Higher ampere-hour efficiency means
QUICKER CHARGING
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The special design of the positive
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Consists of Automatic Relay completely enclosed in Bakelite case, size 4 x 2½ x 2½ ins.

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Distance Switch

Operating power merely a flash lamp battery controlled by any number of ordinary 'bell pushes.' Foolproof: no danger to set or person. Adds tremendously to the value of any set.

EXTRA SPEAKERS WHEREVER YOU LIKE

SET SWITCHED ON OR OFF FROM ANY ROOM

GIVES YOU RADIO ALL OVER THE HOME

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Of Radio Dealers, Ironmongers, etc., with Simple Instructions Send Postcard Now for folder "Radio & Comfort"
"...now I have a set which gives Selectivity, Volume without distortion and Tonal Qualities unsurpassed."

Why be satisfied with indifferent wireless? Perhaps, unknown to you, yours is one of the thousands of Receivers that is being throttled by obsolete or worn-out valves. Like the writer of the letter here reproduced you can give your Set a new lease of life—better all-round performance—by fitting Cossor Valves. Your Dealer will tell you the types you need.

Send for a free copy of the Cossor Valve and Wireless Book—40 pages of interesting information including Radio Definitions—Useful Circuits—List of Stations, etc., etc. Use the Coupon.

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Highbury Grove, London, N.5
Please send me, free of charge, a copy of the 40-page Cossor Valve and Wireless Book B.I.

She Shall Have Music Wherever She Goes

The 1:20 p.m. L.N.E.R. express from King’s Cross to Edinburgh, and the 2:50 p.m. express returning from Scotland to Town have both been equipped with radio-gramophones for the benefit of passengers during the run. Special records with descriptions of points of interest on the route are broadcast at the appropriate time, and during the intervals of the gramophone musical entertainments.

To Further Increase Ether Congestion

As the broadcasts of the new Prague transmitter are poorly received in certain parts of Czechoslovakia it is proposed to erect a relay station at Pilsen.

A Radio Hotel de Luxe

Most of the rooms of the Waldorf Astoria Hotel, New York, possess a small panel furnished with six knobs, five of which on being pressed will supply the occupier with different radio programmes from the main American studios. The sixth will be used for the reception of television in New York.

Too Many High-power Stations

Since the 17 kW. Frankfort-am-Main transmitter has been brought into operation on 250.3 m., listeners in that city complain that interference exists both with Horby (Sweden) and London National. The latter programme creeps through and spoils the reception of the local entertainments. There is a possibility that Frankfort may exchange its channel with Berlin.

Seeing on the Low Waves

B.B.C. experimental television broadcasts are now being carried out on Wednesdays and Fridays between 3 and 5 p.m.; the exact wavelength is 7.3 m. The transmissions are made from Broadcasting House.

Fighting the Radio Pirate

In Canada dealers in receiving sets or components may not effect any sales unless the purchaser can show his or her listening licence. Heavy fines are inflicted if this law is not enforced.

Only Small Fry—But Well Heard

A group of radio amateurs have installed a 250 watt station at Chatellenau, near Charleroy (Belgium). It operates every evening on 215.3 metres, and reception of its broadcasts has been reported from Great Britain and Central Europe.

The Land of Depressions

UTVARP Reykjavik is the call you may pick up, on 1,200 metres, on some favourable nights. It is that of Iceland’s broadcasting station. The announcer, Sigrid Oegmunda, a young woman nineteen years old, speaks German, French, and English, in addition to the Scandinavian languages. Icelandic local time is one hour behind that indicated by our clocks. On Saturdays nights the studio may be heard closing down at 1 a.m. G.M.T. with an old Icelandic hymn.

Super Power Station for Berlin

Work has already been started on the buildings at the Tegel Military Shooting Ranges near the German capital to house the 60 kW. station destined to replace the Witzleben transmitter. It is expected that the new station will be ready by the early summer of 1933.

A Note for D.X. Fans

Broadcasts from WKAQ, San Juan, the new 1 kW. transmitter operated by the Radio Corporation of Porto Rico, have been heard on several occasions during the past fortnight. The station works on 241.8 metres (1,240 kilocycles), and its concerts are best tuned in between midnight and 2 a.m. G.M.T. The station is already on the air at 6 p.m. G.M.T.

A Radio Fanatic

It is reported that Harry Frank Wilcox, a citizen of New York (U.S.A.) inserted in his will a clause to the effect that his pet eight “toob” radio was to be buried with him in the family vault: a sum of money was left to defray the expenses of keeping it in working order.

Sending Announcers to School

The Italian broadcasting authorities have installed a special school at Florence for the training of pupils destined to become studio announcers. At this institute they are taught to speak perfect Italian and also receive tuition in foreign languages.

The Cost of Radio Advertising

Although permission to work the new 200 kilowatt Radio Luxembourg has not yet been obtained, the owners are canvassing the Continent with a view to concluding contracts for publicity over the ether. According to a report received from Holland, the station may be released at the cost of some nine thousand French francs per hour—roughly, at today’s rate of exchange, £110. In addition, in the case of sponsored concerts, the fees of the artists contributing to the programme must also be paid.

Listening to Down Under

Regular transmissions may be heard from VR2ME, Sydney (N.S.W.), every Sunday morning between 6 and 8 a.m. G.M.T. on 31.28 metres; its power is 12 kW. As an interval and concluding signal, the song of the Lyre Bird (Kookaburra) has been adopted: for this special purpose it was recorded on sound-film in Sherwood Forest, near Melbourne.

Radio Developments in Norway

Notwithstanding the power of the Oslo station, Norway has not been covered by its broadcasts. The authorities propose to spend during 1933–4 a million kronen (about £90,000) on the installation of 2 kilowatt transmitters at Stavanger, Tromso, Arendal, Kristiansund, Haugesund, andKirken. Bergen, whose 1 kW. station has been in operation for several years, will be endowed with a 20 kW. transmitter.
Will the Eiffel Tower Close Down?

FROM Paris comes the news that negotiations have been opened between the Poste and Telegraphs administration and the Compagnie Francaise de Radiophonie with a view to the former taking over the new Radio-Paris transmitter. Should the scheme mature, the broadcasts from the Eiffel Tower will be suspended, and its wavelength would be used by the 300 kilowatt station now ready to operate at Luxembourg. The latter station, in this event, will start up without delay and would take over the sponsored concerts hitherto transmitted through Radio-Paris.

For some time the authorities have realized that the Eiffel Tower is not suited to the broadcast of wireless entertainments, and it would thus be permitted to revert to its official duties.

Similar Interval Signals

W LNO (Poland), Ljubljana (Yugoslavia), and Lisbon (Portugal) each in turn adopted a cuckoo call as interval signal between programme items. Fortunately, they broadcast on totally different channels of the waveband.

Cape Town Calling!

THE Marconi Company will shortly erect a Millerton, near Cape Town, a 10 kilowatt transmitter for the African Broadcasting Company, to replace the small station now supplying the wireless entertainments; the wavelength of 570 metres which is at present being used having proved favourable will remain unaltered.

What the U.S.A. Stations are Doing

IN 1931 the National Broadcasting Company of America relayed 147 programmes at local studios for the benefit of its listeners, and during the past year this number has been exceeded. In addition regular transmissions from Europe have been taken at regular intervals by the Columbia network.

Another Wavelength Conference

A S a result of the decisions taken at Madrid last month the International Union of Broadcasting Stations (U.I.R.) will probably meet at Berne (Switzerland) during June, 1933, to discuss a further plan for the allotment of wavelengths. From the point of view of European listeners the Madrid Conference appears to have been a complete failure.

K. Raymond Again

ONE of the earliest firms in the radio industry, Messrs. K. Raymond are again entering the field. A new department has been formed which supplies any up-to-date kit to those willing to take an old set in part exchange, making a very liberal allowance for it. This will enable all listeners with old sets to become really up to date. We are glad to see this name once again, and are pleased to bring this notice to the attention of our readers.

PRACTICAL WIRELESS

ROUND the WORLD of WIRELESS (Continued)

The New Leeds Studio

I WAS looking over the new B.B.C. headquarters in Leeds the other day and was very favourably impressed by their appearance. The architectural design is excellent and the whole place has a most palatial appearance. There is a very large studio, measuring about 50ft. by 40ft. and nearly 30ft. high, or about the same size as that at the new Manchester H.Q. It is appreciably larger than any of those in the old Savoy Hill buildings. I was informed that the Leeds buildings will be ready for use by the New Year, and it is hoped to make full use of the recognized Yorkshire talent.

INSPECTION of NEW EMPIRE TRANSMITTING STATION AT DAVENTRY.

The new Empire Transmitting Station which has been built at Daventry, for the purpose of transmitting programmes to all parts of the Empire.

SOLVE THIS!

Problem No. 15

Having a rather good Moving Coil Speaker of the low resistance type, Jones decided he would like to try Push-Pull and see if it was an improvement on his present arrangement. He therefore obtained two matched valves and a centre tapped output choke. The anodes were joined to the ends of the choke, with the tapping to H.T. positive. The two anodes were also joined to the ends of the speech coil of the speaker. Results were not good, so Jones decided to try Up-Down. What was the reason? Three books will be awarded for the three correct solutions opened. Mark envelopes Problem No. 15, and send to the Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2, to reach us not later than 2nd Jan., 1933.

SOLUTION to Problem No. 14

By twisting the Aerial and Earth lead together (by adopting lightening flex) Johnson was by-passing all his signals to earth through the capacity formed by the twisted pair. The following three readers receive books in connection with Problem No. 14: J. H. Davies, Esq., Bodron, Halkyn Road, Flint; N. Wales; N. Shrew, Esq., 16, Sinclair Road, London, and N. Clayton, Esq., 39, Seabourne Street, Maryport, Cumb.

Seventeen and a Half Hours Transmissions

AS mentioned in these columns last week, the S.W. Colonial broadcasting station will definitely commence operations early this month. The transmissions will start at 9.30 a.m., with a two-hour programme to Australia, and then, after an interval of three hours, the Indian programme will run from 2.30 to 4.30 p.m. At 6 p.m. another two-hour period will be devoted to Africa; from 8.30 to 10.30 p.m. the West African transmission will be sent out, and, lastly, the Indian programme will run from 1 a.m. to 3 a.m. (Tuesday morning). All times are G.M.T., of course.

PRACTICAL WIRELESS

Breslin in France

I HEAR that French listeners are complaining of interference with their popular Poste Parisien transmissions, and that the French have been sending comments through the air. The latter station is received at great strength in France than are most of the French stations.

Poste Parisien

SINCE the recent increase of power to 60 kW, Poste Parisien has been coming in at wonderful strength. I listened to the running commentary of the first Australian Test Match broadcast from this station from 6.30 to 8.30 on the morning of December 2nd, and it was surprisingly good. Despite the fact that the Australian commentator’s remarks were sent over miles of telephone lines and thousands of miles of “ether,” they were as clear as if he had been in the studio. Up to 7.30 a.m. the transmission was perfectly steady, but as daylight approached a certain amount of fading became noticeable, although signal strength generally was practically unchanged.

Another European Station

A NEW station is shortly to take the air. This time it is in Greece, and it will be called Radio-Thesalونik. The wavelength will be about the 270-metre mark, but there are as yet no details available regarding its power.—JACK.
Safeguarding the Set
Some Practical Points on Fitting Fuses for Protecting Certain Parts of a Receiver.

By GILBERT E. TWINING

Accidents happen in the best regulated sets, and they should be definitely guarded against. Serious damage may be done coating several pounds by inadvertently making wrong connections, or by working inside the set when it is switched on. If any metal tool, such as a screwdriver, is dropped into the interior of the set it may cause a short-circuit and bridge across the high-tension current to the low-tension circuit and thus burn out the filaments of the valves and harm some other component.

The ordinary house lighting supply is divided into several circuits, each circuit being protected by a fuse so that the current cannot exceed the safety point without the fuse blowing or melting. When a short does occur or for any other reason the fuse burns out, it is a simple matter to replace it with another length of 5 ampere fuse wire. From this it can be understood that the different circuits and components in the wireless set should be protected in exactly the same way. Wireless currents are so very minute, however, that any normal type of fuse would be useless, for in house lighting the current is calculated in amperes, whilst in wireless practice it is calculated in milliampères, which is one-thousandth part of an ampere. Because of this, fuses are required which will blow at a very much lower value.

The filament of a 2-volt valve is so constructed that the current from a 2-volt battery heats it to the correct temperature. If the voltage of the current is excessive the filament will get so hot that it will actually melt, and the valve will then, of course, be useless. To prevent this excessive overheating a fuse is inserted, and the most common position for it is from the high-tension negative terminal across to the low-tension negative terminal; this will stop any high-tension current from overloading the valve filament through a short-circuit. The fuse is shown in position in Fig. 1.

The Function of a Fuse
A fuse is a device which, when the normal current that it carries is exceeded, breaks down and in so doing prevents the components in the set from burning out.

There are several very good inexpensive fuses on the market at the present time and types very similar to flash-lamp bulbs have been developed and operate on as little as 60 milliamperes; these blow at about 100 milliamperes. They can be obtained up to values in the neighbourhood of 300 to 500 milliamperes, their chief disadvantage being the appreciable fraction of a second they take to blow. Care should be taken with this class of fuse to see that when replacements are made they are of the correct value. Another very good fuse is the gold film fuse, which is a very thin layer of gold mounted on a thin strip of glass. At normal currents it has excellent conductivity and when it does break down its action is very quick.

Sometimes a fuse will glow or even burn out when the set is first switched on and this is accounted for by the fact that the set has probably several 1 or 2 microfarad condensers in its make-up and the action of switching causes a momentarily larger current to flow which charges these condensers sufficiently high to exceed the rating of the fuse. In this case a fuse of a little greater capacity should be fitted, say, 100 milliamperes. These fuses, which have to carry very small currents, have an appreciable resistance and when such fuse is connected in the negative lead, battery coupling may be introduced; this can be overcome by shunting the fuse with a 1 microfarad condenser as shown in Figs. 2 and 3.

