wish that this was a weekly, when I would certainly buy it even at 6d. per week. It will seem a long time waiting for No. 2, but I hope that the transmissions will not be curtailed as has been suggested in several quarters.—R. S. T. WHITELEY (Barnet).

SIR,—I was highly delighted with *Practical Television*. I hope that future numbers will deal with cathode-ray systems and other high-voltage schemes, and that you will not restrict your energies to the low-priced simple apparatus.—A. TRAIL (Rugby).

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO



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. Neumes, Ltd., 8-11, Southampton St., Strand, London, W.C.2.

The coupon on Page 771 must be attached to every query

QUERIES and ENQUIRIES by Our Technical Staff

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.

A D.C. Problem

"When connecting a commercial two-valve all-mains D.C. receiver to the supply I had the misfortune to burn out a resistance, due, I am told, to connecting the earth lead straight to the set instead of through a fixed condenser. Is this correct, please?"—J. B. (Highgate, N.19).

When the positive mains lead is earthed it is quite possible to introduce a short-circuit into a receiver which has not been suitably wired. Practically all commercial receivers, however, are fitted with a condenser in the earth lead so that when the earth is fitted no short can arise. Without knowing the exact circuit employed in the receiver we cannot state whether a resistance has been destroyed as a result of using the earth without a condenser. With all D.C. receivers it is preferable to use a fixed condenser between the aerial lead and the aerial terminal and also between the earth lead and the earth terminal.

Operating a Neon Lamp

"I am interested in television and should like to try out a small disc receiver. What is the current which must be passed through the lamp, and will my S.G., detector, and L.F. receiver be good enough for average results. I am operating the receiver from an A.C. eliminator."—T. H. (Barnet).

At your address the three-valve receiver will probably produce a sufficiently strong signal to give fairly good results. The current which should pass through the normal neon is in the neighbourhood of

25 milliamps, and therefore the output valve should be of the type which passes this current, although the effect of the voltage drop through the neon must be borne in mind. If your eliminator does not deliver sufficient H.T. to enable this method of connection to be employed you will have to use a 1 to 1 transformer, with the primary joined in series with the secondary across the H.T. supply. The extra current will have to be delivered by the eliminator and you should be careful that you do not overload it. If there is ample current to spare, a 5,000 ohm resistance may be joined in series with the neon lamp in order to regulate the brilliancy and so balance the picture.

Short-wave Coils

"I should like to carry out some experiments on the short waves, but do not want to build up any clumsy coils. I have seen in an American book a scheme for using old valve bases for coil formers, and as I have about a dozen of such old valves at home, all burnt out, I have the necessary bases by me. I am not certain regarding the windings for the coils and should be glad of your advice."—A. K. L. (Hull).

To build a range of coils on valve bases you will undoubtedly find it most convenient to use the Hartley, Ultraudion or some similar circuit, where only a single coil with a centre-tap is required. This avoids the complication of trying to arrange a separate reaction winding. A number of coils, having from six turns upwards should be constructed, and to avoid losses the centre of the valve base should be cut away, and a low-loss valve-holder should be used for connecting the coils into the circuit.

Superhet and Converter

"I have had an argument with a friend who knows something about wireless, and in order to clear up the matter we should like your ruling on the following point. For short-wave work with a standard broadcast receiver it is possible to use an adaptor or a converter. So far as I understand it, the adaptor simply takes the place of the tuning circuit and is used with a normal detector stage, so that it may be

used with a set using detector followed by L.F. stages, or even with sets employing H.F. stages, if these are eliminated by plugging into the detector stage. The converter is for use with sets having H.F. stages, and these are converted into I.F. circuits. The problem now is, what does one use in a superhet circuit, where frequency changing is already in existence?"—W. B. G. T. (Bodmin).

For a superhet receiver the most satisfactory method of adaptation for short-wave work is to build a frequency changer, and when this is coupled to the superhet the normal tuning circuits are adjusted to the frequency employed in the additional unit. Thus, a frequency changer, consisting of a detector and oscillator (or alternatively one of the new combination valves could be used), may be built to convert the received signal into, say, 500 kc/s, and the tuning circuits of the superhet receiver should be set to that frequency.

H.T. Battery Constituents

"I have become interested in wireless and have started the 'pull it to pieces' craze. The amount which can be learned by this means is tremendous, but I have now come to a point where I must ask you for some information. I have dismantled an H.T. battery and I find that in addition to the zinc cell there is a canvas bag with a lot of wet stuff in it. I should like to try and make up a large cell, using the contents of the H.T. cell as a basis. Can you tell me what is used in this cell. I believe sal-ammoniac is one of the principal parts, but should like a correct formula."—W. G. (Balham).

