Idea PAGE 22

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FREE INSIDE! DATA SHEET No. 3. RESISTANCES

Practical Wireless

3D.

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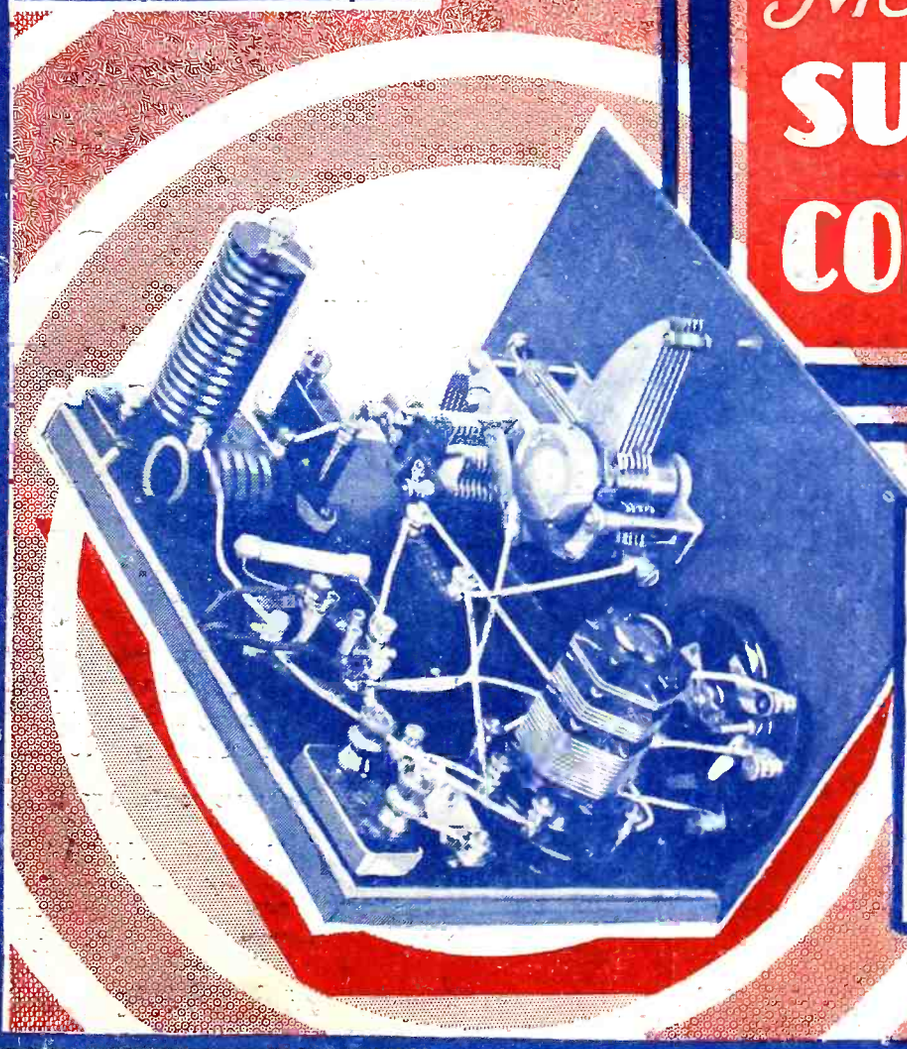
Making A SUPER-HET CONVERTER



SEND US YOUR WRINKLE AND WIN HALF-A-GUINEA

ANOTHER FREE DATA SHEET NEXT WEEK!

ROUND *the* WORLD *of* WIRELESS

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 2.5 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 broadcasts.

Too Many High-power Stations

SINCE the 17 kW. Frankfurt-am-Main transmitter has been brought into operation on 259.3 m., listeners in that city complain that interference exists both with Hörby (Sweden) and London National. The latter programme creeps through and spoils the reception of the local entertainments. There is a possibility that Frankfurt 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 Chatelineau, 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 Oegmunds, 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 Saturday nights the studio may be heard closing down at 1 a.m. G.M.T. with an old Icelandic hymn.

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 to-day'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 VK2ME, 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 £50,000) on the installation of 2 kilowatt transmitters at Stavanger, Tromso, Arendal, Kristiansund, Haugesund, and Kirken. Bergen, whose 1 kW. station has been in operation for several years, will be endowed with a 20 kW. transmitter.

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.

ROUND *the* WORLD *of* WIRELESS *(Continued)*

Will the Eiffel Tower Close Down?

FROM Paris comes the news that negotiations have been opened between the Posts and Telegraphs administration and the *Compagnie Française 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 would be suspended, and its wavelength would be used by the 200 kilowatt station now ready to operate at Luxembourg. The latter station, in this event, would 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

WILNO (Poland), Ljubljana (Jugoslavia), and Lisbon (Portugal) have each in turn adopted a cuckoo call as interval signal between programme items. Fortunately, they broadcast on totally different channels of the wave-band.

Cape Town Calling!

THE Marconi Company will shortly erect at Milherton, near Cape Town, a 10 kilowatt transmitter for the African Broadcasting Company, to replace the smaller station now supplying the wireless entertainments; the wavelength of 370 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 from foreign 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

AS 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.

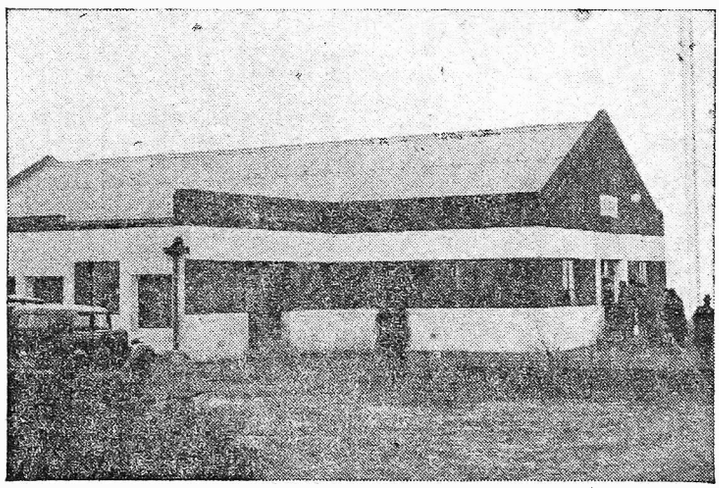
K. Raymond Again

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 set, and is 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 at small expense. We are glad to see this name once again, and are pleased to bring this notice to the attention of our readers.

INTERESTING and TOPICAL PARAGRAPHS

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.

Nottingham

IT is understood that the Nottingham studio, which closed down when the North Regional came into being, is shortly to be renovated and reopened. This will be good news for Nottingham and district listeners, who will expect to hear more of their local talent.

S.-W. Programme to be Relayed

READERS will be pleased to know that the Christmas Day short-wave transmissions to the Colonies will also be relayed through the longer wave B.B.C. stations. Excellent programmes have been arranged and, although definite arrangements have not yet been made, it is hoped that H.M. the King will broadcast Christmas greetings.

Seventeen and a Half Hours Transmissions

AS mentioned in these columns before, 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 Australasia, 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 Canadian programme will run from 1 a.m. to 3 a.m. (Tuesday morning). All times are G.M.T., of course.

Breslau in France

I HEAR that French listeners are complaining of interference with their popular Poste Parisien transmissions on 328.2 metres by the new 60-kilowatt German broadcaster at Breslau, which works on 325 metres. Apparently the latter station is received at greater 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-Thesalonik. The wavelength will be about the 270-metre mark, but there are as yet no details available regarding its power.—JACE.

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 terrible, signals being practically inaudible. What was the reason? Three books will be awarded for the first 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 leads together (by adopting lighting flex) Johnson was by-passing all his signals to earth through the capacity formed by the twisted wire.

The following three readers receive books in connection with Problem No. 13:—

J. H. Davies, Esq., Bodaros, Halkyn Road, Flint, N. Wales; N. Snewin, Esq., 16, Sinclair Road, London, W.14; N. Clayton, Esq., 53, Senhouse Street, Maryport, Cumb.

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 costing 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 milliamperes, 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 passes 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 milliamps. They can be obtained up to values in the neighbourhood of 300 to 500 milliamps, 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.

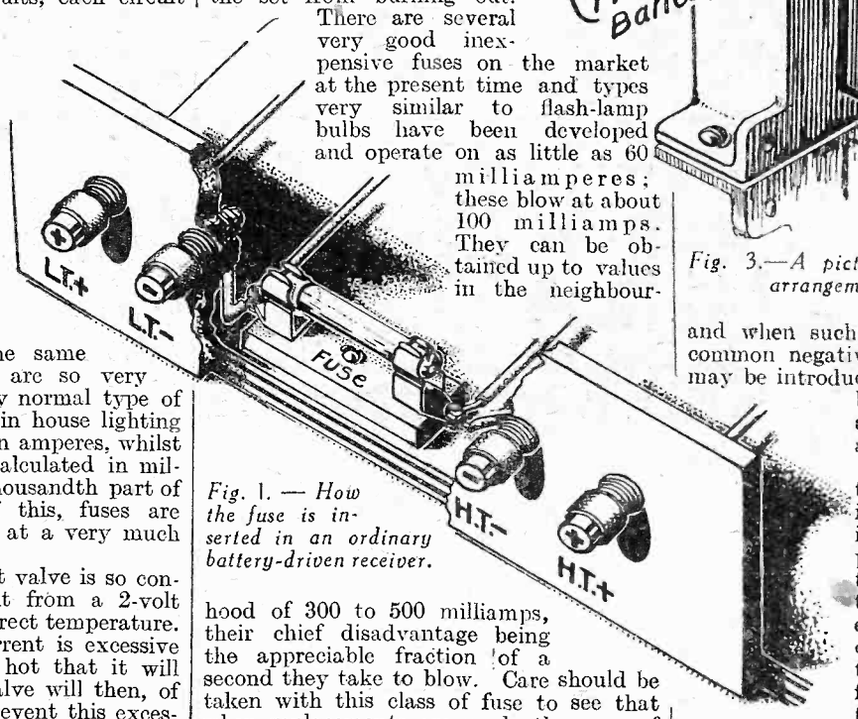


Fig. 1. — How the fuse is inserted in an ordinary battery-driven receiver.