When deriving high-tension from the mains it is advisable to insert a fuse in each lead from the supply to the input side of the mains transformer of the set; these fuses, however, must be capable of carrying a larger current than the ordinary battery fuse; it is not sufficient to fit fuses rated to carry the normal current and blowing at twice this amount, for the reason that at the time of switching on the surge of current rises to, perhaps, three or four times this value, therefore the fuses must be obtained to stand up to this extra surge and to blow at three to four times the normal current.

In fitting fuses in a mains radiogram, where the turntable is operated also from...
the mains, it is advisable to incorporate two sets of fuses after the mains switch, that is to say, one in each lead going to the set and one in each lead going to the motor, see Fig. 4, care being taken to keep the motor leads right away from the low-frequency side of the set, otherwise induction will probably take place and produce a very bad hum when the gramo. part of the set is being used. When a fuse does blow it is very necessary to locate the fault before inserting a new one; look for frayed flex, loose or broken connections, or even short pieces of connecting wire left inside when the set was being built, for these may have moved and so be causing a short-circuit. If the baseboard of the set is covered with aluminium foil, or sheet, it is advisable to slip under the valve holders a disc of cardboard slightly larger than the diameter of the holder; this will prevent any chance of the valve pins projecting through the holder and touching the foil, or if the foil is very thin it will also prevent damage.

**SOLDERING TAG**

Fig. 5. How an unused soldering tag may touch on earthed metal screen and cause damage.

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**WIRELESS IS KILLING BOREDOM**

By Colonel Sir Arthur Holbrook, K.B.E.

**Miracles cease to be miracles by the process of repetition. And every miracle finds critics just as soon as its magic...**

Miracles cease to be miracles by the process of repetition. And every miracle finds critics just as soon as its magic fades. The specialist in any particular sphere, whether it be music, drama, talks, vaudeville, or sport, can, no doubt, find much at which he is right-contented, for the way his particular subject is treated by those in authority at Broadcasting House. And in letters to the Press, supported by every other means at his command, he airs his grievances with the Press, supported by every other means at his command, he airs his grievances with the Press, supported by every other means at his command, he airs his grievances with the Press, supported by every other means at his command. Judging by most of the printed comments of this nature, a traveller from another planet might be excused the thought that there is nothing right after all the blase which emanates nightly from millions of loudspeakers.

It is easy to criticize radio, particularly if you have a bee in your bonnet, but devilishly hard to be constructive where the tastes of millions of listeners are concerned. Which probably explains why there are so many self-appointed radio critics. At the other end of the scale, equally misguided, are those fanatics who make grandiloquent and unprovable assertions as to what radio is going to do for them; that, of course, only pleases a few, as said a few, people who plead that radio is assuring the future peace of the world, as though a few unintelligible words of German or Italian or French heard through a loud-speaker

A sour and tasteless thing until it was banished not boredom, but something very much worse, for radio is slowly but surely killing boredom. This is an achievement which excuses its minor sins a thousand times over. Do you seriously doubt that radio is doing this thing? If so, consider for a moment the way family life was shifting just before its advent. The optimist would portray the various members of the average family as spending their leisure mainly outside the home. He might draw your attention to the fact that ardent theatre-goers, Johnny a movie fan, Bill a young man devoted to sport, and Milly a girl aspiring to be a society hostess, might pick an argument, quicken their imagination, rouse their enthusiasm for financial and other reasons, but mainly because they could not afford to do anything else, father and mother, Johnny, Bill, and Milly were forced to spend their great deal of their time sitting at home. The excursions were the "high spots": sitting at home the everyday necessity.

On the whole they were bored with each other, sometimes more than others, but on the whole, bored. They each wanted to do different things, which resulted in their getting into each other's way, and they had little to say to each other beyond commonplace, simply because they were all at different stages of development and lacked a unifying influence. They had the gramophone, of course, but here again expense limited the scope of this instrument. They were friendly to each other, but fundamentally they were bored.

In those days boredom stalked within the four walls of the average suburban home. Then as they say in the film...
DISTANT CONTROL OF WIRELESS RECEIVERS

In a previous article which appeared in Practical Wireless dated December 24th, 1932, I dealt at length with the many advantages associated with the wiring of different rooms in the home so that the loudspeaker could be used although remote from the set. No doubt many readers have already taken advantage of the suggestions made, as I have stated once before in these columns, it is a law of Nature that we never have an advantage without an accompanying disadvantage. Fortunately, in this case the disadvantage (a dual one) does not outweigh the advantages attached to loud-speaker extensions, and, furthermore, it is possible to counter one of the disadvantages in one or two simple ways. As far as the actual tuning of the set is concerned, this cannot yet be carried out at a distance without very elaborate apparatus; but as a general rule this does not cause inconvenience. In the average home the set is often left tuned to one station for hours at a stretch, or, alternatively, altered only once or twice in the course of an evening. With an extension point within handy reach of the set, therefore, this does not involve much trouble.

What is objected to is the necessity for having to actually handle the set in order to switch it on or off at the beginning or end of the programme listened to. Often cases arise when wireless reception is desired in the bedroom, and it is a chilly job coming downstairs to switch off at this time of the year. Of course, the loudspeaker can be disconnected; but this is not only wasteful from the point of view of H.T. and L.T. consumption, but, if the speaker is connected direct in the anode circuit of the output valve, it is damaging to the valve to break the anode circuit and yet retain the filament operative with the grid bias on, and in the case of the pentode valve, leave the screen voltage as well. It is therefore advisable to include with your loud-speaker extension scheme a method whereby the set can be "remote controlled," as far as switching on and off is concerned.

A New Distance Switch

Fortunately there are several simple ways of doing this, but I shall content myself with describing one or two. The first involves the use of a new and ingenious switch which has just been placed on the market by Wates Radio Ltd. Its very simplicity is its greatest recommendation, and I can well imagine readers saying, "Why hasn't it been thought of before?" It is called a distance switch, and is shown in an accompanying illustration and also diagrammatically in Fig. 1. As will be seen, it has only three moving parts, consisting of a toothed contact-wheel having four contacts and four insulated sections, a pawl or lever, and a soft iron plunger to which the pawl is attached. Two spring contact arms rest lightly on the contact wheel. Around the plunger, which is mounted vertically, is a spool of wire or solenoid with a central opening into which the plunger can pass without undue friction. When a current of electricity is passed through the spool of wire the plunger is drawn up and the pawl engages with one tooth of the contact wheel, causing it to move through 36th turn. When the circuit is broken and the current ceases, the plunger falls back by gravity, and is readied to turn the wheel through another 36th turn on the next upward movement. Only a momentary current is required, as the action of the switch is very rapid. Thus, if the coil is connected to a bell-push and battery, one pressure on the push turns the wheel 9th turn, making a contact between the two springs, and the next pressure turns the wheel through another 9th turn, thereby bringing the insulated sections under the springs and breaking the contact. The springs and wheel are thoroughly insulated from the rest of the mechanism, and may be safely connected in the electric-light mains lead and to a wireless set.

In the diagram of Fig. 1 the terminals marked 1 and 2 should be taken to control the L.T. or mains supply to the set, while 3 and 4 go to the bell-push and battery. Now for the method of fitting up the distance control arrangements—Fig. 2. Mount the switch vertically either inside the set cabinet or close to it, and, assuming for the moment that the set derives its L.T. and H.T. from accumulators and batteries, join terminals 2 and 4 in series with one of the leads between the set and the accumulator—the makers of the switch recommend the negative lead. Take a lead from terminal 4 to one of the contacts of a flash-lamp battery (if the run of wiring to the distant point or points is more than twenty yards it may be necessary to use...
two flash-lamp batteries in series, or alternatively use a 9 volt G.B. battery. Finally, take a twin lead, join one end of one wire to terminal 3 and the other wire to the remaining pole of the flash-lamp battery. Run this lead to a convenient point in every room where distance control is desired—shown theoretically in Fig. 2. Join a push-button switch across the twin lead at each point and, assuming that a parallel extension of loud-speakers has already been effected, the arrangement shown in Fig. 2 will result.

**How the Switching Arrangement Works**

Obviously, one dual bell-push and speaker position will be adjacent to the set and the other points in rooms as desired. The switch on the set must be left on, and if we imagine the distance switch is in the "break" position, a depression of any of the push-button switches will switch on the set. If by chance any one switch should now push their switch button the set will be rendered inoperative, and the button has to be pushed again to energize the set.

When the family—assumed situated in different rooms of the house—is retiring for the night the following order of things will take place. Room A wants to finish, so depress the bell-push in the room, but leaves the loud-speaker connected. A moment or two afterwards the loud-speaker comes to life again, indicating that those people in the other rooms are still listening in and have operated their own push-button. The last party in room A must therefore disconnect their speaker if they do not want to listen. This process is followed by each room in turn until the last party switches off.

The scheme is a very simple one, and can be thoroughly recommended. For a mains-driven set the same arrangement will do, it being inserted in series with one mains lead, as shown in Fig. 3. For sets worked from an eliminator and L.T. battery a special switch—model B—must be used, as this particular one will control the two circuits simultaneously; that is, both mains and L.T. In the illustration a small board has been fitted up complete with switch, bell-push, flash-lamp battery and mains feed to illustrate the working of the switch, all the wiring having been carried out behind the board.

**Relay Switching**

Another form of distant control apparatus is that marketed by A. F. Bulgin and Co. Ltd. This consists of a relay located near the wireless set, and on closing a switch situated at any loud-speaker position the relay closes, and this in turn switches on the filaments. This is indicated in Fig. 5A, and if the house is already wired up for loud-speaker extensions as described in my previous article, then it is only necessary to run a pair of leads to each switch position and add the relay. When the set is in operation a warning glow is reflected by the ruby indicator on the relay, and this riot only shows that it is operative, but limits the current flow necessary to operate the device.

Another way of carrying out the same operation is to include what is called a Bulgin remote control wall jack at each loud-speaker position. This jack, in addition to the parallel type contacts employed for the loud-speaker extension, has a second finger contact which is closed by the pressure when the plug tip is pushed into the jack socket. The underside of the finger is insulated so that there is no electrical contact with the plug tip, only mechanical. The arrangement for this is shown in Fig. 5B, while an accompanying illustration depicts the special combined relay and indicating control, together with samples of the type of jack just described. Speaking of relays reminds me of another method which has been used to advantage by some people who have installed remote or distance control. It is illustrated in pictorial fashion in Fig. 6. First of all, it will be assumed that the loud-speaker points are ready wired up for parallel working as shown. Another pair of wires is run from the L.T. terminal of the accumulator and a positive tapping on the H.T. battery—somewhere in the neighbourhood of the accumulator going direct to the set.

When it is desired to listen to the broadcast programme, connect the loud-speaker, depress the bell-push and maintain contact. Current will flow immediately through the relay coils, and the movable "tongue" closes on its contact. The closing of the tongue now establishes the filament circuit, the valves are rendered operative and current at once flows through the output terminals via the loud-speaker, H.T. battery and relay. Once this current has been established the bell-push can be released, for the relay tongue will be held in contact with its stud. When any of the positions wish to finish listening in, the loud-speaker is disconnected, and when the last person has done this the anode current circuit is broken and the relay "opens," switching off immediately the filaments of the set at the same time.

**Another Relay Controlled Switching Device**

In conclusion, one other scheme will be described. This is shown in Fig. 7. At each loud-speaker position is installed a single filament control jack, while a four-core cable makes connection as indicated. A relay is wired up as drawn in the diagram, and on inserting a loud-speaker plug in any one position, current will flow from the L.T. accumulator through the relay coil. This attracts the relay tongue or contact, and the L.T. supply to the set is at once established.

It does not matter how many speakers are working on the circuit, but it will be noticed that the last loud-speaker plug to be withdrawn breaks the relay coil circuit.

A commercial form of this scheme is marketed as the Lotus Remote Control, and in some tests I carried out with the apparatus I found that the relay current consumption was only 20 milliamperes with a 2-volt accumulator.

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**Fig. 7.** Alternative Remote Control Scheme.
A SHORT-WAVE SUPER-HETERODYNE CONVERTER

Some Further Details Concerning the Converter which was Described on page 689 of last week's issue.

It was pointed out last week that the tuning control of the normal receiver, with which this Converter is employed, must be set to a tuning point on the long wave-band. This latter point is very important, and the actual construction of the receiver will govern the best wavelength to which it must be tuned. Generally speaking, a wavelength between 1,000 and 2,000 metres will be found suitable, and a certain amount of time should be spent in trying the different

dial settings between these two extremes. Bear in mind that the tuning control of the Converter will also require adjustment as the tuning control of the aerial. This control is one of the most important, so that, for best results, too much time cannot be spent in finding the best setting.

The Aerial

The aerial which is employed with the Converter will affect the setting of the small pre-set condenser in the aerial lead of this apparatus, and it may be found desirable to experiment with several different types of aerial. A short length of stiff wire, standing straight up from the aerial terminal, and about 12in. long, will be found to give remarkable results under some circumstances, and a similar wire, running from a picture-rail down to the receiver, may also be found advantageous. As the Converter covers three wave-bands, it will probably be found that it is not easy to find a setting of the pre-set condenser which will enable the maximum results to be obtained over the three wave-bands, and the alternative wave-bands should therefore be tried out so as to find one which will enable the three wave-bands to be efficiently explored.

The tuning condenser is fitted with a very efficient slow-motion dial, but even so, it will be found that the slightest touch will make the station and start adjusting the controls in an endeavour to bring it back, only to find that you have lost the spot altogether.

The Earth

The earth connection will be found to be even more important than in ordinary broadcast reception, and we can only reiterate our previous remarks regarding this part of the installation. Remember that the earth must be in a moist condition if the resistance is to be kept low, and therefore you should use some preparation to ensure that this is effected. We cannot give a list of the stations that are likely to be received on this arrangement, as reception on the short waves varies in different parts of the country, and a station that is heard clearly in Devonshire may be inaudible, even on a more powerful receiver, in Yorkshire. This is due, of course, to the skip distance effect, and for this reason also it is not worth while trying to receive the Empire broadcasts from Chelmsford in this country. They may be received in some parts, but it is much more certain to try for one of the European or American stations which broadcasts on high power, especially when first exploring the short waves.