The make-up of various manufacturers' products differs, but the cell may be made in the following manner. Round the centre carbon is a mixture of graphite and manganese dioxide. This mixture is wrapped tightly in a bag of cheesecloth. Surrounding this and packed into the zinc case is a mixture consisting of plaster of paris and water to which is added equal parts of glycerine and flour and sufficient sal-ammoniac to make the mixture into a thick paste. A little zinc chloride may be added if desired. The case is the negative pole and the carbon rod the positive pole.

THE QUERIES COUPON APPEARS ON PAGE 771.

THE WORLD'S HANDIEST AERIAL

SELF ADHESIVE
BEST PICK-UP
NEATEST

A revolutionary idea in Aerials. Just unroll the tape and press it up in position around the room or up to the attic—and it sticks. One pull and it's down and leaves no mark. No danger from lightning, reduces static interference and increases selectivity. Ideal for artistic homes. Excellent pick-up for flats. Obtainable everywhere. British Pix Co., Ltd., London, S.E.1.

PIX INVISIBLE AERIAL

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DOUBLE LENGTH **3/6**

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face type and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 8/- per line. All advertisements must be prepaid. Radio components advertised at below list price do not carry manufacturers' guarantee. All communications should be addressed to the Advertisement Manager, "Practical Wireless," 8, Southampton Street, Strand, London.

PREMIER SUPPLY STORES

Offer the Following Manufacturers' Surplus New Goods at a Fraction of the Original Cost; all goods guaranteed perfect, carriage paid over 5/-, under 5/- postage 6d. extra, I.F.S. and abroad, carriage extra. Orders under 5/- cannot be sent C.O.D. PLEASE SEND FOR ILLUSTRATED CATALOGUE POST FREE.

STUPENDOUS Purchase of Set Manufacturers' Stock. All electric 3 Valve (S.G. Det. Pen.) Set in Walnut Cabinet with moving-coil speaker 200-250 volt 40-60 cycles. Chassis built. 200-2,000 metres with 4 valves, £4/19/6.

ALL Electric 3-stage Amplifiers, 200-250v., 40-60 cycles, 10 watts, undistorted output, complete with 5 valves, £7/7/-. Suitable speakers, pick-ups and microphones can be supplied.

SPECIAL Offer of P.M. and Energised M.C. Speakers. Purchased from well-known gramophone co.

TYPE 10955F, 9in. diameter, 11,650 ohm field, 20/30 m.a. auditorium type power transformer. Handles 10 watts, 30/-.

TYPE 10955H, 9in. diameter, 115 ohm field, 350/400 m.a., auditorium type Pentode transformer. Handles 10 watts, 30/- A.C. Kit, 20/-.

TYPE 4480, 9in. diameter, permanent magnet. Handles 4 watts. 7 ohms speech coil, 13/6. Multi-radio transformer, 4/6 extra.

PREMIER SUPPLY STORES Announce the Purchase of the Complete Stock of a World Famous Continental Valve Manufacturer; all the following standard mains types, fully guaranteed, 4/6 each, H.L., power, High, Medium, Low magnification, Screen Grid. Directly heated Pentodes, 1 watt, 3 watt and 4 watt A.C. outputs.

THE following Type, 5/6 each; 350 v. and 500 v., 120 milliamperes full wave rectifiers, 2½ watt indirectly heated pentode.

THE Following American Types at 4/6: 250, 227, 112, 171, 210, 245, 26, 47, 24, 35, 51, 58, 55, 37, 80 and the following types, 6/6 each; 42, 77, 78, 25Z5 36, 38, 83, 39, 44, 58, 6A7, 6B7, 2A5, 2A6, 2A7, 2B7, 5Z3, 6C6, 6A4, 6D6, 6F7.

ELIMINATOR Kits, including transformer, choke, Westinghouse metal rectifier, T.C.C. condensers, resistances and diagram, 120v., 20 m.a., 20/-; trickle charger, 8/- extra; 150v., 30 milliamperes, with 4v., 2-4 amps. C.T., L.T., 25/-; trickle charger, 6/6 extra; 250v., 60 milliamperes with 4v., 3-5 amps. C.T., L.T., 30/-; 300v. 60 m.a. with 4 volts, 3-5 amps., 37/6; 200v. 100 milliamperes, 39/6.