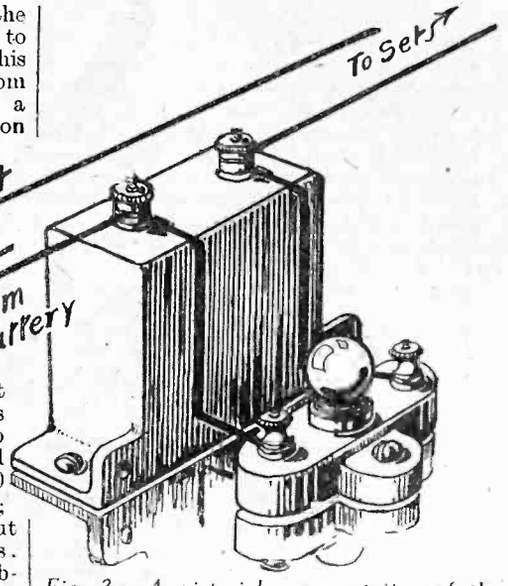


Fig. 3.—A pictorial representation of the arrangement shown in Fig. 2.

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 of, say, 100 milliamps. These fuses, which have to carry very small currents, have an appreciable resistance and when such fuse is connected in the common 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

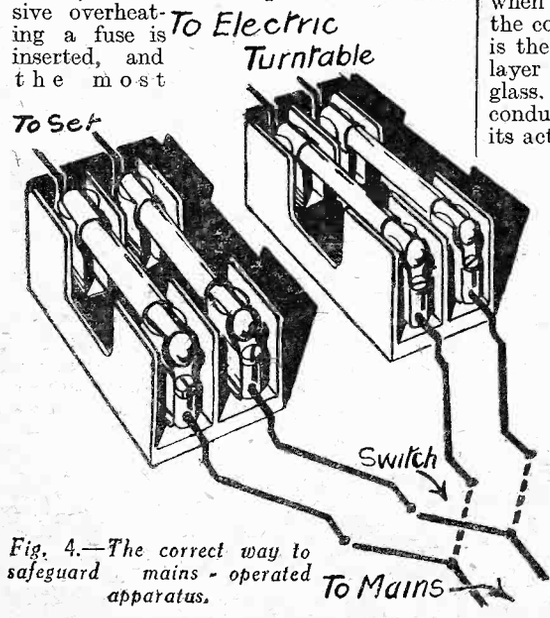


Fig. 4.—The correct way to safeguard mains - operated apparatus.

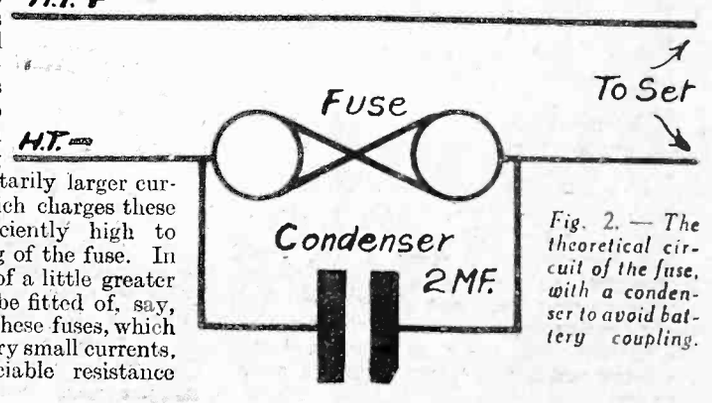


Fig. 2. — The theoretical circuit of the fuse, with a condenser to avoid battery coupling.

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 mains 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 it from buckling up under the holder and touching the screws which hold the sockets into which the valve pins fit. Care should be taken when not using the soldering tags on components, the terminals of which are placed close to the metal foil, that the tags do not become bent downwards so that they make contact with the foil, thus earthing the connection. Such a tag is shown in Fig. 5. It is better to remove them, if possible, before building up or cut them off short with an old pair of scissors, if no cutting pliers are handy. The writer had a similar experience of this kind when called in to test a set some time ago; every conceivable test had been made until it was noticed that a soldering tag which was almost out of sight was earthing on to the metal base. When this was corrected the set worked perfectly.

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

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 is forgotten. To this rule radio is no exception. The first programmes, imperfect but now endowed with all the glamour with which the present endows the past, were hailed with unconcealed delight and little or no criticism. They were accounted wonderful by the fact of their very existence. This phase passed.

Radio has now arrived at the stage where its critics, in public, at any rate, are more vociferous than its defenders. But is it not time that we took a calmer, a more reasoned view, of the whole situation; time that we recognized how wireless, with all its imperfections, has killed boredom—the monster which threatened to make life a sour and tasteless thing until it was banished by radio? The specialist in any particular sphere, whether it be music, drama, talks, vaudeville, or sport, can, no doubt, find much at which he is righteously indignant in the way his own pet 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 little or no difficulty, for most newspapers, apart from those specifically devoted to radio, are ever ready to give prominence to any snack at broadcasting as at present constituted. 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 about the fare 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 doing for this, or that, or the other; the 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 make any appreciable difference in the fundamental outlook of the majority of listeners; the people who would have us believe that a few years of radio will be equivalent, as far as turning us all into highbrows is concerned, to a course at one of the older universities; and so on!

Radio's Great Achievement

All these specialist critics and extravagant claimants only confuse the issue, and blind us to the real significance of radio—the fact that it 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 drifting 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 father and mother were ardent theatre-goers, Johnny a movie fan, Bill a young man devoted to sport, and Milly a confirmed cyclist. He might try to convince you that most of their leisure time was spent doing these various things; that they were rarely at home. Do not believe him. The fact is, of course, that 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 a 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 commonplaces, 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, amiable enough, 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 captions, "Came the wireless." And very steadily—so steadily that some of us have hardly noticed—wireless has banished that boredom to a place whence it cannot return unless civilization perished in some world cataclysm, and with it radio. Father and mother, Johnny, Bill, and Milly have been provided with a sociable pursuit in which they can all participate. Wireless has given them a common interest, a sociable home pastime which they can share together, at the same time.

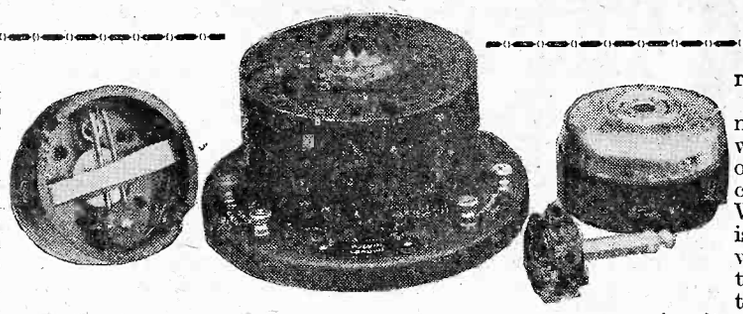
An Ever-Recurring Pastime

Please note this very carefully. Novel reading is a pastime in which all the members of a family can join, but it is a solitary business. Two people cannot, or very seldom do, read the same book at the same time. When you are in the middle of a marvellous novel your one aim is to get someone else to read it and share your pleasure, but by the time you have finished and they are half-way through, most of your first enthusiasm has evaporated. Wireless is the one ever-recurring, inexpensive pastime which the whole family can enjoy as a single unit.

Family boredom dies when two or more members of the family share a common pursuit, even if they do not agree about its worth. It gives them ready-made topics for conversation, widens their horizon, quickens their imagination, rouses their interest, sets them arguing with each other. The result is that in the intervals between the business of getting a living and the occasions on which they take their pleasures outside the home as separate individuals, they are not bored—but, on the contrary, stimulated.

Wireless is killing boredom, and this is an achievement besides which all its little sins of omission or commission are as naught. And if it is an achievement to have banished boredom where the members of families are concerned, what praise is high enough for it in the case of the solitary listeners in their bed-sitting rooms, the invalids cut off from the outside world, the blind? For such as these it has banished not boredom, but something very like Hell itself.

DISTANT CONTROL OF WIRELESS RECEIVERS



H. J. BARTON CHAPPLE, Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

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 loud-speaker could be used although remote from the set. No doubt many readers have already taken advantage of the suggestions made, but, 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.

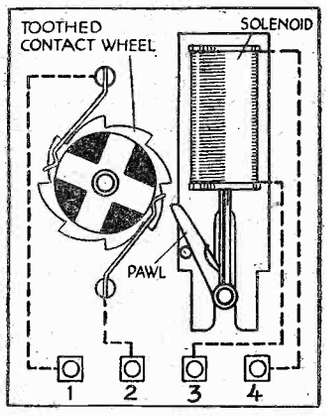


Fig. 1.—Diagram showing the elements of the Wates Remote Control.

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 loud-speaker 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 volts on 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 ⅛th of a turn. When the circuit is broken and the current ceases, the plunger falls back by gravity, and is ready to turn the wheel through another ⅛th 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 ⅛th turn, making a contact between the two springs, and the next pressure turns the wheel through another ⅛th 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 to a wireless set.