One final word should be given, and that is that the Converter will not work with receivers which have no high-frequency stages. The valve in the Converter acts as a combined first detector and oscillator, and the high-frequency stages in the broadcast receiver carry out the amplification of the signal at the new frequency. The detector valve in the receiver then again detects the signal and passes it on to the L.F. stages.
I shall only describe such parts as can be home-made, because in many cases the components required can be made up at home by anyone with some mechanical understanding how a component works and how each part functions.

**A Low-frequency Choke**

Perhaps one of the easiest and most useful components which can be made at home is a low-frequency choke. A choke of this kind can be used for coupling L.F. valves on the choke-capacity principle, and for providing a choke output filter for the load-speaker.

**Hedgehog Chokes**

In a previous article I described the construction of chokes requiring special Stalloy core stampings, so now I shall deal with a simpler and less costly type called, due to the shape, a hedgehog choke. This consists of a winding of copper wire placed on a bobbin through which is passed a bundle of soft iron wires. A sketch of the finished choke is given in Fig. 5, whilst the various stages of construction are shown in Figs. 1 to 4.

**The Winding Bobbin**

First, we must make a bobbin to accommodate the windings, and for this we shall require a strip of cartridge paper measuring 16in. by 3in., a 6in. length of 1in. dowel rod, some glue, a small piece of plywood, and some stiff cardboard or fibre. As a preliminary we must form a rigid tube from the cartridge paper by winding it tightly round the dowel rod; thin glue should be applied to the paper as it is being wound on. The next step is to make two plywood and two cardboard discs 12in. in diameter, and having a hole in the centre large enough to allow them to fit tightly on to the paper tube. A small notch should be cut in each of the cardboard discs, as shown in Fig. 2. All four discs should then be fitted to the tube, in the positions indicated in Fig. 2, with strong glue. Next, remove the bobbin from the rod, and put on one side until thoroughly dry and firm.

**Winding**

It can then be replaced on the rod, and mounted on a chassis and connected. The winding consists of 12,000 turns, or almost exactly 6 oz. of 38 gauge enamelled wire. The job of putting on the wire can be carried out much more easily if the reel is fitted on a small stand similar to that shown in Fig. 6. It can then be replaced on the rod in readiness for winding. The winding consists of 12,000 turns, or almost exactly 6 oz. of 38 gauge enamelled wire. The job of putting on the wire can be carried out much more easily if the reel is fitted on a small stand similar to that shown in Fig. 6. Preparatory to winding, a 12in. length of rubber-covered flex must be soldered to the end of the fine wire; remember that a non-corrosive flux such as resin is best for this purpose. Cover the soldered joint with insulation tape or a piece of stamp edging, and wind the flex about six times round the bobbin. Then continue to wind on the wire until the first section is nearly full. Pass through the slot in the cardboard separator, and wind the second section, afterwards passing on to the third. Keep the turns as even as possible and take care that all three sections are wound in the same direction. When the whole 6 oz. of wire has been wound on, solder another 12in. length of flex to the end, and let this form the last three or four turns. Now cover all the windings with empire tape or ordinary insulation tape, taking care that no wire is exposed anywhere.

**The Core**

The core comes next, and is made from a bundle of soft iron wires 8in. long. It might be helpful to know that these can be obtained for a few pennies from most ironmongers or florists. The wire can usually be bought ready cut lengths of 8 or 9in., and is sold by weight. It is essential that the wire should be really soft and, if you are in any doubt about yours, put it in a low fire on going to bed, and leave it overnight; that will certainly do the trick. When the core is ready it should be pushed through the bobbin so that it projects by the same amount at each end. Make sure that it is a perfectly tight fit, and then bend the ends over the bobbin until they overlap in the middle. Of course, the two flexible leads must be brought through the core wires. Lastly, secure the core wires by binding with...
**Components**

How to Make L.F. Chokes, and Variable Resistances, etc.

Mounting the Choke

The choke can be mounted directly on the baseboard by means of a brass strap, or it can be made up in more finished form, as shown in Fig. 5. A small piece of well-seasoned hardwood is used for the base and terminals are attached to this. Ebonite could be used instead of wood, if preferred, but the latter has amply good insulation properties if thoroughly seasoned and dried. It will be noticed from Fig. 5 that a terminal is employed to secure the brass core if a few of the iron wires are pulled from under the empire tape and allowed to make contact with the brass.

**Characteristics**

The choke described will give an inductance of some 20 henries when passing a D.C. current of up to 4 milliamps, and will therefore be ideal for choke-capacity coupling after either a detector or an L.F. valve. Its inductance when passing up to 20 milliamps D.C. will approximate to 35 henries, which is suitable for a choke-capacity loud-speaker filter after either a large or small power valve. The choke's D.C. resistance will be just under 900 ohms, and its maximum safe current-carrying capacity, 50 milliamps.

**A Pentode Output Choke**

The inductance of the latter choke will be rather too low for efficient working as an output choke in the anode circuit of a pentode valve, but an excellent component for this purpose can be made by using a winding of 9 oz. of 40 gauge enamelled wire on a larger bobbin or by putting 6 oz. of 40 gauge wire on the bobbin previously described. In either case, the actual construction will be exactly the same as that explained above. As 40 gauge wire is very thin and more difficult to handle, most constructors will prefer to use the thicker material. This can be done by making the end choke, and separating discs 11 in. long, instead of 12 in., in diameter, and using core wires 9 in. long. The choke will have an inductance of about 100 henries at 8 milliamps, and a D.C. resistance of 1,300 ohms.

**A Tapped Choke**

When the choke is required for an output filter after either a three-electrode or pentode valve it is always useful to have a few tappings so that the loud-speaker can be matched to the output valve. When a tapped choke is required, it will be best to make it like the larger one previously described, so that it can be used for almost any purpose. Tappings should be taken after winding one half, two-thirds and three-quarters of the wire. It will then give ratios of 1 : 1, 2 : 1, 3 : 1, and 4 : 1 when connected as shown in Figure 7.

The easiest way to make the tappings will be illustrated next week. The line wire is bare of insulation for a distance of about an inch by carefully scraping with a sharp knife. A loop is made in the bared portion and a 12 in. length of flex tinned round the bobbin and securing it with insulation tape or paper to prevent a possible short circuit with other turns. By winding the flex a few times round the bobbin and securing it with insulation tape the danger of damaging the fine windings by tension on the tapping is entirely removed.

**Smoothing Choke**

A smoothing choke for use in an eliminator or mains set can be made in exactly the same way as the choke previously dealt with by using a larger bobbin and core. For a 30 henry choke capable of carrying up to 60 milliamps the choke should be 1 in. diameter and 10 in. long. The bobbin should be 3 in. long, as before, but the end cheeks and separators will need to be 2 1/2 in. diameter.

(To be continued)
Thinking in Terms of Frequency

(\textit{PART 2})

The First Article Appeared on Page 637 of our Issue Dated December 17th.

It must be clearly understood that, although sound is a form of wave energy, it is transmitted through quite a different medium from that employed in radio. Radio waves are electro-magnetic in nature, and occur in the ether of space. Sound waves are purely mechanical, and the medium is air or water. It will appear later how sound-frequency signals can be transmitted through the ether, but for the moment we must confine ourselves to the various sound frequencies themselves as they occur in Nature.

Audio Frequencies

For all practical purposes the useful band of sound frequencies lies between about 16 vibrations per second up to about 12,000, but a receiver capable of reproducing with fidelity all frequencies between 50 and 8,000, or even 6,000, would be considered quite an efficient apparatus. The frequency indicates the "pitch" of the note or sound, the lower frequencies giving the lower, or bass, notes and the higher frequencies the upper, or treble, notes. It is useful to know that "middle C" on the piano corresponds to a frequency of 256 per second, and that for every octave above, the frequency is doubled, while for every octave below, the frequency is halved. Very few instruments output not even one single frequency. What they do give out is a main frequency, called the "fundamental," and a whole host of other frequencies, all bearing some simple mathematical relation to the fundamental. These are known as "harmonics" and "overtones," and the number and relative strength of them gives to each instrument its characteristic "timbre" or tone.

Alternating or Periodic Electric Currents

Radio transmission depends upon the fact that it is possible to produce electric currents which vary either at radio frequency or at audio frequency. This is done at the broadcasting station. Special apparatus which cannot be described here is used to produce radio-frequency currents, while the microphone, of course, is the source of audio-frequency currents.

These two currents are combined to produce what is termed a "modulated" radio-frequency current—that is to say, a current which vibrates at radio frequency, while its amplitude varies in accordance with the variations in a sound-frequency current. This process is indicated graphically above. When the "modulated" current is applied to the transmitting aerial, a modulated wave is sent into space. When intercepted by your aerial, the energy of the wave is reconverted into a modulated radio-frequency current, which is the raw material upon which your set has to work. In the detector stage the radio-frequency portion is filtered out, leaving the audio-frequency component to be further amplified before it is powerful enough to operate the speaker, in which the original sound is re-created.

The So-called Side Bands

Because the receiving aerial picks up energy from a large number of stations, it is necessary to "tune" the receiver—i.e., to make it particularly sensitive, to the frequency employed by the station it is required to hear and comparatively insensitive to all other frequencies. The broadcasting systems of Europe are so organized that certain standard frequencies are allotted to different stations, these frequencies being spaced over the available broadcasting band at intervals of nine kilocycles. Now it is quite possible to design a receiver in which the tuning is so "sharp" that the set only responds to frequencies differing only slightly from the official frequency of the "wanted" station. Such "razor-edge" tuning, it may be thought, would be ideal, for it avoids all risk of interference from other stations. Avoid interference it does, but, nevertheless, it is far from satisfactory. It is found that the quality of the reproduction is, under these conditions, very bad indeed.

The reason is that a modulated radio-frequency wave behaves in exactly the same way as if it were a combination of an unmodulated wave with a number of other waves of slightly different frequency, some higher and some lower. The highest of these "side waves" has a frequency equal to that of the carrier plus the highest musical frequency in the modulation, while the lowest side wave has a frequency equal to the carrier frequency minus the highest musical frequency in the modulation. The side waves, therefore, are spread over a band of frequencies on either side of the carrier frequency, and are known as "side bands."

Mathematical analysis indicates that the existence of side bands is a reasonable working theory; it is the experience that the effects of side bands are manifest; but it is impossible to prove their existence, and very difficult even to obtain a clear mental impression of them.

There are, as a result, two schools of thought on the side-band question, one maintaining that there are side bands and one denying that they can exist. Probably it is all a matter of how one thinks of these things. To most of us "amplitude modulation"—that is to say, a varying height of wave, produced by the audio-frequency modulation—is the easier to imagine; others, however, may be able to obtain a better mental picture of a band of frequencies grouped round the carrier frequency.

However one looks at it, the principle of working as just described, unless the receiver is sufficiently flatly tuned to pass a certain band of frequencies on each side of the carrier, distortion will occur. It is not an easy matter so to arrange the tuning that, while accepting a sufficiently wide band to ensure good quality, the side bands of interfering stations are excluded. The many variants of the "band-pass filter" system of tuning achieve a very good measure of success in accepting a sufficiently wide band of frequencies to maintain a high standard of performance and at the same time ensure selectivity.

An alternative scheme, which has been proposed and actually used in one or two wireless receivers, achieves a high degree of selectivity by using very sharply-tuned radio-frequency circuits, thus at the same time severely clipping the side waves. Then, to replace the lost quality, a certain amount of amplitude distortion is deliberately introduced in later stages of the receiver.

Supersonic Frequencies

There is one more "trick" with frequencies which should receive passing attention.
Switching Arrangement for Loud-speakers

The accompanying diagram, below, shows the connections for switching two loud-speakers, using a double-pole, double-throw switch. The advantages of this type of switch are its good contact and its quick action in switching from one speaker to the other. For making good connection to the speakers, plug-in coil-holders are very handy. Two holders can be screwed to the cabinet or on to the wall.

**Connections for Long Speaker Leads.**

*Old Coil Holders*

A switching arrangement for loud-speakers.

the other two being attached to the leads from set, thereby permitting a quick removal of either speaker without having to disturb the whole length of flex, which can conveniently be run round the picture rail down to the speakers.—William Wilson (Greasbrough).

![Diagram of Switching Arrangement for Loud-speakers](image)

**Screening of S.G. Leads.**

Here is an idea which will no doubt prove useful to readers who wish to make their own screened leads for connection to the top of the S.G. valve, Pick-up, etc. Procure a piece of expanding curtain rail and cut to the length required to cover the lead. A length of rubber-covered flexible wire will pass very easily down the centre of the ‘runner’ and the ends of which should be bound up with insulating tape to prevent the earthed covering slipping down on to the bare end of the rubber-covered wire, resulting in a short circuit of the H.T. supply. If the last coil of the ‘runner’ is bent into the form of a loop at right angles to the wire, it may be screwed down to the base-board as shown in the accompanying sketch, and the springiness of the runner will keep it in an upright position when the lead is disconnected from the top of the valve.—Charles E. Curtis (Waterloo, Lanes.).

**Using Electric Light System as an Aerial.**

Here is a little dodge which enables the electric light system to be used as an efficient indoor aerial. A length of wire is connected to one of the metal contacts of a lamp holder adapter, and the free end of the wire to the terminal of a .0003 mfd. or .0002 mfd. mica condenser (preferably one tested to 500v. A.C.). Another wire is attached to the other terminal of the condenser, the free end of this wire being connected to the aerial of the set as indicated in the accompanying sketch.—Eric Eversfield (Ulverston).

**Short Earth Lead.**

An efficient and short earthing device can be arranged in the following manner:—Every house is provided with air ventilators under the floor-boards, and all that has to be done is to find the ventilator which is near the ground. Take the measurement from the nearest ground-floor window, and from the inside drill an hole in the floor-board directly over the air vent, close to the skirting-board. Pass the earth wire through this hole, and, with a piece of wire bent to form a hook, pull the earth wire through the ventilator and fix it to the earth tube.—J. T. Howard (Grove Park).