PREMIER chokes, 40 milliamperes, 25 hys., 4/-; 65 milliamperes, 30 hys., 5/6; 150 milliamperes, 30 hys., 10/6; 60 milliamperes, 80 hys., 2,500 ohms, 5/6; 25 milliamperes, 20 hys., 2/0.

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.7 Transformer, output 135v. 80 m.a. for voltage doubling, 8/6; 4v. 3-4a., C.T. I.T. 2/- extra; with Westinghouse rectifier giving 200v. 30 m.a., 17/6.

PREMIER H.T.8 and 9 Transformers, 250v., 60 m.a. and 300v. 60 m.a. rectified, with 4v. 3-5a. and 4v. 1-2a. C.T. L.T. and screened primary, 10/-; with Westinghouse rectifier, 18/6.

PREMIER H.T. 10 Transformer, 200v. 100 m.a. rectified with 4v. 3-5a., and 4v. 1-2a. C.T. L.T. and screened primary, 10/-; with Westinghouse rectifier, 19/6.

PREMIER Mains Transformer, output 250-0-250v. 60 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a. (all C.T.) with screened primary, 10/-.

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, 10/-.

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

WESTERN ELECTRIC Mains Transformers, 300-0-300v. 65 m.a., 4v. 1-2a., 4v. 2-3a., 6/6; 300-0-500v. 150 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 2-3a., 4v. 1a. C.T., 4v. 1a. C.T., 19/6; 1,000-0-1,000v. 250 m.a., 4v. 3a. C.T., 4v. 3a. C.T., 49/6; 2,000-0-2,000v. 150 milliamperes, 49/6.

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

PREMIER L.T. Charger Kits, consisting of Premier transformer and Westinghouse rectifier, input 200-250v., A.C., output 8v. ½ amp., 14/6; 8v. 1 amp., 17/6; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6; 2v. ½ amp., 11/-.

B.T.H. Trussed Induction Type (A.C. only) Electric Gramophone Motors. 100-250v.; 30/- complete.

(Continued at top of column three.)

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	Deposit	Monthly
TELSEN Latest 323 Kit	29/6 4/-	7 of 4/1
TELSEN S.G. 3 Kit	39/6 4/4	9 of 4/4
LISSEN Skyscraper 4 Kit	112/6 10/-	11 of 10/3
EXIDE H.T. Accu. 120-v.	60/- 6/-	9 of 6/8
ATLAS Eliminator C.A.25	59/6 5/-	11 of 5/6
AVON MINOR METER	40/- 5/6	7 of 5/6
B.T.H. Pick-up Vol. Con.	21/- 3/10	5 of 3/10

Parts for any Kit Set. Any make of Speaker.

New Goods Obtained for Every Order.

Send us a list of the parts you require and the payments that will suit your convenience, and we will send you a definite quotation. Anything Wireless.

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Phone: Museum 1414.

OUR NEW MONTHLY Practical Television 6D. FROM ALL NEWSAGENTS

PRACTICAL, private and postal Radio training. All branches. Fees payable 2/6 weekly. Full particulars without obligation.—R. T. I. G. B., 47, Earl's Court Road, London.

VORTEXION Lead Again.

VORTEXION, Wimbledon, for 99.9% reliable transformers. Guaranteed 1 year; 5 years guarantee, 2/- extra.

IF You Haven't Tried Them Yet Ask Someone Who Has, or call and inspect complimentary letters.

GUARANTEED 12 Months, and within 5% normal and 2½% super models, neat shrouding, with detachable feet, as used by Government Departments, etc., etc.

VORTEXION.—New Monoidal transformer, 200-250, 50 cycles, 425-0-425, 120 m.a., 4v. C.T. 3a., 4v. C.T. 1a., 4v. C.T. 1a., 4v. C.T. 6a., screen primary, open type, 20/-; shrouded, 22/-; super shrouded, 26/-; weight 14lb., carriage 2/- extra; 10 henry choke, 6/6, post 9d.; 20 henry, 8/6.

VORTEXION 26h. 120 m.a. Choke, 140 ohms, in die-cast shrouding to match; 12/6.

ALL Secondaries Centre Tapped.

VORTEXION.—250-0-250 60 m.a., 4v. 1 to 2a., 4v. 2 to 4a., open type, 10/6; shrouded, 12/6; post 9d.