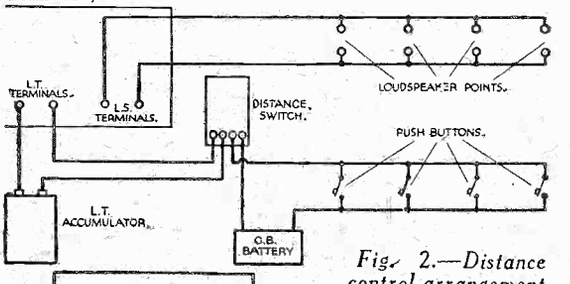


Fig. 2.—Distance control arrangement.

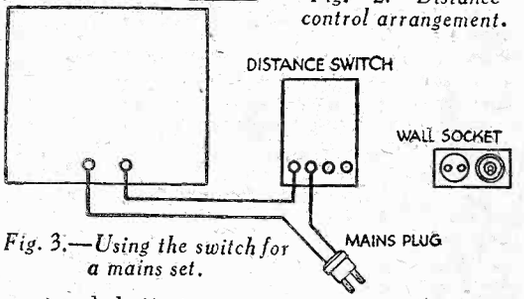
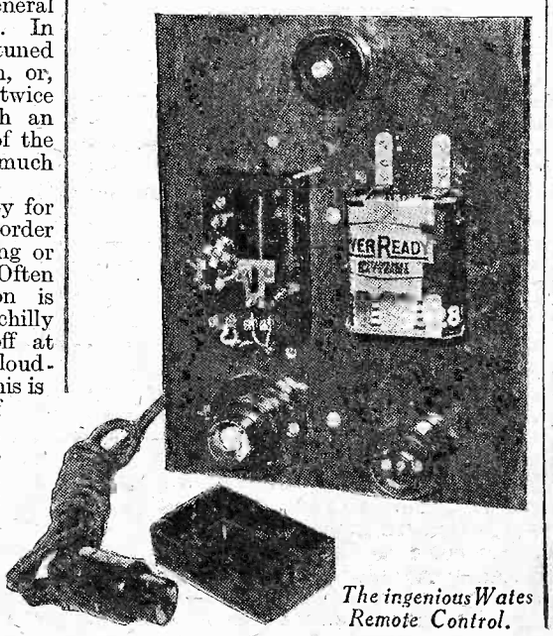


Fig. 3.—Using the switch for a mains set.



The ingenious Wates Remote Control.

In the diagram of Fig. 1 the terminals marked 1 and 2 should be taken to control the L.T. or mains power 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 3 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 pole 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

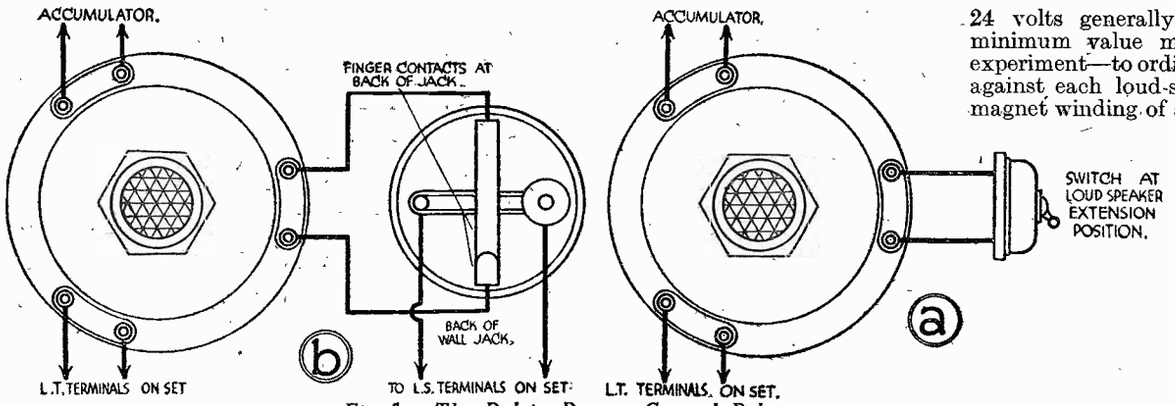


Fig. 5.—The Bulgin Remote Control Relay.

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 else 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 depresses the push button 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 to switch on. The original 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. If silence is maintained, they know that no one else is listening to the programme, and they can retire without touching their own loud-speaker, secure in the knowledge that the set has been safely switched off.

The scheme is a very simple one, and can be thoroughly recommended. For a mains-driven set the same distance switch 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 not 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 of the plug tip when inserted 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 24 volts generally is suitable, but the minimum value must be found out by experiment—to ordinary bell pushes located against each loud-speaker position. The magnet winding of a relay, preferably one of the sensitive high-resistance type, such as a Siemens or Weston, is now joined between the H.T.—terminal of the battery and the L.T.—terminal of the accumulator. Then the movable contact arm is taken to the usual negative filament connection on the set, the positive lead from 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.

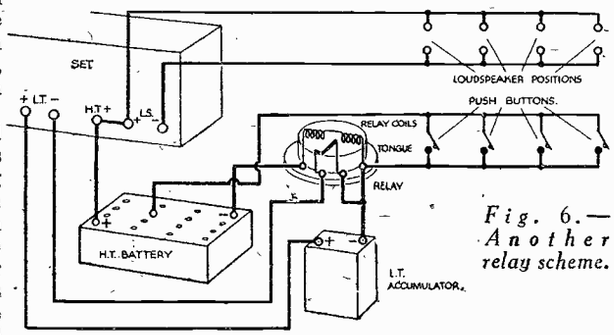


Fig. 6.—Another relay scheme.

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.

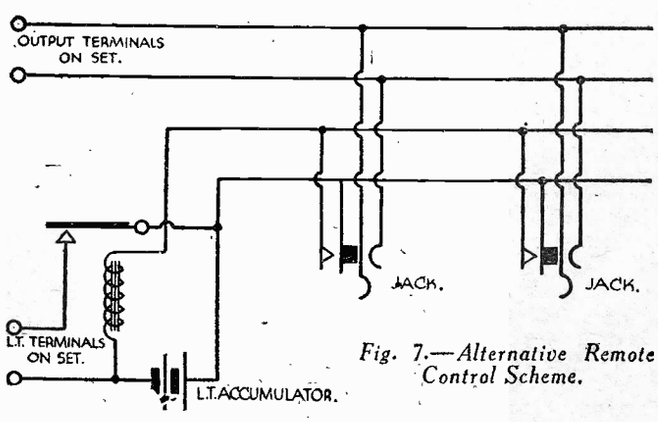


Fig. 7.—Alternative Remote Control Scheme.

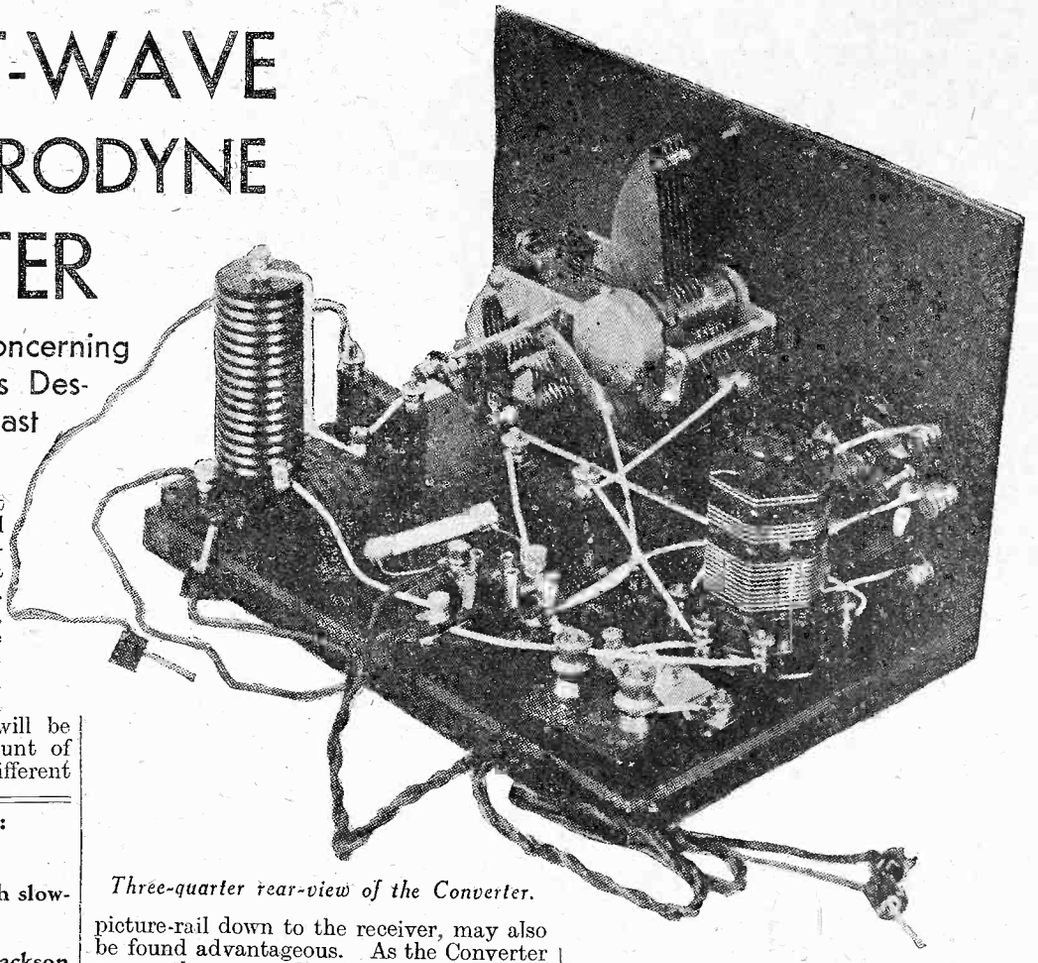
A SHORT-WAVE SUPER-HETERODYNE CONVERTER

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 receiver control is varied. This control is one of the most important, so that, for best results, too much time cannot be spent in finding the best setting.