**A Cheap Remote-Control System.**

I have this small remote-control layout working very satisfactorily. It is very simple to make, and each room is in full control of the set. The relay is a Polar, picked up cheaply, and works for months on a four-volt dry battery. The set must have an output filter unit. The wiring and the switches are clearly shown in the accompanying illustration. This arrangement does away with the trouble of going from room to room to switch the set on and off, and is well worth the time taken wiring up.—W. J. Williams (Leamington Spa.).
A Use for old H.T. Batteries

When the voltage of an H.T. battery drops to half of its original value, we consider its useful life is at an end, and so discard it. There is generally some odd piece of tubing or its useful life is at an end, and so discard it. There is generally some odd piece of tubing or

A Use for old H.T. Batteries

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Simple Remote Control

A simple method of enjoying radio in bed, and not having to walk to the set to switch it off, is as follows: Obtain a length of 4-core flex to requirements; one double-pole double-throw switch, and one single-pole double-throw switch; a piece of wood, 6 in. by 3 in.; an old filament resistance, and two terminals. The switches are fixed behind the set, while the block with its two terminals and rheostat mounted upon it is fitted up by the bedside. The diagram shows the connections. Having done this, the operation is carried out in this manner. When the switch handles are pointing down, this works the set with its speaker in the ordinary way. When

Push-Pull Amplification

Here is a method which gives all the advantages of push-pull working without the rather heavy cost of centre tapped transformers. Most of the parts required, which are given below, will be found in your original receiver if it incorporates an output filter circuit:

- One 4-1 or 3.5-1 transformer
- Two 20 Hy. at 40 m/A. chokes
- Two 2 mf. 500 v. test (or higher, if necessary) condensers

The circuit is shown in the accompanying diagram. In order to be sure that each valve is getting its full share of current, a milliammeter should be joined in series with the plate of each valve in turn, and the potentiometer adjusted until the reading from each valve is equal. The valves used will, of course, depend on the H.T. supply available; for battery sets two small power valves give excellent results, such as Osram L.P.2S or Mullard PM2S. Where the H.T. supply is adequate such as with a suitable mains unit, two such valves as the Marconi PX4 will give a greater output.—E. Neason (Coventry).

Simple Remote Control

A simple method of enjoying radio in bed, and not having to walk to the set to switch it off, is as follows: Obtain a length of 4-core flex to requirements; one double-pole double-throw switch, and one single-pole double-throw switch; a piece of wood, 6 in. by 3 in.; an old filament resistance, and two terminals. The switches are fixed behind the set, while the block with its two terminals and rheostat mounted upon it is fitted up by the bedside. The diagram shows the connections. Having done this, the operation is carried out in this manner. When the switch handles are pointing down, this works the set with its speaker in the ordinary way. When

Push-Pull Amplification

Here is a method which gives all the advantages of push-pull working without the rather heavy cost of centre tapped transformers. Most of the parts required, which are given below, will be found in your original receiver if it incorporates an output filter circuit:

- One 4-1 or 3.5-1 transformer
- Two 20 Hy. at 40 m/A. chokes
- Two 2 mf. 500 v. test (or higher, if necessary) condensers

The circuit is shown in the accompanying diagram. In order to be sure that each valve is getting its full share of current, a milliammeter should be joined in series with the plate of each valve in turn, and the potentiometer adjusted until the reading from each valve is equal. The valves used will, of course, depend on the H.T. supply available; for battery sets two small power valves give excellent results, such as Osram L.P.2S or Mullard PM2S. Where the H.T. supply is adequate such as with a suitable mains unit, two such valves as the Marconi PX4 will give a greater output.—E. Neason (Coventry).
FOR REGULAR READERS ONLY

SPECIAL OFFER

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This is Your LAST OPPORTUNITY!

REGULAR readers of "Practical Wireless" who have not already reserved their Data Sheets Binder should do so now. These Binders are being expressly made to contain the "Practical Wireless" Data Sheets for permanent reference, and will undoubtedly prove most valuable to all Radio constructors.

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The date on which the Binders will be ready for despatch will be notified in "Practical Wireless" early in the New Year.

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A TALK ABOUT "ANCE," "IVITY" AND "OR"  

By "CYNIC"

The beginnings of the twin sciences of Magnetism and Electricity date back more than two thousand years, and developments continued through the centuries, at first slowly, then more quickly, and, in recent years, extremely rapid pace. It is one of the penalties which we must pay for this long period of growth, extended over times of very varied methods of thought and carried on by men of many different nations, that the terminology of the science has become somewhat confused. An ideal nomenclator would be one in which all terms referring to the same phenomenon would have the same stem or root word, and all terms referring to the same aspect of different phenomena would have the same ending.

To a certain degree this system is followed in modern technical terminology. Thus, we have resistance, resistor, resistivity, all referring to different aspects of the opposition offered to the flow of electric current by various bodies. Similarly, we have capacitance, condenser, capacitance and so forth, as names applied to similar aspects of different properties of an electric circuit.

However, there is one more term in connection with resistance which requires explanation, namely the word "resistivity." All terms ending in "itivity" refer to the amount of a given property possessed by a given body under specified conditions. In the case of resistivity, the term is employed to indicate the way in which the resistance of a given piece of apparatus is generated when the current is changing from resistance in that its value depends upon the frequency of the alternating current.

Impedance

We now come to the question of impedance. Impedance is the property possessed by a circuit or piece of apparatus by virtue of which an electro motive force can be produced in the circuit due to changes in the magnetism of the circuit. The change of magnetism can be caused by a varying current in a closed circuit, when the inductance is termed "mutual inductance," or by a varying current in the circuit itself, when the effect is called "self-inductance.

A use for old H.T. batteries.

Here again, we have not "inductivity" to indicate the degree to which inductance is possessed by a piece of apparatus, but "inductance" (sometimes called the "coefficient of inductance") is measured in terms of a unit called the "henry," a coil of one henry inductance being one in which an electromotive force of one volt is generated when the current is changing at the rate of one amper per second. There is a term "inductive" which is used to indicate that a circuit or piece of apparatus is so designed that its self-inductance is for the conditions under which it will be used, appreciably greater than its resistance. Frequently used in this sense is the term "capacity" or, as it should properly be termed, "capacitance." This is the property possessed by a piece of apparatus usually called a condenser, but which some engineers now call a "capacitator.

Capacitor

A condenser, or "capacitor" consists of two conducting plates or sets of plates, separated by an insulating material. Naturally, such an arrangement will not pass a direct current, but, if a steady voltage is applied between the plates, there is a momentary rush of current, and a certain quantity of electricity flows into the condenser, and is stored in the form of electrical stress in the insulating medium between the plates. When the electromotive force is removed, the charge remains stored, that is to say, there will still be a difference of electric pressure between the two plates, so that if they are connected together a rush of current will occur as the accumulated stress of electricity is dissipated. The capacitance of a condenser is measured in farads or in microfarads, a condenser of one farad capacitance being one requiring a definite value of resistance is included in a circuit to denote the amount of opposition offered by a given piece of apparatus. Thus, we may desire to reduce the voltage applied to the anode of a valve, and we can do this by inserting a suitable resistor. For example, we may desire to reduce the voltage applied to the anode of a valve, and we can do this by inserting a suitable resistor.

A Talk about "ance," "ivity" and "or" by "CYNIC"
**THE AUTOKOIL PENTODE TWO**

A Powerful Duet of Valves—A Unique Tuner and a CHEAP Set Combined

**Construction**

As with any receiver, the first part of the work to receive attention is the panel. This should be marked out using the Autokoil for the accurate placing of the three holes required for this unit. The central hole is a 7s clearance hole and the two outside holes are required for the one-hole fixing bushes which retain the unit in position. The switch and variable condenser may be attached in any position, and there is no need to refer to the diagram for these, provided they align with the other knobs. Before mounting these components, mark out and drill the terminal strip. The condensers which are to be mounted on the baseboard should now be placed in their relative positions and when perfectly sure that sufficient clearance is given in all places drive home the necessary screws. Mount the Autokoil unit, and if desired, the special escutcheons should be obtained for it. It consists of a thin ebonite plate which the degrees for the selectivity control and other useful guides are marked, and it costs 1s. extra. It not only adds to the appearance of the finished receiver, but greatly simplifies the adjustments required for the various stations which may be received. Wiring may now be carried out, and this will present no difficulty if the wiring diagram is kept beside the work. There are very few wires required, owing to the employment of the tuning unit, and the whole job should not take more than an hour.

**Testing Out**

Into the first valveholder (that is, the four-pin socket) plug a Cossor 210 H.F. or a 210 Det. The former will be found most suitable in outlying districts, or for those listeners who live some distance from a main station, whilst the 210 Det. will be better for those who have trouble due to the close proximity of a powerful transmitter. The pentode is plugged into the remaining socket, and the batteries may then be connected up.

It will be noticed that there is only one positive terminal left for the high-tension supply, all the voltages required in the circuit being obtained either direct or through resistances. Join the loud-speaker, making sure that the leads are attached to the correct terminals, and the receiver is ready for testing. Turn the right-hand knob of the unit as far as it will go to the right, the left-hand knob about half-way round, and the centre knob also to a midway position. Pull out the switch, and if the receiver oscillates at once rotate the centre knob until reaction ceases. The direction will not matter, as a full 360 deg. rotation is obtainable on this control. Simply, therefore,

(Continued on page 746.)
WHAT IS TELEVISION?
A Continuation of the Series of Articles Explaining the Principles of Television.

The last three articles in this series have dealt mainly with the transmitting side, for I felt that in presenting to readers the general outline of a new science, it was necessary to learn something of how the television signals are produced before we take up what many regard as the more interesting part, namely, the receiving end. This has now been done, and we can picture our television signals as being the electrical and optical disembodiment of the scene in the television studio flashed piecemeal into space. Our attention must, therefore, now be focused on simple ways and means of reassembling these signals so that they become an intelligent image to be watched by one or more people at the receiving end. Obviously, a wireless receiver is necessary, but at the moment this need not concern us very largely. One to tune in the London National station on 261 metres is necessary, but before so doing, it is necessary to learn something of the vision apparatus itself.

These transmissions are entirely experimental, the subjects transmitted being, for the most part, the artists rehearsing in the television studio in preparation for the regular television transmissions.

The ultra-short-waves offer the advantage of a very large available wave-band, which enables pictures with much more detail, and no flicker, to be transmitted. Images with 90 lines, and up to as many as 540 lines, in place of the present 30 line pictures, have been transmitted experimentally in the Baird laboratories, and when ultra-short-wave broadcasting becomes established, the result of this research will become available to the public. In the meantime, amateurs with ultra-short-wave receivers will be able to take advantage of the test transmissions from the B.B.C. aerial, but before so doing, it is necessary to learn something of the vision apparatus itself.

"Re-integrating" Apparatus
A little thought should make it clear to the reader that in the "re-integrating" apparatus, we must have material which resembles somewhat the "disintegrating" apparatus, except that the process is to be reversed. Scanning at the transmitting end was carried out at the rate of 15 pictures per second, that is, 750 revolutions per minute, and in consequence, we shall require a motor to effect this in the receiving apparatus. The power of this motor will depend upon whether a disc or a mirror drum is being employed for scanning, by these types of apparatus being shown accompanying illustrations. In either case, the motor may derive its power from the D.C. or A.C. house mains, or an accumulator and be capable of running at a speed of 750 revolutions per minute for long periods at a stretch. Furthermore, the motor should be capable of easy speed control so that the "changer" (this, by the way is the word suggested by the B.B.C. to be equivalent to the "listener" of ordinary sound programmes) can make any adjustments rapidly, if his motor speed does not change.

Next, we shall require a mirror drum or a disc, and on the score of cheapness and simplicity, the latter is the obvious choice and will, at least, be adhered to for purposes of explanation. In practice, a disc is made from fairly thin sheet aluminium—No. 32 S.W.G. is very satisfactory—and to still further lighten it, the sectors are removed, giving the finished product the appearance of a five or six-spoked wheel, as shown in an illustrative form of receiver. The result is a "flimsy" character of the disc is vastly inasmuch as it will allow it to whip out flat when mounted on the motor shaft and run up to speed. It then functions as a solid disc without the object of weight.

Apparatus for Home Use
For a simple machine to use in the home, a disc and some form of receiver are required. The former is, of course, the obvious choice, and the latter may be varied as the user pleases. In the accompanying illustration, Fig. 2, a simple form of receiver is shown. This consists of a base, on which is mounted a small table with a mirror disc attached to a spoked wheel. The disc is made of a somewhat flimsy sheet of material, such as a piece of sheet brass or zinc, and the spoked wheel is made of wood, and acts as a turning head for the disc, thus ensuring the necessary speed. The disc is arranged to revolve in the same manner as the wheels of a bicycle, and is, therefore, capable of running at any speed desired. The results are very satisfactory in practice, and the apparatus is well worth the trouble of constructing.
EVISION? (4)


The diameter of 20in. is satisfactory, and for the edges of this disc must be punched a single turn spiral of thirty holes, spaced apart twelve degrees radially. To receive the B.B.C. transmissions, this spiral of holes must turn towards the electric eye of the receiving disc, the bottom edge of each hole will be exactly on a radius, each radius being separated from its neighbour by an angle of 12 degrees. Then, in a direction concentric with the circumference, or outside edge of the disc, the inside edge of one hole will be on the same arc as the outside edge of the following hole, as shown in the rough diagram of Fig. 1. Each hole is square-shaped and very small, but we need not worry about how the hole size is calculated: that can be deferred until a later date. Unless the apertures conform to this standard, a faulty disc will result, and this can be most disappointing and, furthermore, many people fail to recognize that the distorted image is brought about by this mechanical trouble. For example, if angular errors are present, that is, an exact 12 degree radial spacing has not been made, then no matter how perfectly the holes are punched, distortion will be present. It can be recognized best when any article which has a straight edge is transmitted -say the top of a table. With an accurate disc it will appear as (A) of Fig. 2, but with a continuous and progressive angular error, the table-top will appear inclined or lopsided, as in (B). If three or four holes have incorrect angular spacing, then the edge will be jagged, as in (C), or if a face was being shown, perhaps the eyebrow or the lip would be lifted out of place, and with a very bad disc quite a grotesque effect is noticed.