VORTEXION Transformers, tested with 2,000 volts between windings.

VORTEXION.—350-0-350, 60 m.a., 4v. 2.5, C.T. 4v. 3.5, C.T.; open type 13/6, shrouded 16/-; post 9d.

VORTEXION.—Super model for H.T.8 or 9 or 10, 4v. 1 to 2, 4v. 2 to 4; open type 14/6, shrouded 16/6; post 1/-.

VORTEXION.—350-0-350, 120 m.a., 4v. 2 to 5a., 4v. 2 to 4a., 4v. 2.5a.; open type, 14/6, shrouded 16/6.

VORTEXION.—400 or 450 or 500 v., 120 m.a., 4v. 2 to 5, 4v. 2 to 5, 4v. 2.5a.; open type 19/-, shrouded 23/-.

VORTEXION.—400 or 450 or 500, 150 m.a., 4v. 4a., 4v. 2.5, 4v. 2, 4v. 2, 4v. 2. cores size 2½ x 1½ in., a superb job, 2% regulation, 25/-; shrouded with terminals, less terminals, 30/-; open type 26/-; post 1/3.

VORTEXION Auto Transformers to B.E.S.A. Specification, 100, 110, or 120v. to 200, 220 or 240 volts, 60 watts, 0/-, post 9d.; 120 watts, shrouded 12/6, open type 10/6, post 1/-; 200 watts, open 14/6, shrouded 16/6, post 1/-; 2,000 watts, £4/10.

VORTEXION 600-watt Transformers; £4/10, carriage free.

VORTEXION 30h. at 60 m.a. Chokes, 5/6; 40h. at 60 m.a., 8/6; 30h. at 150 m.a., 200 ohms, 10/6 open type, 12/6 shrouded.

VORTEXION Transformers Made to Your Specification; price according to wattage, 6v. filament's same price unless wattage grossly exceeded; special quotations by return.

VORTEXION (S. A. BROWN), 182, The Broadway, Wimbledon, S.W.19. Tel.: Liberty 2814.

(Continued from foot of column one.)

COLLARD Gramo. Unit consisting of A.C. motor, 200-250v. high quality pick-up and volume control, 49/-; without volume control, 46/-.

SPECIAL Offer B.T.H. Gramophone Motors, A.C. and D.C., 100/250v., 30/-. Listed £3/3/-.

EDISON Bell Double Spring Gramophone Motors, E complete with turn-table and all fittings, a really sound job, 15/-.

SPECIAL Offer of Wire Wound Resistances, 4 watts, S any value up to 50,000 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.

WIRE Wound Potentiometers, 15,000 ohms, 1/0; 50,000 ohms 2/-; 500,000 ohms, 3/-; 1,000 ohms wire-wound semi-variable resistances, carry 150m.a. 2/-.

CENTRALAB Potentiometers, 400 ohms 1/-, 50,000, 100,000, ½ meg. any value, 2/-; 200 ohms, wire wound, 1/-.

POLAR Star, manufacturers' model, 3-gang condensers, fully screened, 7/6; with trimmers.

AMERICAN Triple Gang 0.0005 Condensers, with trimmers, 4/11; Utility Bakelite 2-gang 0.0005 screened with unknob trimmer, 3/6; Polar Bakelite condensers, complete with knob, 0.00015, 0.00035, 0.0003, 0.0005, 1/-.

ORMOND Condensers, 0.0005 2-gang semi-shielded, 2/6; brass vanes, with trimmers, 3/6. British Radiophone 110 kc/s Intermediate, 3/-.

MAGNAVOX D.C. 152, 2,500 ohms, 17/0; 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.

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T.C.C. Electrolytic Condensers, 550v. working, 650v. peak, 8 mf., 4/-; 4 mf. or 8 mf. 440v. working, 3/-; 15 mf. 50v. working, 1/-; 25v. working, 25 mf., 1/3; 0 mf. working and 2 mf. 100v. working, 6d.; 8+4 mfd., 450v. working, 4/-; 50 mf., 50 v. working, 2/9.

T.C.C. Condensers, 250 v. working, 1 mf., 1/3; 2 mf., 1/9; 4 mf., 3/-; 4 mf., 450v., working 4/4; 4 mf., 750v., working, 6/-.

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DUILLIER Condensers, 8 or 4 mfd. dry electrolytic 450v. working, 3/-.

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VARLEY H.F. Interval Coils, BPS, band-pass complete with instructions in original cartons, 2/6.

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