LIST OF COMPONENTS:

1 Plywood Panel, 9in. by 6in.
1 Baseboard, 9in. by 6in. by ⅝in.
1 .00015 mfd. tuning condenser, with slow-motion dial (Jackson Bros.).
1 Dial pointer (Bulgin).
1 .0001 mfd. reaction condenser (Jackson Bros.).
1 Triple-range S.W. tuner (Lissen).
1 Triple-range wavechange switch (Lissen).
1 .0001 mfd. pre-set condenser (Colvern).
1 .001 mfd. fixed condenser (T.C.C.).
1 .0002 mfd. fixed condenser (T.C.C.).
1 3 megohm grid-leak, with wire ends (Dubilier).
1 S.W. valve-holder (Eddystone).
1 S.W.H.F. choke (Bulgin).
1 H.F. choke (Lewcos).
1 Terminal block; marked "A" and "E" (Lissen).
1 Wander plug; marked "H.T.+" (Belling Lee).
3 Spade terminals: marked "L.T.+," "L.T.—" and "A" (Belling Lee).
1 length "Glazite" connecting wire, 2ft. twin flex, screws.
Approximate cost, 37s.
Also, if required, 1 type 210 H.F. or 210 H.L. metallized valve (Cossor).



Three-quarter rear-view of the Converter.

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 aerials should therefore be tried out so as to find one which will enable the three wave-bands to be efficiently explored. The great point to bear in mind is that the valve in the Converter must be kept oscillating the whole time, and if this is not so the Converter will not function properly.

Tuning-in

When tuning-in a station, set the reaction condenser on the Converter so that the rushing noise is heard, and also set the reaction control of the receiver so that a fair amount of reaction is being employed in that part of the circuit. Now slowly rotate the tuning dial of the Converter until you hear a squeal. This will denote that a station carrier is being heterodyned, and you must proceed to resolve it into intelligible signals. Reduce slightly the reaction control of the receiver, and then slacken off the reaction condenser of the Converter. The silent point between the squeals will give the exact tuning position, and it will be found quite a simple matter to resolve the signal, although on all short-wave receivers tuning is exceptionally sharp. The tuning condenser is fitted with a very efficient slow-motion dial, but even so, it will be found that the slightest touch will tune past a station. Some of the best short-wave stations suffer rather badly from fading, so do not worry if you find that as soon as a station has been received it disappears. If you leave the controls alone you will find that it will return after a short while, and you will soon get used to the effect of this fading trouble. It is very annoying to get a station, and, just as an announcement is about to be made, to lose 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.

Make Your Own

FRANK PRESTON, F.R.A., Tells You L.F. Transformers, H.F. Chokes, Fixed

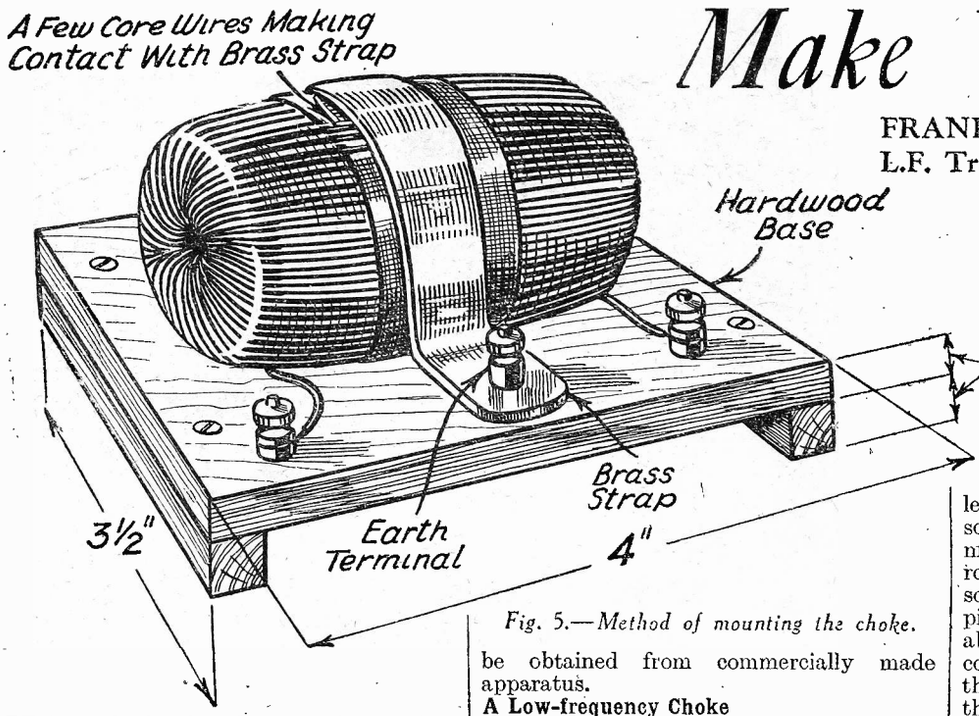


Fig. 5.—Method of mounting the choke.

IT is perfectly clear by now that readers of PRACTICAL WIRELESS are, on the whole, distinctly practical people who are not content merely to buy a kit of parts, mount them on a chassis and connect from point to point by following a foolproof chart. Although they do appreciate a good receiver design and are prepared to follow it when building a new set, they also wish to keep an experimental set with which they can "tinker about" and learn exactly how each part functions. And, as those readers are aware, there is no better way of understanding how a component works than by making it. Now I would not suggest that every part of a receiver should be home-made, because in many cases the cost of the necessary tool equipment would be too great, but I will say that quite half of the components required can be made up at home by anyone with some mechanical inclination and having a fair amount of spare time.

I propose in this article to explain as simply as possible how a number of components can be made by using only those tools possessed by the average amateur. In each case, I shall assume the use of only the commoner woodworking tools, pliers, screwdriver, and soldering equipment, although some of the work could be simplified if a lathe were available. Furthermore, I shall only describe such parts as can be made economically and which will give results at least comparable with those to be obtained from commercially made apparatus.

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 loud-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 ¼in. 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 1⅝in. 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.

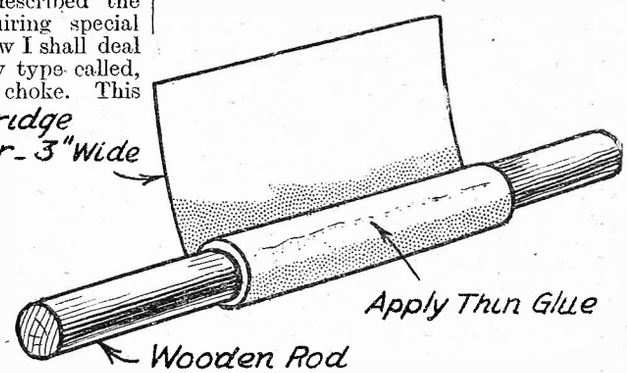


Fig. 1.—Making the tube.

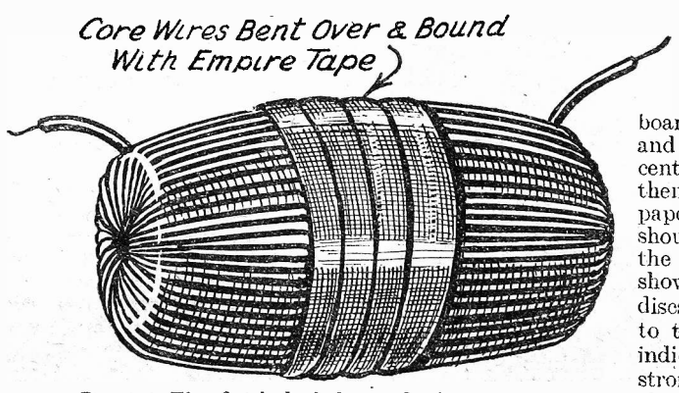


Fig. 4.—The finished choke ready for mounting.

and put on one side until thoroughly dry and firm.

Winding

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 thin 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 coppers from most ironmongers or florists. The wire can usually be bought ready cut to 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.

empire tape, dip the whole choke in a jar of shellac varnish, and allow to dry.

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 strap, and this can be used to earth the 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 80 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. 38 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 cheeks, and separating discs 1⅝in., instead of 1⅜in. in diameter, and using core wires 9in. long. The choke will have an inductance of about 100 henries at 8 milliamps, and a D.C. resistance of 1,300 ohms.