Underlapping

Bad radial spacing, that is in the direction of the radii when the inside and the outside edges of succeeding holes are not in line is evidenced by the presence of continuous black or white lines which appear vertically when the disc is run up to its correct speed, irrespective of whether any signal is being applied to the light source. This particular fault is known as underlapping or overlapping and is indicated in (D) of Fig. 2. When two successive holes overlap, the track made by the inner edge of the first hole is inside the track made by the outer edge of the next hole and thus a white line appears. On the other hand, when the track made by the inner edge of a hole does not reach the track made by the outer edge of its following hole, it produces the condition known as underlapping. The result is an unpleasant black line running from the top to the bottom of the picture, the width of the line depending upon the magnitude of the underlap existing between these two consecutive disc holes. Skilful blocking and reeling will erase these faults when the errors are small, otherwise nothing short of a new disc will remedy matters.

Source of Illumination

Comes now the third item. In order to be visible our image must be built up from some form of light source. This Fig. 1 (below).—The method in which the holes in the disc should align themselves to obtain a clean picture.

Illustrating the "flimsy" character of an ordinary television screening disc used at the receiving end.

An amateur effort in television receiving apparatus showing the disc and neon lamp together with the motor driving the disc through a belt and gearing.
If you glance at a list of mains-fed wireless receivers you will notice at once how few are made for D.C. as against A.C. mains; yet, although in a number of districts the generating stations have changed over, there still exist many towns, and areas, to which direct current alone is supplied. It is to meet such requirements that many makers have realised that in their range a D.C. mains receiver must be included, and for this reason special valves and components have been designed to render the construction of such sets a practical proposition. To-day, in some respects, the D.C. man is almost as well catered for as his A.C. colleague. The Geophone "Nomad" four-valve receiver has been put on the market to fill a long-felt want, namely, a safe and competitive instrument of sound design at a reasonable price.

With the new Osram indirectly heated valves, a high standard of efficiency has been obtained, and results are to-day comparable to those secured with receivers fed by A.C. mains. In addition, running costs are very small; the consumption is kept down to the neighbourhood of 70 watts, which represents roughly a fifteen hours working at a cost of complete sets.

The splendid finish and design of the Geophone Nomad 4-valve D.C. model is apparent from this illustration.

The Nomad circuit, it is advisable to adopt a reasonably short aerial if selectivity is not a requirement, and to drop the supply voltage to the required amount. One amphere protective fuses are incorporated in the set, and the connection to the mains is carried out by means of a specially safe two-pin plug.

As may be seen from the illustration, all the controls are on the front panel. The central knob serves as tuner, and operates a triple gang condenser. The dial aperture is immediately above is illuminated by the voltage dropping lamp, and, in consequence, shows at once whether the receiver is switched on or not. The right-hand knob combines the functions of "on" and "off" mains switch and volume control. It is of a novel pattern, inasmuch as it works a series aerial and reaction condenser. The dial aperture is very accurately calibrated in this manner.

As the central knob is a local-distant switch, of which the use is advised for the reception of powerful local transmissions. By this means the overloading of valves is avoided; strength of signal is considerably reduced, yet may be increased as desired, by bringing the volume control into action. Three aerial connections are provided at the back of the cabinet. Where an outdoor aerial is used, switch 1 is the normal and more sensitive position for the capture of distant transmissions, whilst aerial socket 2, incorporating a very small series condenser, allows selectivity, and will assist in selecting broadcasts on neighbouring channels. Generally speaking, owing to the high sensitivity of the Nomad circuit, it is advisable to adopt a reasonably short aerial if selectivity is not a requirement.
is desired. On the other hand where a long aerial has been erected, in most instances socket 2 will be a necessity. Provision has been made at the back of the receiver for the use of a pick-up, but as the voltmeter control is ineffective, in this case, an external potentiometer is recommended, and with the combined switch set to "gramophone," radio interference is automatically eliminated. When not in use the pick-up may remain connected to the set without causing any inconvenience.

On test, the Nomad showed a remarkable degree of sensitivity, and in this respect gave superior results to any previous four-valve set made by these makers. The receiver was very quiet in operation; the field winding being run in series with the heaters of the valves. Although the decoupling of the circuit and smoothing filters were found to be adequate, as the method adopted prevents any perceptible mains hum.

I have just completed a test of the new Six-Sixty type 3-32 chassis set. This is a receiver of the console type, mounted in a handsome walnut cabinet, the fret of which is of a striking conventional pattern. On the front of the panel there is an oxidized metal dial of a unique design in which a plaque is fitted, dividing the short and long-wave stations. The outer section of this dial gives the names of fifty-two European stations, and the inner section thirteen stations, the former being short-wave and the latter long. In addition to the usual 100 degree dial reading, the wave-length and kilocycle of each station is mentioned. The interesting part of this system of tuning is, when the set is switched on to either long wave or short wave the dial is lighted by a beam of light from behind pointing on the chosen station. It is one of the best systems of tuning for the person who has no time for knob-twiddling that I have as yet come across. Its simplicity is simply amazing. The circuit comprises "Pre-selector," band-pass tuning, screened grid, detector, and pentode output. Automatic grid bias is provided, and also regulating resistances.

The test showed that the Nomad is capable of giving its owner a variety of alternative entertainments, and its over-all performance reflects great credit on its designer. Its outstanding qualities are ease of control, high selectivity, good reproduction, economy of upkeep, and notable absence of mains hum.

This WEARITE HETERO- DINE FILTER UNIT means MUSH-FREE PROGRAMMES

The WEARITE Heterodyne Filter is a barrier to heterodyne whistle. Will fit any set. Write for special leaflet.

A NEW RECEIVER

The WEARITE HETERO-DINE FILTER UNIT means MUSH-FREE PROGRAMMES

THE more sensitive your receiver the more prone is it to heterodyne whistle interference—and the greater the need for this WEARITE Whistle Filter. With a host of really good programmes always available, there is now no need to have distant reception marred by this interference. This WEARITE Unit is made in two types, 'A' to cut off at 3,500 cycles for normal use, and 'B' calling off at 5,000 cycles for the music critic. With it only the programmes reach your speaker—the WEARITE Filter is a barrier to heterodyne whistle. Will fit any set. Write for special leaflet.

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Do solemnly make the following Radio Resolutions for 1933.
Signed

I will not connect HT to LT.

I will not oscillate.

I will not make alterations while the set is alive.

I will not leave tools in odd places.

Licence due on Jan. 13th.

Arthur Ashby
'32
STAGGERING OFFER
TO HOME RADIO CONSTRUCTORS

THE FAMOUS
SLEKTUN
SCOUT S.G.3
"50 Stations" KIT

At a GREAT REDUCTION for Xmas

The famous "Slektun" Scout Screened Grid
Leaves Kit Receiver, already built by thousands of enthusiastic constructors all over the
country and recently sold at £4.15s. now offered to YOU for £3.

The Cabaret Electric Co. Ltd., to commemorate
the opening of a branch at 254, Vauxhall Bridge Road, Lewisham, S.E.1, are able to make
an amazing offer for a limited period only for this splendid receiver. Every kit purchased is a huge
saving. Every kit was splendidly packed in full-size blue-print and illustrated construction
guide. Every kit was supplied complete with all necessary terminals, wire and flex.

The Cabaret Electric Co., Ltd., to commemorate
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COMPLETE KIT

Includes the famous Slektun Super Transistorized
Superheterodyne KIT Receiver, valued at £10. C.C. Condenser with Permeol screening, T.C.C.
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AUTOKOIL

ALL-WAVE TUNER—Specified for the

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PENTODE TWO"

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highly efficient receiver with an exceptionally
wide range of tuning.

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TUNER. Covers 200 to
2,000 metres.

GUARANTEED KIT OF PARTS

1. Autokoil All-wave Tuner (Hambling) 100
2. 1206 Valve Condenser—(Parallel No. 2) 6 v.
3. 1005 Fixed Condenser—(T.C.C.) 1 v.
4. W.B. Tube Holders 1-13, 1-4 pin (Varley)...
5. Bias Resistance 1,000 Ohms (Varley)...
6. 50,000 Ohm Resistance (Varley)...
7. Fuse and Holder (Bulgin)...
8. Terminal Strip El. & M. (Varley)...
9. Meter Panel Black & Steel...
10. "Autokoil" Escutcheon plate (Hambling)...

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KITE Termes—Carriage Paid on all retail orders.
C.O.D. charges paid on orders over 21. Easy
payment terms arranged, if desired.

Accessories extra.
MODERN circuit development has led to the production of short-wave receivers which are greatly improved, and which give results far ahead of those obtained with less efficient apparatus a few years ago. The home constructor now chooses the circuit best suited to his requirements, purchases a kit of parts as specified by the designer, assembles and wires them up as laid down in the constructional article, and finds, when all is coupled up and the set switched on, that the performance leaves nothing to be desired. There are, however, a number of home constructors unable or unwilling to face the expense necessary in order to purchase a complete author’s kit of components, or who desire to use others of different make which they already have to hand. There is a certain element of risk in the adoption of this form of procedure, but in some cases it is unavoidable, owing to circumstances which allow no choice other than doing without a short-wave receiver altogether.

The experienced constructor goes straight ahead and finds that when the receiver is given an aerial test everything is satisfactory. If some obscure trouble is experienced, he knows how to trace it, and, when cured, settles down to search around the short-wave bands. The beginner, under similar circumstances, is a little bewildered, and after a frantic endeavour to overcome the trouble, finds that his aid is a more experienced fellow enthusiast, who soon puts things right.

There are, however, many enthusiasts who do not look to being acquainted with others sharing the common interest. It is safe to say that the troubles met with under the foregoing circumstances may be listed under the following headings:

**Body Capacity Effects**

A metal panel or sub-panel eartied from a number of different points of its surface owing to the difference of potential at various parts of the screen. A screen of aluminium, or copper, either sheet or foil under the baseboard to which all leads to earth are taken directly by means of small bolts placed at the nearest point to the component from which the lead to earth is taken. This shortens the wiring, thus increasing the efficiency of the circuit.

Place a 50 turn choke of 30 d.c.c. wire, wound on a 1in. former in each ‘phone lead. If this has no effect, place a small fixed condenser across ‘phone terminals. Slacken the coupling between the aerial and grid coil. If the coupling between these coils is too tight, instability, hand capacity, and, in some cases, threshold howl will result. If a variable capacity condenser is used in series with the aerial as a coupling condenser, reduce the capacity by adjusting same so that moving plates are full out.

**Interaction**

Test for interaction due to magnetic fields between coils, choke, or screens by holding a piece of copper or aluminium sheet between the suspected components. This in effect will by-pass stray H.F. currents from one coil to the other. An idea as to where interaction is taking place. The receiver should be tuned to a powerful receiver should be tuned to a powerful short-wave bands. If the coupling between these coils is too tight, instability, hand capacity, and, in some cases, threshold howl will result. If a variable capacity condenser is used in series with the aerial as a coupling condenser, reduce the capacity by adjusting same so that moving plates are full out.

**Dead Spots**

A .0001 mfd. fixed condenser placed in series with the aerial will often remove the dead spot to another part of the tuning range. Before trying this, slacken the coupling between grid and aerial coil, or aerial coupling condenser. This trouble is due to the natural wavelength of the aerial falling within the tuning range of the receiver. Providing the most suitable length of aerial can be found by experimenting, this trouble can be completely obviated.

**Threshold or Fringe Howl**

If transformer coupling is used in the L.F. stages, remove each in turn, and substitute with another make. Place an H.F. choke in series with the grid of L.F. valves and transformer secondary.

Decouple H.T. battery by means of a 2 mfd. fixed condenser, and a wire-wound resistance of 25,000-30,000 ohms; a resistance of less than 20,000 ohms should not be used. If two transformers are used for L.F. amplification, replace one with an R.C.C. unit. Immediately this will assist stability, and freedom from background noises, mush, etc.

Reverse leads of L.F. transformers.

Another method, which is, however, a little expensive, is to place a 600-ohm resistance (spaghetti) in series with each H.T. lead, also L.T. and G.B. leads. A 2 mfd. fixed condenser is then connected to the receiver end of each resistance, and the remaining terminal of the 2 mfd. condensers to earth.

**MAKING SHORT-WAVE COILS**

VERY good short-wave coils can be made with the aid of a bottle. Obtain a length of the brown adhesive paper which is now used by the shapers for sealing parcels. This should have a width of 14ins. or 2ins. Cut off a strip which will just go round a bottle having a diameter of about 6ins. Wrap this round the bottle, with the sticky side outwards, and stick down the end. Allow it to dry thoroughly. Now obtain some thick D.C.C. wire, say No. 36 or 20 gauge. Thoroughly moisten the paper, and wind the wire on tightly. It is best to make a set of these coils, having 2, 4, 6, 8, 10 turns, and so on. Leave a space between adjacent turns equal to the thickness of the wire. When the coil is finished it should be held in position while the cotton covering of the wire firmly peels off the paper. The ends of the coil may be anchored by small rubber bands of the same paper. It should be possible to slide the completed coil off the bottle, when it will be found to remain quite solid and firm. If, however, through some fault or other it will not slide off, instead of undoing the coil the bottle may be broken carefully, leaving the coil intact. In America there is a brand of pickles sold in an eight-sided or octagonal bottle, and this makes a splendid former. It may be possible to obtain something similar in different parts of this country, so the particular shape is worth bearing in mind. The finished coil may be mounted in any manner to suit the taste of the constructor. The following table gives a rough idea of the winding range of these short-wave coils, although it is possible that they will be slightly modified by the particular wiring and type of components in each individual set.

<table>
<thead>
<tr>
<th>Turns</th>
<th>.0003</th>
<th>30-50</th>
<th>40-60</th>
<th>60-80</th>
<th>10-100</th>
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<tbody>
<tr>
<td>2</td>
<td>.0003</td>
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<td>4</td>
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<tr>
<td>6</td>
<td>.0003</td>
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**KEEP YOUR DATA SHEETS IN OUR SELF-BINDER. See page 727.**
There is no doubt that for economy and reliability there is nothing to approach the humble crystal set, and for those who are tackling home construction for the first time it is the ideal type of receiver to build. Of course, you cannot expect to work a loud-speaker unless you employ some form of amplifier, but if you are content with headphones you will find a crystal set will provide exceedingly clear reception for a very modest outlay and will entail no running expenses beyond the annual licence fee.