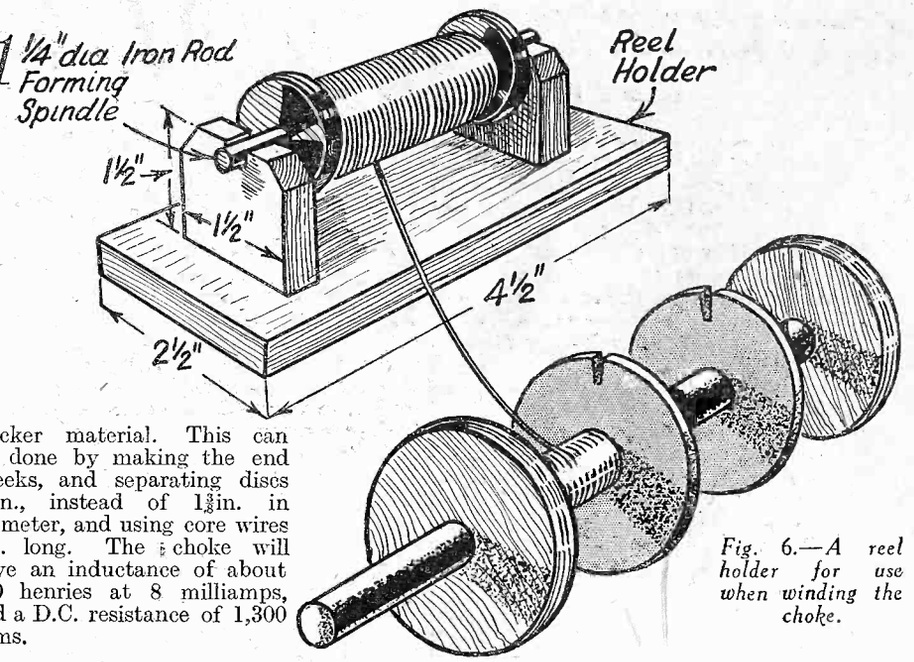


Fig. 6.—A reel holder for use when winding the choke.

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 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 fine wire is bared 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 12in. length of flex soldered on. The joint is then covered 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.

It is well to mark each tapping (by sticking on a strip of paper) for future identification.

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 core should be 1in. diameter and 10in. long. The bobbin should be 3in. long, as before but the end cheeks and separators will need to be 2in. diameter.

(To be continued.)

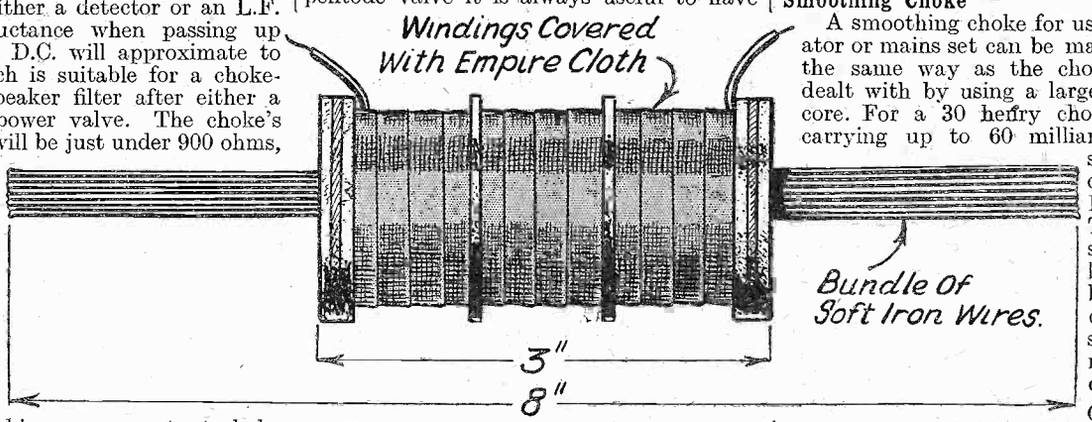


Fig. 3.—Wound bobbin with core wires inserted.

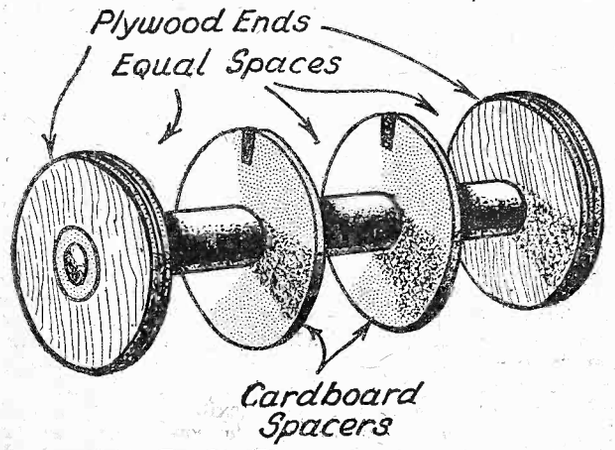


Fig. 2.—The complete bobbin.

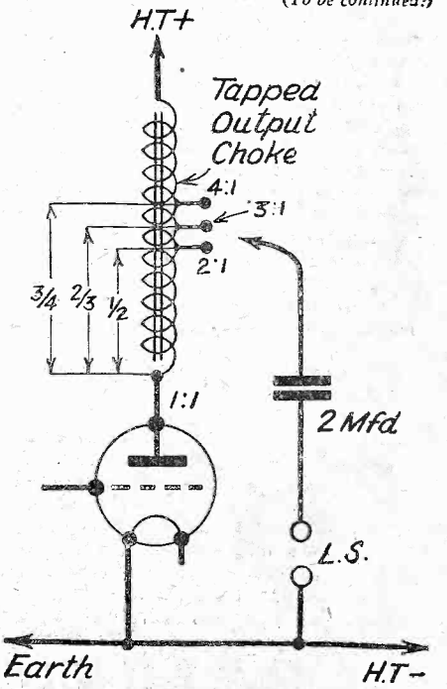


Fig. 7.—This diagram shows how different ratios can be obtained with a tapped output choke.

Thinking in Terms of Frequency

(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 the air. 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 give out a pure note of 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 radio wave is projected 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—that is, 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.

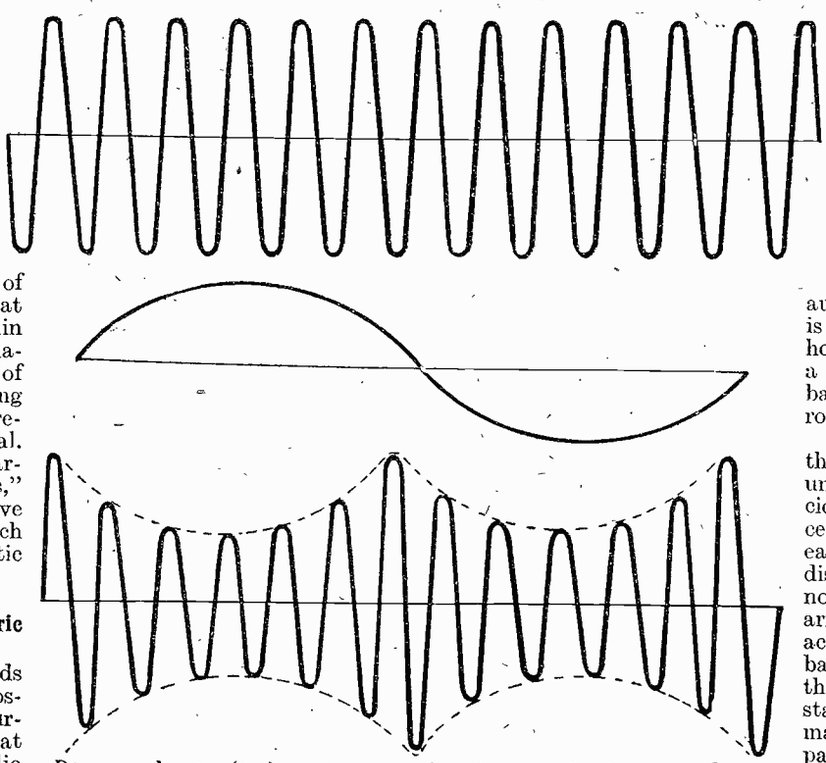


Diagram showing (top) carrier wave of uniform amplitude; (centre), Low frequency wave, and (bottom), modulated carrier wave.

The reason is that a modulated radio-frequency wave behaves in exactly the same way as if it were composed of 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 proved by 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 practical fact remains that unless the receiver is sufficiently flatly tuned to pass a certain band of frequencies on each side of the carrier wave, 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 bands. 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

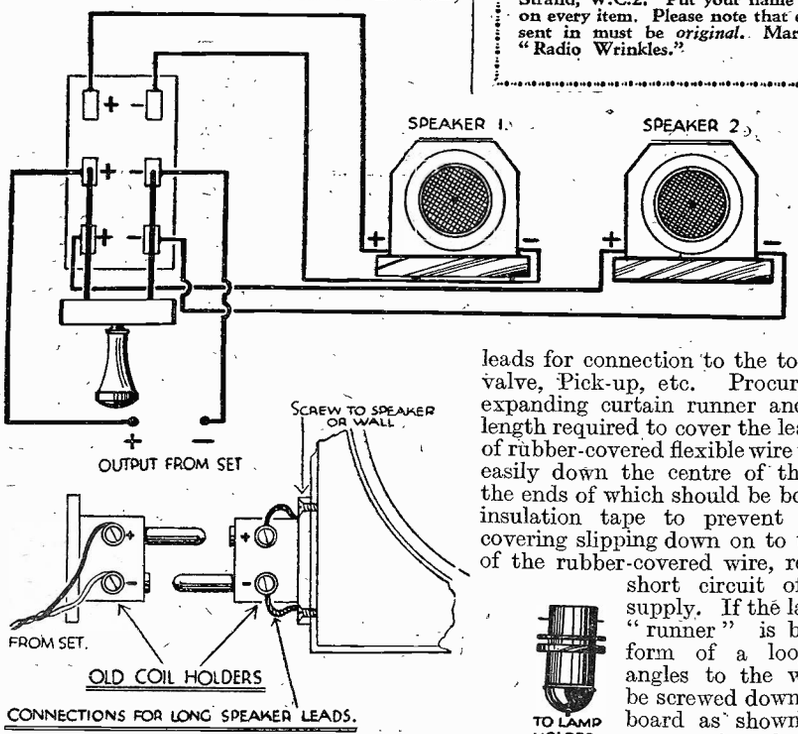
(Continued on page 746.)

THE HALF-GUINEA PAGE

Radio Wrinkles FROM READERS

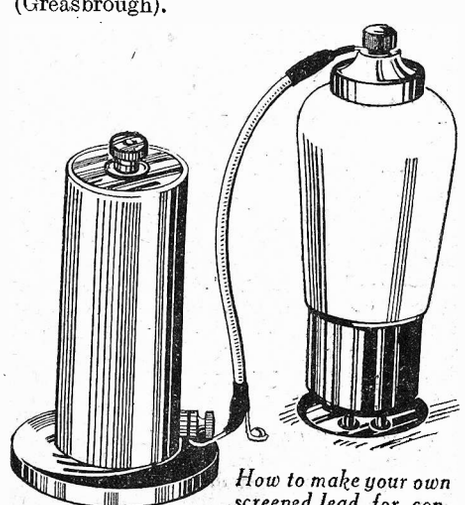
Switching Arrangement for Loud-speakers

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,



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).



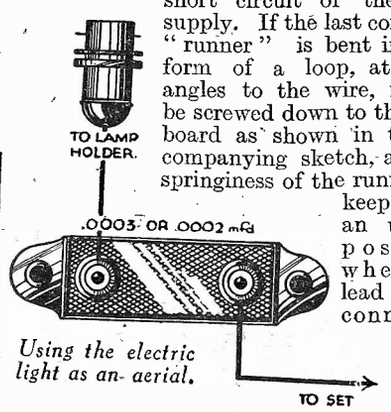
How to make your own screened lead for connecting to the top of an S.G. valve.

THAT DODGE OF YOURS!

Every reader of "PRACTICAL WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? For every item published on this page we will pay half a guinea. The latest batch is published below. Turn that idea of yours to account by sending it in to us, addressed to the Editor, "PRACTICAL WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be *original*. Mark envelopes "Radio Wrinkles."

Screening 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 runner 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," the ends of which should be bound up with insulation 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, Lancs.).



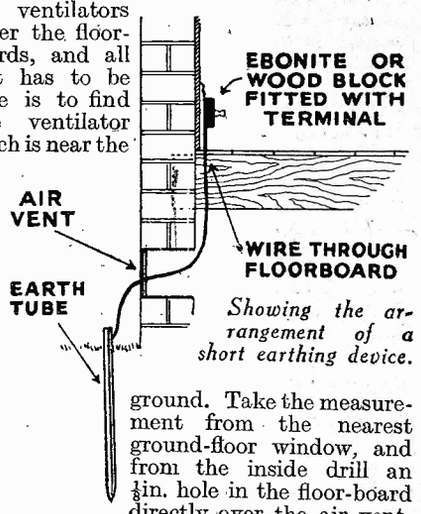
Using the electric light as an aerial.

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

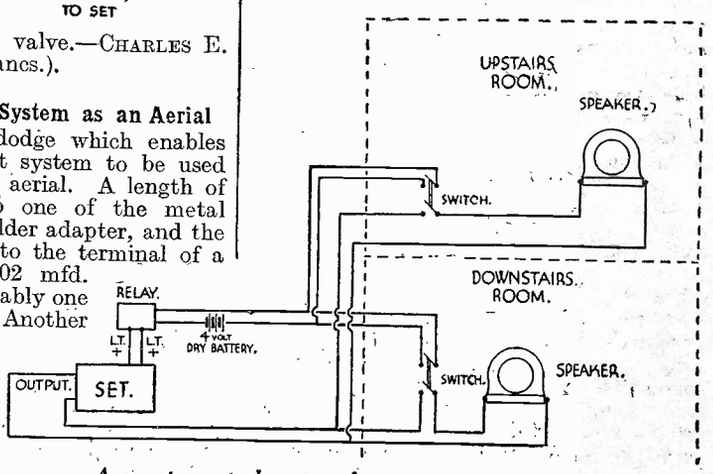
AN efficient and short earthing device can be arranged in the following manner:—Every house is provided with air ventilators under the floor-boards, and all that has to be done is to find the ventilator which is near the ground. Take the measurement from the nearest ground-floor window, and from the inside drill an ½in. 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).



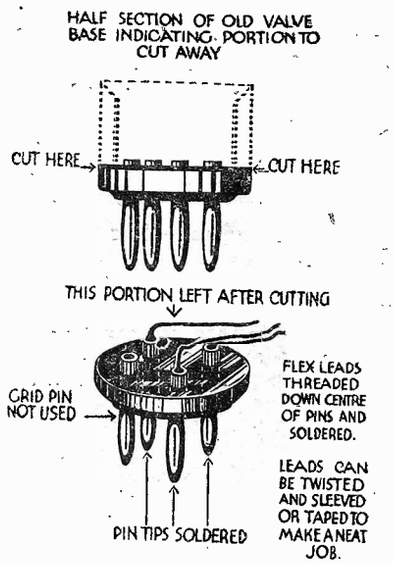
Showing the arrangement of a short earthing device.

A Cheap Remote-Control System

I HAVE this small remote-control layout working very satisfactory. 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 remote-control system for room-to-room working.



An improvised coil adapter.

Short-Wave Adapter Plug

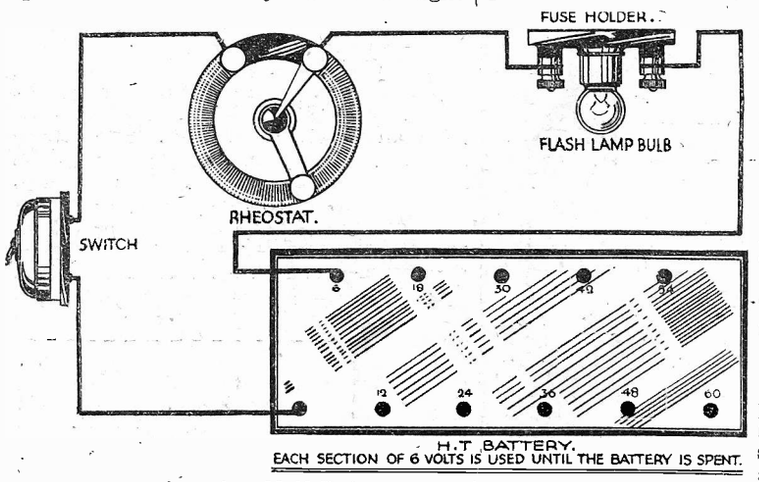
THE illustration shows a half section of an old valve base, and a pictorial sketch of a useful plug for a short-wave adapter. By simply cutting away the side of valve base the plug part is left. After making the plug thread a flex lead down three of the valve pins (anode pin and the two filament pins). The flex leads should be soldered at the pin tips. This is quite easy, as most valve pins are soldered by the manufacturers. To make a neat finish to the plug the flex leads can be sleeved or taped.—C. H. LEECH (North Ormesby).

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 corner about the house in which a little light would be handy. Such a light can be rigged up from old parts you may have lying about. Those required are:—

1 small tumbler switch; 1 fuse holder (flash lamp type); a partly used H.T. battery; 2 wander plugs; some twin flex. Most H.T. batteries are tapped every 6-volts, but even an old battery may show more kick than a 3.5 bulb can stand. Therefore, a safety refinement is the addition of the once popular 7 ohm rheostat.

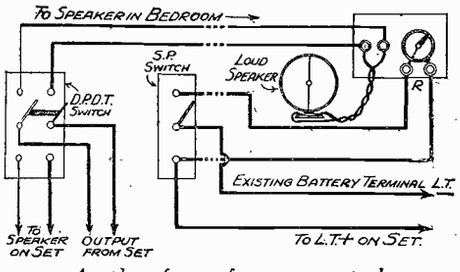
I have used this idea in an out of the way cupboard with an automatic switch, similar to that described in PRACTICAL WIRELESS dated November 5th, under the heading "Switch for a Portable Set," except that the button was not used. Quite long service has been given by batteries which were no good for radio purposes. When the battery is tapped every 12 volts it is necessary to break open the pitch and use crocodile clips for the connections. The accompanying diagram shows the connections.—G. S. GRAHAM (Edinburgh).



A use for old H.T. batteries.

Simple Remote Control

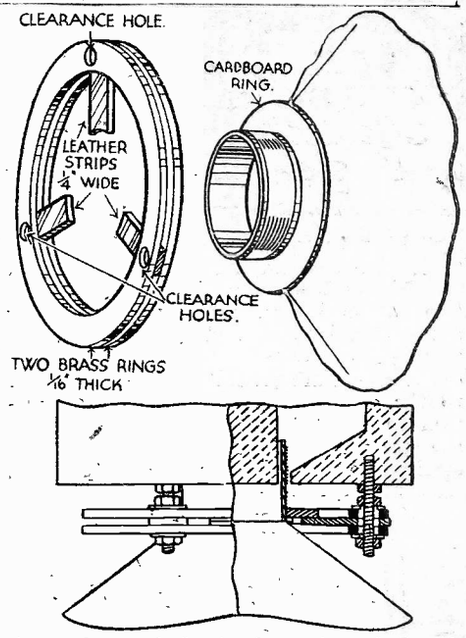
AN easy method of enjoying radio in bed, and not having to walk to the set to switch it off, is as follows: Obtain a length of 4-core flex to requirements; one double-pole double-throw switch, and one single-pole double-throw switch; a piece of wood, 6in. by 3in.; an old filament resistance, and two 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 the switch handles are up, the loud-speaker in the bedroom will be fed. The rheostat acts as a volume control and also a switch. When the knob is turned to the extreme left the speaker is silent and the L.T. positive lead is broken, thus switching off the set. If one speaker has to serve the two rooms the switches can be dispensed with and the connections made direct, to suit either case.—J. H. ATKINSON (Fishergate).