The receiver illustrated here is particularly easy to construct, but at the same time is very efficient. It is designed to meet varying conditions so that it will work well on each of the different aerials, and in various parts of the country. This is achieved with the aid of the special coil, which has three tappings and by means of two flexible leads different settings can be tried, and so the best position as regards selectivity and signal strength may soon be found.

No soldering

If you examine the illustrations you will see the general lay-out of the set. It is perfectly straightforward, there being no awkward wiring and no soldered connections are necessary. The components are mounted on the usual panel and-baseboard. Theformer may be of ebonite or wood, and measures 6in. by 6in., whereas the latter is of 1in. plywood 7in. by 6in. Panel and baseboard may be joined together with small screws as shown or panel brackets can be employed.

\[ \text{USE 22 GAUGE D.C.C. WIRE} \]

**Fig. 1.**—Details of the Tuning Coil.

**THE BEGINNER'S CRYSTAL SET**

Anyone can make this efficient little set in an hour or two. Although specially designed with a view to easy construction it is not a toy. It has a means for varying the selectivity and will separate Regional and National programmes.

**Designed by W. B. RICHARDSON.**

**Making the Coil**

It is perhaps best to start by making the coil. By this we mean the medium-wave coil which is shown with the three terminals on top. For the benefit of those whose most powerful station is the National on the long-waves, provision is made for a long-wave coil as well. This one, however, is not home-made, but is of the plug-in type.

The coil you have to construct is wound on a paxolin or treated cardboard former, and contains 65 turns of No. 22 gauge double cotton-covered wire. The former is 3in. in diameter and 4in. long. Start about 4in. or 1in. from one end, and pierce two small holes. Through these two holes thread the end of the wire. This is to secure it in position. Leave a few inches of wire over for making connections. It is better to have this come through to the inside of the tube as it will make a neater job when it comes to making the connections to the terminals. Having secured the wire, commence to wind the coil, keeping the turns as close and even as possible. When you have wound on 15 turns pierce two more holes close to the last turn you put on and making the wire into a loop about four or five inches long, pass it through the holes, as you did the single wire at the beginning, and pull it tight. You should pass it first through one hole to the inside of the tube, then to the outside through the other little hole, and finally back to the inside.

**Fig. 2.**—Pictorial view of the Beginner's Crystal Set.
the variable condenser which is mounted to the back of the baseboard so as not to foul. It should be noted that the coil should be well to and 3 will show their positions. Figs. 2 and 3 will show the positions of the coil holder and terminal mounts. Figs. 2 and 3 will show their positions. Figs. 2 and 3 will show their positions. Figs. 2 and 3 will show their positions.

Mounting the Parts

The coil is now complete, and it should be mounted on the baseboard with the coil holder and terminal mounts. Figs. 2 and 3 will show their positions. It should be noted that the coil should be well to the back of the baseboard so as not to foul the variable condenser which is mounted on the panel. An easy way to fix it is to the baseboard is to glue a strip of wood inside the lower end like the ebonite terminal strip at the top and to screw this to the baseboard.

Wiring Up

On the panel you have to mount the variable condenser, the crystal detector, and the wave-change switch. If you drill the hole for the spindle of the condenser a little above the exact centre of the panel there will be room for the detector below it, as shown. The type of detector illustrated is preferred by the writer to any other. It contains one of the galena type of crystals such as "Hertzite" and contact is made with a cat's whisker. Provided a little care is taken to find a good spot on the crystal, and the whisker is adjusted to rest on it with the right pressure results are excellent. Of course, there is no reason why you should not use one of the semi-permanent types if you prefer, but although less tricky to handle they are not usually so sensitive.

The receiver is completed by screwing the panel and baseboard together, and wiring up. Actually it is easier to fix some of the wires before the panel is fixed as it gives you a little more room to work. With the exception of the two flexible leads all the connections are made with insulated connecting wire such as Glazite. The two flexible leads are made of ordinary lighting flex with spade terminal tags clipped on one end to facilitate connection to the coil terminals. Fig. 3 will make the wiring quite clear.

The Cabinet

No doubt when you have made the receiver you will want a case for it. If you are at all handy with tools you will be able to make the one shown. As you see, it provides room for the set itself and also an additional compartment for the "phones. This makes a very compact affair of the whole thing. There is nothing difficult about the construction. It is made of mahogany or oak. Or again deal stained to represent either of these woods can be used. The bottom is finished off with a base moulding made by Hobbies, Ltd. It can be obtained in oak or hazel pine (Reference No. 41). It should be mitred together at the corners like a picture frame.

Operating Hints

Now for the try out. Connect up the "phones (4,000 ohms for preference), Join on the aerial and earth, and pull out the wave-change switch. Before adjusting the crystal connect the two flexible leads to the terminals on top of the coil. Try first of all with the one from the crystal detector joined to No. 3, and the other from the aerial to No. 1. Then listen in by turning the tuning knob slowly.
RADIO IN EVERY ROOM

You can easily extend your wireless to every room in the house by means of these handsome fittings. They cannot be confused with your heating or lighting points.

BULGIN MIDGET WALL JACKS, all insulated. Walnut or Mahogany bakelite finish.

BULGIN JUNIOR WALL JACKS in black or brown bakelite with nickel plated cover.

PATENTED
No. 294765.

STANDARD TYPE JACK PLUGS, AS ABOVE, 1½

THEY COST
1/6 PER POINT.

BULGIN MIDGET WALL JACKS, all insulated. Walnut or Mahogany bakelite finish.

BULGIN JUNIOR WALL JACKS in black or brown bakelite with nickel plated cover.

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THEM THEY COST
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I off the free terminal quickly. A flick the free battery lead on and hand, and place one finger on each ing, moisten two fingers of the left battery to a terminal of the wind-
section of the H.T. battery may be mulator will answer, or a small flash lamp battery or 4 -volt accu-
tions.
ations.
example, the right and wrong way round of dynamo field connec-
tions. The primary, so the windings may be com-
pared and identified if unknown. Suppose it is desired to use a transformer as L.F. choke, with the wind-
ings connected in series. How is one to know which terminals to connect together, seeing that the winding direction is unknown? Just connect one ter-
mal of each winding together, and test the free terminals for shock. If the shock is appreci-
able, and greater than either winding gave alone, the connec-
tion is correct. If, on the other hand, the shock is nil or almost so, one end of the con-
nection only must be changed over, because the wind-
ings are connected in opposition. Many applications of this method will sug-
gest themselves to the ingenious experi-
menter.

The best thing is to experiment until you get the most suitable combination

LIST OF COMPONENTS.
One J.B. popular variable condenser, 0,005 mf
One Beco ebonite panel, 6 in. by 6 in.
One baseboard, 7 in. by 6 in.
One Paxolin or card former, 3 in.
diam., and 4 in. long.
Half oz. 22 s.w.g. D.C.C. wire.
One small strip of ebonite 3 in. by
1 in. by 1 in.
Two small Clix brackets.
Four small nuts and bolts, screws, etc.
Five small terminals.
One crystal detector with Shaw's "Hertzite" crystal.
One Bulgin coil-holder.
Two Belling-Lee terminal mounts.
One Ready Radio on-off switch.
One Hank Glazite connecting wire.
ACCESSORIES.
One pair Browns Featherweight Headphones.

TESTING BY SHOCK
A QUICK way of testing L.F. transformers, chokes, and similar highly inductive apparatus which I have used for many years, is the "shock" method. It does not appear in the text-
books, but is one of those little dyes which one develops in a varied electrical engineering experience, and I have often found it useful to check, for example, the right and wrong way round of dynamo field connec-
tions. For testing a transformer a few volts only are necessary. A flash lamp battery or 4-volt accu-
mulator will answer, or a small section of the H.T. battery may be used.
Connect one terminal of the battery to a terminal of the wind-
ing, moisten two fingers of the left hand, and place one finger on each terminal. Now, with the right hand, flick the free battery lead on and off the free terminal quickly. A slight but quite definite shock
will be felt if the winding is O.K. The secondary will give a stronger shock than the primary, so the windings may be com-
ared and identified if unknown. Suppose it is desired to use a transformer as L.F. choke, with the wind-
ings connected in series. How is one to know which terminals to connect together, seeing that the winding direction is unknown? Just connect one ter-
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nection only must be changed over, because the wind-
ings are connected in opposition. Many applications of this method will sug-
gest themselves to the ingenious experi-
menter.

WIRELESS SHORTHAND No. 4
If you are a beginner, you should collect our Data Sheets. YOUR Self Binder for them awaits you.
See page 727.
HAVE you heard the electric organ of Poste Parisien during the test transmissions of this instrument? Broadcasts of this will now form a regular feature of the programmes from this station, since it was officially inaugurated on October 26th.

The organ makes use of wireless waves for the production of music, and the effect is in many ways similar to the ever-popular cinema organ. Many have been the devices used on these organs for the production of different "effects," but, in my opinion, the ordinary pipe organ is still vastly superior in every way. Unfortunately, this instrument is difficult to broadcast, and the control engineer is always kept busy during a transmission of this nature. The large range of frequencies and the great volume range to be obtained from an organ mean constant control if the best results are to be obtained. The mighty volume of the diapasons needs curtailing, if listeners' eardrums are not to be "blasted," and as often as not, in organ music, a mighty rush of sound is immediately followed by the complete absence of the swell, which is missed completely by the listener unless the engineer handling the "knobs" is very alert. Microphone improvements have, however, much improved the transmission of the king of instruments, and reception is much better than used to be the case.

U.S.A. and Sponsored Programmes

AMERICAN listeners are now getting a heartily bored of sponsored programmes, especially those which comprise more talk by the sponsors than by actual music programme. An outcry against the length, frequency and the aimlessness of the "sales talk" is sweeping the whole of the States, and it is beginning to be believed that the sponsor who simply announces his name and product will find the best results from an organ mean constant control if the best results are to be obtained. The mighty volume of the diapasons needs curtailing, if listeners' eardrums are not to be "blasted," and as often as not, in organ music, a mighty rush of sound is immediately followed by the complete absence of the swell, which is missed completely by the listener unless the engineer handling the "knobs" is very alert. Microphone improvements have, however, much improved the transmission of the king of instruments, and reception is much better than used to be the case.

What We Owe to Bakelite

A NEW super factory has been just opened by Mears, E. K. Cole and Co., Ltd., the famous Southend makers of "Ekco" products. The way this firm has progressed to open such a factory is from a small room with a handful of workers to a gigantic factory employing some 3,000 hands, is yet another of the miracles of radio. The history of this factory has to a large extent been the history of the development of the substance known as bakelite, and the new "Ekco" works is being devoted solely to the production of bakelite articles.

What we radio amateurs owe to bakelite is not fully realized. In the early days, knobs and dials used to be carved from ebonite. Later, a method of moulding this substance commercially became known, but when the principles underlying the manufacture of bakelite were fully understood, and a technique regarding the special moulds necessary for the production of bakelite articles evolved, ebonite quickly took a back seat. Now, complete cabinets are moulded from bakelite, and hardly a component in our sets is free from bakelite in some form; it is safe to say that the use and development of bakelite has been one of the greatest factors in bringing radio within the means of the masses during a period of great depression.

Music from Oscillating Valves

YOU may have noticed that I have a weakness for telling you things about our country across the "wireless pond," and I came across an interesting account of an invention from Philadelphia. This time, however, it is an invention of a Russian physicist who has developed another of those weird electrical instruments which produce sounds by means of oscillating valves or similar arrangement. This new instrument has sufficient novelties about it to warrant my mentioning it, the chief of which is that it is played by an ordinary keyboard somewhat like that of a piano. Almost endless possibilities are held out to the performers, however, for the volume is controlled by the extent the keys are depressed. A heavy-handed performer, therefore, would be guaranteed to raise the roof, or at the very least to so "blow" the loud-speaker, from which the sounds emit, as to seriously cause trouble with the neighbours. The inventor, however, had something of this in mind when he arranged a means of "silencing" the performer. Instead of his instrument, by a simple device the volume can be reduced and fed through headphones so that only the performers themselves are able to hear the result of their endeavours.

"Soft" Valves

I CAME across a very rare thing the other day—a "blue-glowing" valve. It is not often that these are found nowadays because "blue-glowing" invariably implies a state of "softness" in the valve. As you may know a hard valve is one that has a high degree of vacuum inside its glass bulb, and in the early days of valve manufacture the special pumps used for exhausting the air from the bulbs were not as efficient as those used to-day. Furthermore, modern valves are mostly covered inside the bulb with a silvery substance known as "gettering," which is the residue left over from an electro-chemical process which removes the last vestige of air remaining after the bulbs come from the exhausting pumps. By this, the silvery is a necessary evil, and does not serve the purpose of hid ing the "works" from inquisitive eyes as some people think. Well, as I was saying, in the early days of wireless the pumps were not so efficient and valves imperfectly exhausted were termed "soft," and in use often a blue glow could be seen around the cathodes. Some of you may remember the old Dutch bright-emitter which very noticeably "blue-glowed" and made such good detectors, and which led to the almost standard practice of keeping any blue-glowing valves as "working" detector stage. Nowadays, such a valve is rare indeed, which is a very good thing, for its use in a modern circuit. Even the modern components will only give rise to distortion and poor results generally. You might try such a valve in the detector socket, but I am afraid you will find it falls very far behind the special detector valves now available, especially as a "blue-glowing" valve generally works best with an unusually low voltage, some of these lamps I referred to giving the best results with about 25 to 30 volts on the plate.