Another form of remote control.

Three Point Location for Speech Coil

DURING a series of experiments with a moving-coil speaker, I required a simple means of locating the speech coil, to enable the latter to be readily examined and adjusted during these experiments. The device can be made as follows:—Firstly, procure two brass rings of as large a diameter as can be accommodated on the magnet pot. Drill three clearance holes for a four B.A. screwed rod, equidistant round the edges. Using these holes as centres, glue three pieces of thin leather, about ¼in. wide (AB and C) between the rings. In turn, these pieces of leather are glued to the cardboard ring which has been fixed upon the speech coil, again at points A, B and C. The whole assembly is then set upon three 4 B.A. screwed rods which are set into the magnet pot. By means of nuts, the coil can be adjusted either inwards, or outwards; also, due to a clearance being in the holes in the rings, a lateral adjustment is obtained.—C. CROWLEY (Birmingham).



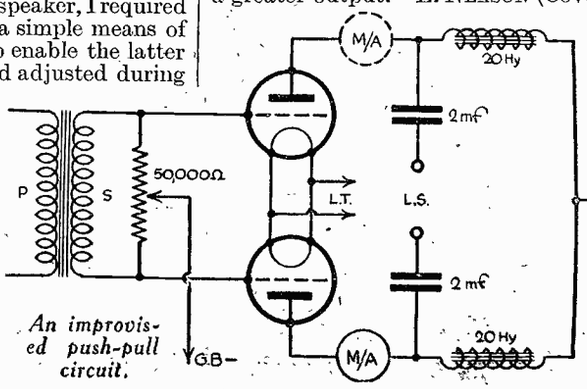
A simple method of adjusting and speech winding.

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;
One 50,000 variable potentiometer.

The circuit is shown in the accompanying diagram. In order to be sure that each valve is getting its full share of current, a milliameter 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).



An improvised push-pull circuit.

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... ,, Type 40.
... ,, Type 50.
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... Bias Resistance.
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...or 210 Det.—see text) and 230 H.P.T. (Cossor).
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...sion 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.*)

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

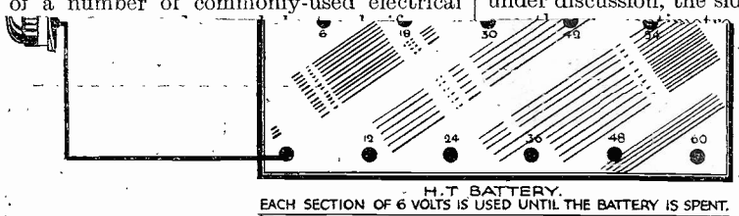
By "CYNIC"

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, at an 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 nomenclature 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 *resist*ance, *resist*or, *resist*ivity, all referring to different aspects of the opposition offered to the flow of electric current by various bodies. Similarly, we have conduct*ance*, resist*ance*, induct*ance*, capacit*ance* and so forth, as names applied to similar aspects of different properties of an electric circuit.

As we shall see, however, electrical and radio terminology is not perfectly consistent. For example, we have resist*ance*, and resist*or*, and we have imped*ance*, but not impedor. The piece of apparatus which, if we were really consistent, we should call an impedor, we have to call a "choke." Other examples of inconsistency will be mentioned later on. In many cases, one word is made to serve for several meanings; in other instances, several words have identical or almost identical significance. But although our present system of technical terminology is far from ideal, there is no need to make matters worse by applying such terms as exist in a loose or incorrect manner.

The following notes will, it is hoped, explain the strict and correct significance of a number of commonly-used electrical



A use for old H.T. batteries.

can be rigged up from old parts you may have lying about. Those required are:—

1 small tumbler switch; 1 fuse holder (flash lamp type); a partly used H.T. battery; 2 wander plugs; some twin flex. Most H.T. batteries are tapped every 6-volts, but even an old battery may show more kick than a 3.5 bulb can stand. Therefore, a safety refinement is the addition of the once popular 7 ohm rheostat.

I have used this idea in an out of the way cupboard with an automatic switch, similar to that described in PRACTICAL WIRELESS

ever, is also used quantitatively and in conjunction with a suitable unit is employed to denote the amount of opposition offered by a given piece of apparatus. Thus, we may say that a certain circuit has a resistance of 20 ohms, the ohm being the unit of resistance in the same way that a pound is the unit of weight.

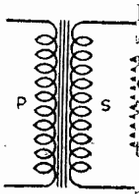
When a piece of apparatus having a definite value of resistance is included in a circuit primarily in order to make use of its resistance or of some effect caused by its resistance, it is called a "resistor." For example, we may desire to reduce the voltage applied to the anode of a valve, and we can do this by inserting a suitable resistor in the high tension circuit. Unfortunately, a good many of us, including leading technicians who ought to know better, have contracted the habit of calling a resistor a "resistance." Strictly speaking this is definitely wrong. It is as incorrect to go into a radio shop and ask for a "10,000 resistance" as it is to ask your grocer for a weight of two pounds. What you require in the first case is a resistor having a resistance of 10,000 ohms, and in the second a piece of, say, cheese, having a weight of 2 lbs.

"Resistivity"

There is one more term in connection with resistance which requires explanation, namely the word "resistivity." All terms ending in "ivity" 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 depends upon the material of which the resistor is made. This was at one time known as the "specific resistance" of the material, but is now called the "resistivity," or more correctly the "mass resistivity" of the material. The mass resistivity is the actual resistance of a cube of the material under discussion, the side of the cube being [illegible] and the resistance [illegible] faces.

Three Point [illegible]tion for Speec

DURIN[illegible] any series o[illegible]tance. periments wi[illegible]xam- moving-c[illegible]circuit speaker, I requ[illegible]ected a simple mea[illegible]ther. locating the speech coil, to enable the [illegible]rrent to be readily examined and adjusted du[illegible] that these experiments. The [illegible]lowed device can be made as [illegible]nce," follows:—Firstly, procure [illegible]allows two brass rings of as large [illegible]called a diameter as can be [illegible] the accommodated on the [illegible] it is magnet pot. Drill three [illegible]tance, clearance holes for a four [illegible]spelt B.A. screwed rod, equi- [illegible]nce of distant round the edges. [illegible]-tenth Using these holes as [illegible]tance centres, glue three [illegible]ed as pieces of thin leather, [illegible]ch as [illegible] has,



An improved push-pull circuit.

therefore, a high conductivity, and the material such as "eureka" having a high resistivity, has a low conductivity. Materials which have very high resistivity and thus poor conductivity, are called insulators.

"Impedance"

Now another term, analogous to resistance, namely, "impedance." This property, sometimes called the "apparent resistance," is the opposition to an alternating current. It is measured by the same unit as resistance—the ohm, but differs from resistance in that its value depends upon the frequency of the alternating current.

Inductance

We now come to the question of inductance. Inductance is the property possessed by a circuit or piece of apparatus by virtue of which an electromotive 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 another circuit, when the inductance is termed "mutual inductance," or by a varying current in the circuit itself, when the effect is called "self inductance."

Here again, we have not "inductivity" to indicate the degree to which inductance is possessed by a piece of apparatus, but the inductance (sometimes called the "coefficient of induction") 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 ampere 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 almost in the same breath with inductance 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."

"Capacitator"

A condenser, or "capacitator" 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 charge is dissipated. Numerically the capacitance of a condenser is measured in farads or in microfarads, a condenser of one farad capacitance being one requiring a current of one ampere flowing for one second to charge it to a pressure of one volt.

THE AUTOKOIL PENTODE TWO

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

THIS is a new two-valve receiver in which construction has been reduced to the minimum, and in which the principal parts of the circuit, especially on the aerial side, are all contained in one unit. We refer, of course, to the Autokoil, which has been designed and manufactured by A. W. Hambling. This is a complete all-wave tuner employing a coil wound on an air-spaced former with a tapped selectivity device and reaction control. This is built up on an ebonite plate provided with the three essential controls, and for those readers who require it a special escutcheon is provided at an additional cost of 1s. The complete receiver employs this unit as the main panel mounting fixture, the remaining panel parts consisting of a tuning condenser and on-off switch.

A perusal of the list of components will show that a 7 to 1 transformer is employed for coupling a detector valve to a pentode, in the anode circuit of which is a tone compensator. Ample decoupling is provided, and the receiver will be found perfectly stable in use. A fuse is incorporated to safeguard the valves against damage occasioned by short circuits. The remainder of the circuit details are quite straightforward and are standard.

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 $\frac{3}{8}$ths 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 give any measurements for these, provided they align with the other knobs. Before mounting these components, mark out and drill the terminal strip. The components 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, one of the special escutcheons should be obtained for this. It consists of a thin ebonite plate on 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.