Gift Tokens

I SEE that a novel scheme has been launched by an association of book-sellers to make easy the way of presentation to one whose relatives who are uncertain of the recipient's wants. A token of any value can be purchased and given as a present, this token being taken to any book-shop, and a volume or volumes of appropriate value chosen. It ensures that the person who receives the gift obtains exactly what he wants, and the giver is relieved of a lot of responsibility. Could not some such scheme be evolved in the radio trade? How convenient for a rich uncle, when his nephew's birthday comes along, to give him a token for, say, ten pounds, and how great for the radio-minded nephew to be able to rush off and buy the parts for the very latest Practical Wireless set! At Christmas, too, it would be a boon, for, to anyone keen on wireless, a radio token would completely fill the bill as an ideal gift, for what radio man could enter a radio shop with a token to the value of ten shillings without being able to find something he had been wanting for a long time?
Radio Ramblings

When testing parts by the 'phone and battery method, it is as well to insert a resistance of about 10,000 to 20,000 ohms in the test lead, and to make contact with circuits carrying really high voltages, both to protect the 'phones and your ears. This method of testing is crude, perhaps, but it has the advantage of being always ready to hand and calls for no expensive instruments. It gives a certain indication when a fault is present, and a current not exceeds a certain limit, a further indication of the degree of the fault. The testing of fixed condensers that are suspected of having broken-down always presents difficulties to the beginner, as a click will almost always be heard when first touching the two terminals of such components. If the circuit is broken, and again touched, the click should be very much diminished or else not be heard at all if the fixed condenser is in good order, as by this time the condenser has become charged up to your set to the battery being used in the test. If the condenser has broken down it will not hold this charge, and the current will drain away from the battery being used in the test, every time the 'phones are connected across the terminals. Sometimes, a suspected primary of an L.T. transformer will give a click, even though it is broken down at some point. This is because a fixed condenser of small value is sometimes incorporated inside the case of the L.T. transformer, which also provides the only path of current for the click, a click is heard when breaking circuit is the transformer in good order. That is, when the test leads are removed from the primary terminals, a click almost as loud as that in the beginning, when first connected, should be heard. Coils can be tested in the same manner, but if the coil has been wound with wire of fairly high resistance, the clicks will not be very loud, but to hear a click at all is almost all that matters. After a little practice, the state of a component can be estimated by the volume of the click, when 'phones are connected across, but to prevent too great a drain being taken from the battery it is as well to insert the resistance in series as mentioned above to keep the sound within the capacity of your ear-drums.

Wireless Precautions for the Festive Season

By the time you are reading this, your mind will be full of the good things that are associated with festivities and the New Year. Parties, as a matter of course, are not infrequent and loved by all who have a taste for things merry and boisterous. Some people, however, will feel it necessary to exercise caution and forbearance when making contact with circuits carrying really high voltages, both to protect the 'phones and your ears. This method of testing is crude, perhaps, but it has the advantage of being always ready to hand and calls for no expensive instruments. It gives a certain indication when a fault is present, and a current not exceeds a certain limit, a further indication of the degree of the fault. The testing of fixed condensers that are suspected of having broken-down always presents difficulties to the beginner, as a click will almost always be heard when first touching the two terminals of such components. If the circuit is broken, and again touched, the click should be very much diminished or else not be heard at all if the fixed condenser is in good order, as by this time the condenser has become charged up to your set to the battery being used in the test. If the condenser has broken down it will not hold this charge, and the current will drain away from the battery being used in the test, every time the 'phones are connected across the terminals. Sometimes, a suspected primary of an L.T. transformer will give a click, even though it is broken down at some point. This is because a fixed condenser of small value is sometimes incorporated inside the case of the L.T. transformer, which also provides the only path of current for the click, a click is heard when breaking circuit is the transformer in good order. That is, when the test leads are removed from the primary terminals, a click almost as loud as that in the beginning, when first connected, should be heard. Coils can be tested in the same manner, but if the coil has been wound with wire of fairly high resistance, the clicks will not be very loud, but to hear a click at all is almost all that matters. After a little practice, the state of a component can be estimated by the volume of the click, when 'phones are connected across, but to prevent too great a drain being taken from the battery it is as well to insert the resistance in series as mentioned above to keep the sound within the capacity of your ear-drums.
always cautioned against long grid wiring, and the addition of the capacity due to several feet of pick-up wiring cannot be checked but detrimental to results generally. In this case it is possible to obtain from most transformer makers a suitable transformer for transformers of this kind, I do not believe they are generally advertised, but they can be had if you approach transformer makers; the only details necessary are those concerning the make of your pick-up, as the resistances of these vary considerably.

About Grid-Leaks

D 0 you remember the days when we invariably used a variable grid-leak in our sets? The principle was sound in theory, but mechanically worse was lost than gained by their use—I say mechanically because it was the problem of the designer of that part that proved insurmountable, considering the limitations regarding cost and space. At the same time, it is realised that a mean value of grid-leak is often necessary on short circuits and sometimes a theoretical compromise is often difficult to achieve. In these cases it is best to place your grid-leak in a place where it can be easily removed if it prove to be a disadvantage. Overhead wiring as much as possible, so that leaks of different value can be slipped in without the need for wrecking the set. While leaks of 5 megohms are best for long-distance work, the best quality is obtained from the local station with leaks of quite low value, and it pays to experiment in this direction, the above remarks only applying where leaky grid detection is used.

Using 'Phones for Long-distance Work

M OST of us nowadays tune in on the loud-speaker as a matter of course, but for really long-distance work, essential when you are miles away from the station, head-phones cannot be beaten when knife-edge tuning is employed. Moreover, when two or more tuning controls are used, the control most in resonance much more easily if the soft sibilant hissing noise indicating this state of affairs can be easily heard without any distraction of outside noises. The snag comes when a station suddenly comes through with a strength sufficient to shatter your ear-drums, and it is not pleasant nor desirable that you should allow your ears to suffer this discomfort. When listening with head-phones I often insert a spaghetti resistance in series, which makes listening comfortable, and which at the same time removes much of the fearful clatter with which the ether is full nowadays. A megohm is the maximum value that should be used.

New Year Greetings

I SHOULD like to add my voice in wishing you all a VERY HAPPY NEW YEAR, and hope that you will have your fair share of enjoyment and interest from the pursuit of your hobby of work. One of the finest hobbies it is possible to have.

A Year of Progress

W HAT do you consider to be the most outstanding development during 1932? There has been nothing that can be called revolutionary as regards wireless, but it cannot be disputed that steady progress has been made in many directions. Cabinets have assumed a slightly more modern note, not so box-like in the old kind, I do not believe they are generally advertised, but they can be had if you approach transformer makers; the only details necessary are those concerning the make of your pick-up, as the resistances of these vary considerably.

The Standard

Leclanché Self-Charging

PERMANENT H.T. BATTERY

Thirty per cent. reduction. And we sell direct to give personal advice and attention. The STANDARD battery recharges itself when the set is shut down, and so gives ample current, month after month, year after year. Dead silent background. Brings in difficult stations at their best. These advantages are enjoyed by thousands PERMANENTLY, because the eventual replacement is merely a matter of changing cartridges at a few pence each.

Prentice's Battery Co., Ltd., Dept. N.W.

STANDARD BATTERY, CO., LTD., 184-186, Shaftesbury Avenue, London, W.C.2

STOP BUYING DRY BATTERIES

HERE'S A CHEAPER WAY TO GET BETTER H.T.

ONCE AND FOR ALL

Free Booklet Tells You All About the

STANDARD

Leclanché Self-Charging

PERMANENT H.T. BATTERY

Novelty 

Any voltage, Any capacity, Model H.B. No. 3 size, 12,000 millamp capacity, 120 volts, 84 cells. Down without trays, Tray containers if required. Other capacities 2,000 to 25,000 millamps

STANDARD BATTERY, CO., LTD., Dept. N.W.

164-186, Shaftesbury Avenue, London, W.C.2

PICKETTS

(The P.R.) Albion

SLEKTUN “SCOUT S.G.S.”

Simpler than ever to build

FREE

Transformers 4/-, all repairs magnetised tree.

Out of print,但是如果 otherwise unique, it will not be published in groups.

December 31st, 1932

PRACTICAL WIRELESS
IGRANIC PICK-UP

The Pick-up manufactured by the Igranic Company, illustrated below, is a very efficient instrument of
rather original design. The entire apparatus is
snugged in a trough, with the base and pick-up
mounted in bakelite. The base is of square shape
and provides a very solid fixing point for the arm,
thus reducing the risk of vibration shatter due to
insufficient support. The arm is held in a global fitting;
the counterbalance weights at the rear of the trough
completely avoids pressure wear on the record; and
therefore, combined with an almost frictionless
screw action on the support, will enable the records
to be used practically indefinitely with a good
trace of record wear. The magnet system is made up
from cobalt steel and the needle holder is rubber
cushioned, with the armature arranged so that the
frequency response is practically uniform when used
with 78 r.p.m. records. This means that the pick-up may
be rotated for easy needle changing. The price of the
complete set is 25s., and the pick-up only may be had for
20s.

PREH VARIABLE POTENTIOMETERS

Samples of the two types of potentiometer now
manufactured by this company by the Preh
Manufacturing Co., Ltd., have been sent to us for
review, and these are extremely neat and small.
One variety bears the name "Multihm," and the
other incorporates the balancing mechanism on the
friction disc type, while the former is of the slider-
type. The rating of each model is 2 watts, and both
types are wire wound, and made in values from 2,000
to 25,000 ohms. The winding is protected by a
metal case, and the value of the component is highly
marked on this casing so that the actual resistance
is at all times observable. Too many components of
this class have the value printed in some out-of-the-
way position in microscopic figures. The workmanship
of these resistances is quite good, and the action
is very smooth. On test the valves found to be
reasonably accurate, both values being slightly
above the actual rating. The error, however, was
under 10 per cent. The current rating was extremely
conservative, and the full 2 watts could be dissipated
with only the slightest rise in temperature. At 6s.
for the ordinary model, and 8s. for the de-luxe model,
these components are which thoroughly recommend.

NEW G.E.C. D.C. MAINS SET

The "Gala" is a 3-valve "All-In" D.C. table
model, of the I.F., detector and pentode type.
Incorporating the standard G.E.C. features adopted
this season, i.e., moving coil loud-speaker, single knob
incorporating the standard G.E.C. features adopted
for the ordinary model, and 55s., for the de-luxe model,
with only the slightest rise in temperature.

CLIX CHASSIS MOUNTING VALVE-HOLDERS

THE capable home constructor of to-day is following
closely on the heels of the set manufacturer,
and is generally using the " chassis" method of con-
struction. This permits a neat lay-out, with most
of the wiring " below deck." The newest "Clix"
valve-holder, here shown, is a pleasant component for
this method, whether used on raised wooden base
or metal chassis. In appearance a " skeleton," it is yet
exceedingly strong and thoroughly sound mechanic-
ally. Who has not experienced the holder into
which the valve has to be forced, or, on the other hand,
the feeling that some of the pins are not contacting,
because the valve seat is an inch inside. The Clix
sockets are able to move laterally, and so align them-
selves with the pins, while their spun-steel framework
and ensured maximum surface contact without fear
of collapse. The valve is inserted with perfect ease,
and comfortable snap. The maker are A. F. Bulpin
and Co., Ltd., Abbey Road, Burying.

HEAYBERD TRICKLE CHARGER

In our issue dated December 24th, page 709, we
illustrated the Heayberd Trickle Charger. Through
a mistake in the information supplied this is shown
as their model A.02, but should read A.03.

Have you Reserved YOUR Self-
Binder for our Free Data Sheets?
(See page 727)
PRACTICAL LETTERS

from

Readers.

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

A Plea for Plug-In Coils

Sir,—The letter of A. Bedding (Chapman) in issue No. 12 has voiced my wishes regarding a good selective circuit for plug-in coils, and I am pleased to read that you have something on these lines for us in the near future. May I make a suggestion, which would remove that bugbear of plug-in coils, viz., coil changing? Can you give us a circuit in which high and medium waveband coils are on the same base board and some simple switch device to cut out the waveband not required? I much prefer plug-in coils, but I have a dual wave coil in my set in deference to the female side of family, to whom coil changing is anathema. I hope, if this is a feasible proposition, to see it in your columns in the near future.—W. OSBORN (Chatham).

Topping Accumulators

Sir,—Referring to the method of topping up accumulators, suggested by a correspondent in your issue for December 3rd, I should like to draw attention to the fact, well known to most persons habitually handling sulphuric acid, that water should never be added to the acid, the contrary obtains, the acid should be added to the water. By not being added to acid, great heat is generated, which undoubtedly will shorten the life of the accumulator, and if the container be of glass, the heat may cause it to crack, with danger to the user by acid burns. I know that the method suggested is adopted by some careless operators at charging stations (so-called) with a beautiful disregard of their customers' property. May I be allowed to offer my method, which is safe, and involves little expense or trouble. By the container be of glass, put in sufficient distilled water for topping up, that is, to cover the spouted milk jug, put in a small spouted milk jug, put in sufficient distilled water for topping up, that is, to cover the plates well (easily estimated), then by removing a good syringe (rubber bulb on a glass tube), an arrangement similar to that used on hydrometers for testing the s.g. of acid, withdraw a fair quantity of acid from the accumulator, replace into the water in the jug, and pour back into the accumulator. Scarcely any heat will be developed, and a rinse in water renders the apparatus used harmless. Anyone who may say that ever since your paper came out I have watched eagerly for such an article, but have not seen one. I take a great interest in building up sets and I find that dual-range coils at 17½ are too much for us poorer radio fans, and from my past experience I know what a saving it is to construct coils, etc., for oneself. I may say that up to now I have found PRACTICAL WIRELESS the best threepennyworth we have had for a good many years. Before I close I want to ask you just one thing more, and that is—please cater a little more for those who cannot afford expensive components.—R. TOASE (Darlington).

Five-Valve Portable Wanted

Sir,—I thought it would be of interest to the technical staff of PRACTICAL WIRELESS, I wish to ask a favour of your technical staff. Will they give in an early issue the constructional details for a good tuner for medium and long wavebands. I may say that ever since your paper came out I have watched eagerly for such an article, but have not seen one. I take a great interest in building up sets and I find that dual-range coils at 17½ are too much for us poorer radio fans, and from my past experience I know what a saving it is to construct coils, etc., for oneself. I may say that up to now I have found PRACTICAL WIRELESS the best threepennyworth we have had for a good many years. Before I close I want to ask you just one thing more, and that is—please cater a little more for those who cannot afford expensive components.—R. TOASE (Darlington).

Congratulations—Still They Come

Sir,—Allow me to congratulate you on your most interesting journal, PRACTICAL WIRELESS. It is by far the most interesting periodical of its kind I have seen. It puts everything in such a clear and straightforward way for those who, I think, should be studied a little more than they have been in the past, viz., the amateur constructors. At the same time your paper is quite as interesting for the more advanced amateur. The circuits described are suitable for everyone. Altogether, I consider it a splendid paper and wish it every success.—S. BURNARD (Boscobel).
The Autofoil Pentode Two  
(Continued from page 729.)

The tone from this receiver is very good indeed, owing to the choice of the constants turn this knob until the reaction stops. Now upon adjusting the variable condenser the nearest B.B.C. station should soon be picked up and the left and right-hand controls for the receiver will be employed to obtain the optimum positions. With this ingenious unit it will be found very simple to obtain any degree of selectivity or signal strength and this will be found most valuable when it is desired to listen to a station which is situated some distance away and is working on a wavelength different from that of the nearest B.B.C. station.

A similar effect can be obtained with radio waves. Two signals of almost identical frequency will combine to produce a beat frequency which may be of audio frequency, in which case it will be heard in the form of a tone modulating the carrier, commonly known as a "heterodyne" whistle. In the present congealed state of the ether it is impossible to provide any real remedy for heterodyne whistle. However, an effective method of cutting it out, with some sacrifice of quality, is by including in the audio-frequency portion of the receiver circuit a filter which cuts off all musical frequencies above, say, 8,000 cycles, including, of course, the heterodyne whistle. A certain lack of brilliance in tone may be compensated for in some degree by the use of a pentode output valve, which has a particularly good high note response.

Although heterodyne whistles are a great nuisance when due tooutside causes, the principle is usefully employed in the "super-heterodyne" receiver. In this type of equipment, the incoming radio-frequency signal is multiplied with another radio frequency differing slightly from it and produced by a local valve oscillator. The frequency of the impressed local oscillation is so adjusted that the output will be exactly opposite to the incoming signal, and will therefore be able, no doubt, to bring in the Midland at greater strength. However, this is a point which depends upon local conditions.

No list of stations which can be received has been given, as conditions will vary with individual hearers. It is, for instance, a listener living at Barnet, which is on top of the Broombank transmitters, will have to employ a much higher degree of selectivity to enable him to tune the B.B.C. In the Midland Regional, for instance, it is clear that there will be a slight loss of signal strength on that station. A listener, on the other hand, who is situated at Margate would not require the same degree of selectivity and would therefore be able, no doubt, to bring in the Midland at greater strength. However, this is a point which depends upon local conditions.

We shall be pleased to publish Club reports. Such should not exceed 150 words in length, and should reach us by Friday of each week.

VISIT TO BIRMINGHAM BROADCASTING STUDIO

The London Wireless Society paid a visit to the studio of Messrs. Wm. Baylis, Ltd., Sheepcote Street, Birmingham, on the evening of Friday, 25th February. Approximately 50 members and friends took this opportunity of seeing one of the largest broadcasting studios in the world. The programme was arranged and the studio was very gratefully received by Mr. Gould, who proceeded to demonstrate the effects of equipment recently secured by means of an experimental spurious-frequency amplifier. By means of this equipment a perfect reproduction was obtained in which all frequencies were adequately represented.

Particulars of membership of this society can be obtained from the Hon. Sec., Mr. E. Fisher, M.A., 30, Fonthill Road, Kensington, London, S.W. 11, or from the secretary of the society, The Smethwick Wireless Society, The Smethwick Wireless Society, Willowbank, Uxbridge, England. No charge is made for membership to the society. Fellow members in any part of the world.

A RADIO LEAGUE OF NATIONS

The Anglo-American Radio and Television Society, and the associated society, The International Radio League, aim to promote goodwill and fellowship between nations. The societies have members in thirty-five different countries, and members of the society may communicate with fellow members in any part of the world. No charge for membership to the society is made, and for this reason a stamped addressed envelope should be enclosed with the application. The membership dues, however, do not exceed 1s.

The societies aim to aid radio and television enthusiasts by supplying them with radio data, etc. The societies have a world-wide membership as stated above, and are always looking for new members. The societies are interested in all broadcasting, both in this country and abroad.

A LOUD-SPEAKER TEST 

The members of the Bradford Radio Society spent a very interesting time at a recent meeting when a loud-speaker demonstration was staged. A 12-watt amplifier was used at each loud-speaker and number of loud-speakers were placed on the stage. The demonstration was given in the same portion was used for each test, a particular sound signal being given to the loud-speakers and the test being taken in three parts of the room, the winners of the heats taking part in the final round to find out which speaker was the best. Not a single member in the audience knew which speaker was actually being used at the different stages and it was not until the conclusion that the audience knew which was the best. The test was taken by a group of speakers, which ranged from models at just over £1 to the best. The group of speakers was distinctly gratifying to local industry to find that it was local product which secured both first and second places,
SAND-PASS TROUBLE

"I have an all-Mains A.C. set, and it is of the band-pass tuning type. I cannot cut out Daventry National when I have Radio-Paris on, and yet if I can cut out Daventry National when I have Radio-Paris on, I can cut out Daventry National if I wish to do so. Is it possible to use, say, two separate band-pass circuits in the same set, or am I limited to using only one band-pass circuit?"

-T. S. T., Northampton.

If the receiver employs commercially-made band-pass coils, the separation should be quite sufficient to enable you to hear Radio-Paris with no background noise. If you cannot do this it would appear that you have not got the two circuits accurately matched, or have used the wrong value of coupling unit. If you are employing homemade band-pass condensers you should pay attention to the trimming adjustment, and also make sure that you are using non-inductive coupling condensers, as recommended, according to the requirements of the particular coils.

TESTING CONDENSERS

"I have a large fixed condenser in my set, and I wish to test them for leakage. How can I do this?"


The simplest method of testing a condenser across a fairly high voltage supply, and leaving it joined to the circuit, is to connect it and avoid touching the terminals. At the end of an hour, short the terminals with a metal object, and if you can obtain a faint spark, the condenser is sound. If you cannot obtain a spark, the condenser is dead, or short-circuited. Be careful not to touch the terminals while testing; if you do, the high voltage may cause a spark, and may damage the insulating material.

NOISES AND THE PORTABLE

"I have a powerful wireless portable receiver, but am troubled by electrical scratching and stray noises. I have read in your pages how to disconnect the aerial and earth lead, but if I do so, the circuit will become open, and I cannot hear anything. Is it possible to disconnect the aerial and earth lead, and still avoid stray noises?"


The trouble you are experiencing is due to electrical static, which is caused by the electric fields surrounding the receiver. Disconnecting the aerial and earth lead will not prevent the static, as it is caused by the outside environment. The best solution is to use an aerial with a good shield, and to use a shielded cable for the power and detector circuits.

PUTTING CAPACITORS IN SERIES

"If the value of a capacitor is doubled, the reactance is halved. Is this also true for the capacitance?"

-J. H., London.

No, doubling the value of a capacitor does not halve the capacitance. The capacitance is the reciprocal of the reactance, and is not affected by changing the reactance. Doubling the value of a capacitor will double the capacitance.

FREE ADVICE BUREAU

This coupon is available until Jan. 7th, 1933, and must be attatched to all letters containing queries.
WHERE CATALOGUES RECEIVED

To save readers trouble, we undertake to send on
request a copy of any of our catalogues. Simply state, on
a postcard, the name of the firm from whom you
require catalogues, and address it to "Catalogues"

PRACTICAL WIRELESS, Geo. Newnes, Ltd., Hill,

WHEN YOU MAKE A CHARGE, OR REQUIRE POSTAGE, THIS
SHOULD BE INCLUDED.

BULGIN KNOBS

SOME time ago we commented in our pages on the
fact that the home constructor was often in a
difficulty owing to the multifarious knobs which were
fitted to components of different makes. This
typically leads to a very untidy-looking panel, and we
suggest that perhaps manufacturers could standardise
their controls. Messrs. Bulgin point out that this
difficulty may be overcome, as they stock a very
comprehensive range of control knobs, in either black
or brown baleen finish. These are illustrated on
page 52 of the very complete catalogue which may
be obtained by readers from sending 3d. in stamps to A. P. Bulgin & Co., Ltd., Abbey Road, Barking,
Essex. In addition to these knobs, the whole range
of Bulgin components is illustrated, and the catalogue
is completed with a twenty-eight page manual which is
packed with information which is of interest to
every home constructor.

FERRANTI POWER AMPLIFIERS

THE name of Ferranti is associated with high-
quality receivers and amplifiers, and the home
constructor will find the new pamphlet issued by this
firm of great value. Seven amplifiers and receivers
are described in this pamphlet, which gives the list
of parts required, wiring diagram and layout, circuit
diagram, and other information important to each, in
grouped sets. In the front of the pamphlet there are eight pages of notes on operation, and other
relative notes. The sets dealt with are:

(1) Three-stage amplifier for battery or eliminator
(2) 80/4 A.M. Band Pass Receiver for battery or eliminator operation
(3) D.C. Mains three-stage amplifier
(4) A.C. Mains two-stage amplifier.

BLUE SPOT LOUD-SPEAKERS

No difficulty should be experienced in choosing a loud-speaker, as each model is illustrated on the
front cover, which gives the list of parts, and a
complete list of instructions for manufacture, which
should be followed:-

1. Write legibly, in ink.
2. State type of receiver used, and whether trans-
mitter you heard it.
3. Write legibly, in ink.
4. Give details of programme received, and, if you

CANTERA, A. W., Ltd.
Cossor, A. C., Ltd.
Edison Swan Electric Co., Ltd.
Formo Co., Ltd.
Graham Farish, Ltd.
Hambling, A. W., Ltd.
Heayberd, F. C. & Co.
Jackson Bros., Ltd.
Lectro Linx, Ltd.
London Electric Wire Co. & Smiths, Ltd.

Page
739
713
735
748
735
742
735
735
735
735

Mason, E. C.
Newnes' Presentation Binder
Newnes "Strand Magazine"
Inside Back Cover
Picketts
Pressland, Clifford, R. (Sales), Ltd.
Skelton Products, Ltd.
Standard Battery Co.
Technical Institute of Gt. Britain
Telegraph Condenser Co., Ltd.
Wates Radio Ltd.
Wright & Weaire, Ltd.
Weedon Power Link Radio Co.

Page
743
727
739
739
713
713
735
743
742
739
713
733
743

between which two stations (of which you have the
receiver) the transmission was picked up.
4. Give date and time when broadcast was heard.
Do not forget to add whether a.m. or p.m.
5. Give details of programme received, and, if you

Are you a subscriber to broadcast news?

This service is mainly applicable to broadcast-
stations, wherever possible replies will be given
in regard to morse transmitters (commercial stations,
for broadcasting) and short-wave broadcasts. For the
identification, however, of stations operating on chan-
nels below 100 metres it will be evident to inquirers
that a closer estimate of wavelength must be sub-
mitted than in the case of broadcasts on the medium
or long waveband if successful identification is to be

in due course in each issue of PRACTICAL WIRELESS.

LIST OF INSTALLATIONS

The PRACTICAL WIRELESS Index includes the
following:—

FORMO Matched Condenser and Condensers Assemblies solve the problem of making your set selective.
You have now an accurate tuning unit giving the
finest possible band-pass response.
FULLY MATCHED CONDENSERS assure accuracy of selectivity and such a unit
A FORMO Matched Unit provides the home constructor as some other way in frequencies and in some cases
forward set construction.
Ask your dealer. Write for Catalogue in case of difficulty.

FORMO MATCHED UNIT

FOR DUAL GANG
Cat. No. 8, 22
33/6
BAND-PASS ADAPTER
to bring your set up to date
A simple way to obtain the selectivity in with our FORMO Matched Band-pass Assembly as described by a
leading wireless journal.

WRITE FOR FREE ILLUSTRATED CONSTRUCTION SHEET.

BAND-PASS ADAPTER

FOR 46/6
Cat. No. 66
46/6

FORMO MATCHED UNIT

FOR TELEGANG

This Index includes:

- ADVERTISER'S INDEX
- CATALOGUES RECEIVED
- PRACTICAL WIRELESS
- SELECTIVITY IS SIMPLE WITH FORMO
- BROADCAST QUERY CORNER
- REPULSIVE TOREADERS TROUBLE, WE UNDERTAKE TO SEND ON REQUEST A COPY OF ANY OF OUR CATALOGUES. SIMPLY STATE, ON A POSTCARD, THE NAME OF THE FIRM FROM WHOM YOU REQUIRE CATALOGUES, AND ADDRESS IT TO "CATALOGUES".

PRACTICAL WIRELESS, GEO. NEWNES, LTD., HILL, SOUTHAMPTON ST., STRAND, LONDON, W.C.2.

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3. Write legibly, in ink.
4. Give details of programme received, and, if you

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Submit
"Was your distant connexion Wilmot a midget?"
"No. He was a Nodder."
"A what?"
Mr. Mulliner smiled.
"It is not easy to explain to the lay mind the extremely intricate ramifications of the personnel of a Hollywood motion picture organisation. Putting it as briefly as possible, a Nodder is something like a Yes-man, only lower in the social scale. A Yes-man’s duty is to attend conferences and say ‘Yes.’ A Nodder’s, as the name implies, is to nod. The chief executive throws out some statement of opinion, and looks about him expectantly. This is the cue for the senior Yes-man to say Yes. He is followed, in order of precedence, by the second Yes-man—or Vice-Yesser, as he is sometimes called—and the junior Yes-man. Only when all the Yes-men have yessed do the Nodders begin to function. They nod.

A Pint of Half-and-Half said it didn’t sound much of a job.

"Not very exalted," agreed Mr. Mulliner.

"It is a position which you might say, roughly, lies socially somewhere in between that of the man who works the wind machine and that of a writer of additional dialogue. There is also a class of Untouchables who are known as Nodders’ Assistants, but this is a technicality with which I need not trouble you. At the time when my story begins, my distant connexion Wilmot was a full Nodder. Yet, even so, there is no doubt that he was aiming a little high when he ventured to aspire to the hand of Mabel Potter, the private secretary of Mr. Schnellenhamer, the head of the Perfecto-Zizzbaum Corporation."

Read this delightful story in the January

STRAND MAGAZINE

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