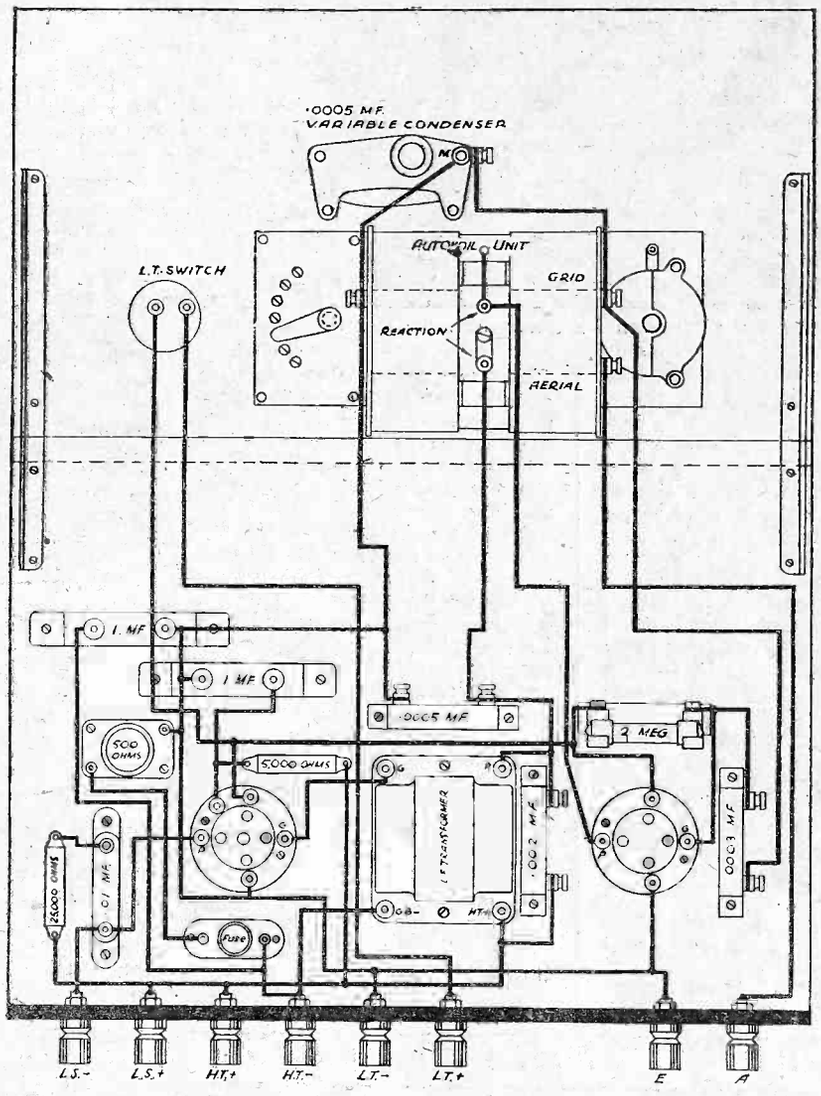
Testing Out

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 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.)

WIRING DIAGRAM OF THE AUTOKOIL PENTODE TWO



LIST OF COMPONENTS FOR THE AUTOKOIL PENTODE TWO

1 Autokoil All-Wave Tuner (A. W. Hambling).
1 .0005mfd. Polar No. 2 Variable Condenser.
1 .0003mfd. T.C.C. fixed condenser, Type S.
1 .002 ,, ,, ,, ,, Type S.
1 .0005 ,, ,, ,, ,, Type S.
1 .01 ,, ,, ,, ,, Type 40.
2 1.0 ,, ,, ,, ,, Type 50.
1 2 Meg Grid Leak (Lissen).
1 Watmel 500 Ohm. Bias Resistance.
1 Varley 5,000 Ohm Resistance.
1 Varley 25,000 Ohm Resistance.
1 W.B. 4-pin valveholder.
1 W.B. 5-pin Valveholder.
2 Valves—210 H.F. (or 210 Det.—see text) and 230 H.P.T. (Cossor).
1 Telsen 7-1 L.F. Transformer.
8 Clix Terminals marked L.S.+, L.S.—, H.T.+, H.T.—, L.T.+, L.T.—, Aerial and Earth.
1 Fuse and Holder Type, F.5 (Bulgin).
1 Terminal Strip 12in. by 1½in.
1 Pair Bulgin Panel Brackets.
1 Bulgin Type S. 85 On-off Switch.
1 Lissen 120 volt H.T. Battery.
1 Lissen 2 volt Accumulator.

WHAT *is* TE

A Continuation of the Series of Articles Explaining the Principles of Television.

A family group looking in at a "televisor" to watch the television programme.

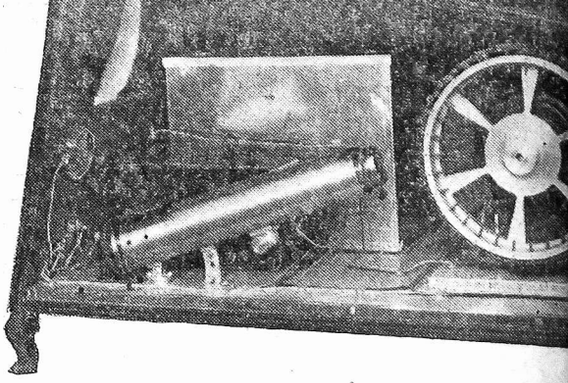
THE last three articles in this series have dealt mainly with the transmitting side, for I felt that in presenting to readers the general outline of a new science, it was necessary to learn something of how the television signals are produced before we take up what many regard as the more interesting 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, if the normal nightly programmes are to be watched, but an ultra-short-wave receiver will be required if advantage is to be taken of an interesting fact which has just been made public.

It is to the effect that transmissions of television by the Baird process are now being sent out on Wednesday and Friday of each week, from 3 p.m. to 5 p.m., on the 7.3 metre B.B.C. transmitter at Broadcasting House. 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 240 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 t



An experimental form of mirror drum television receiver which projects the image on to a front screen.

be reversed. Scanning at the transmitti end was carried out at the rate of 1 pictures per second, that is, 750 revolutio per minute, and in consequence, we sh require a motor to effect this in the receivi apparatus. The power of this motor w depend upon whether a disc or a mirr drum is being employed for scanning, bo these types of apparatus being shown accompanying illustrations. In either cas the motor may derive its power from t D.C. or A.C. house mains, or accumulato and be capable of running at a speed 750 revolutions per minute for long perio at a stretch. Furthermore, the mot should be capable of easy speed contr so that the "looker" (this, by the wa is the word suggested by the B.B.C. be equivalent to the "listener" of ordina sound programmes) can make any adjus ments rapidly, if his motor speed does te to change.

Next, we shall require a mirror drum a disc, and on the score of cheapness a simplicity, the latter is the obvious choi and will, at least, be adhered to for t purposes of explanation. In practice, th disc is made from fairly thin sheet al minium—No. 32 S.W.G. is very satisfacto —and to still further lighten it, lar sectors are removed, giving the finish product the appearance of a five or si spoked wheel, as shown in an illustratio of one form of receiver. The resulta "flimsy" character of the disc is valuab inasmuch as it will allow it to whip o flat when mounted on the motor sha and run up to speed. It then functio as a solid disc without the object of weig

Apparatus for Home Use

For a simple machine to use in the hom

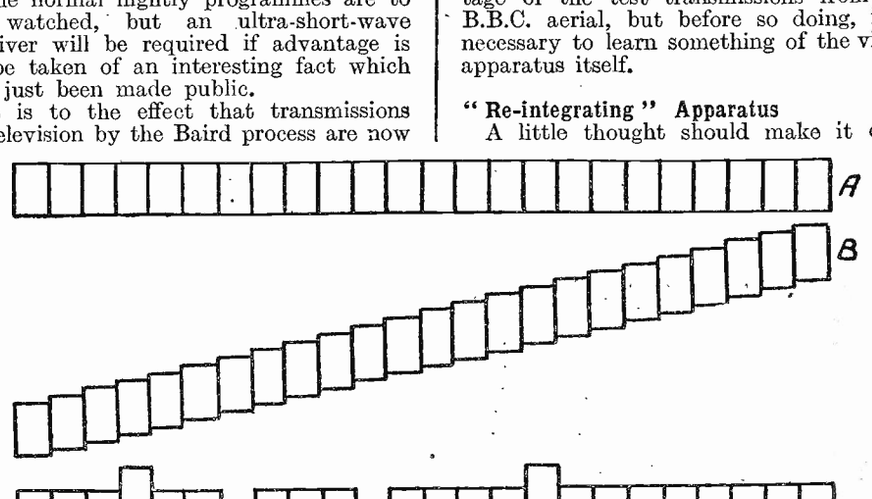
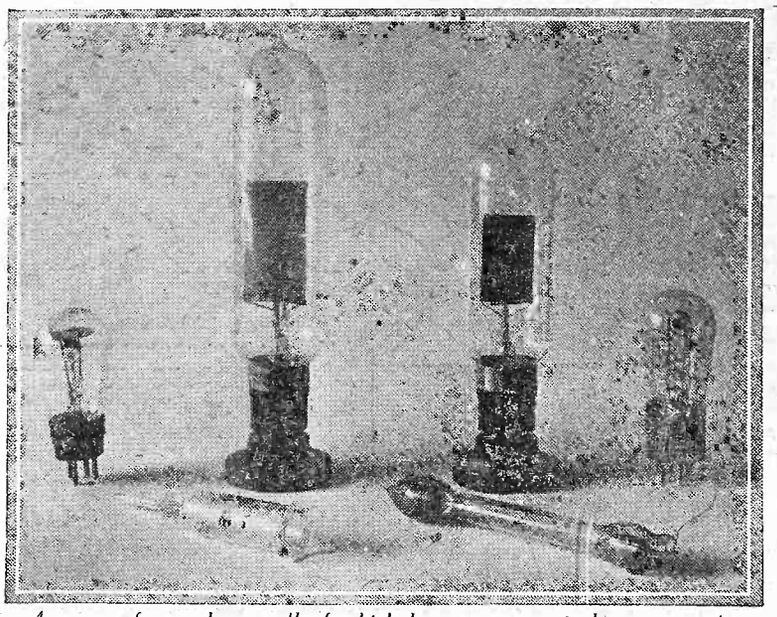


Fig. 2.—This diagram illustrates the effects of holes which do not accurately align. It will be seen that the picture will be broken in various ways. The top line shows how the holes should join up.

EVISION? (4)

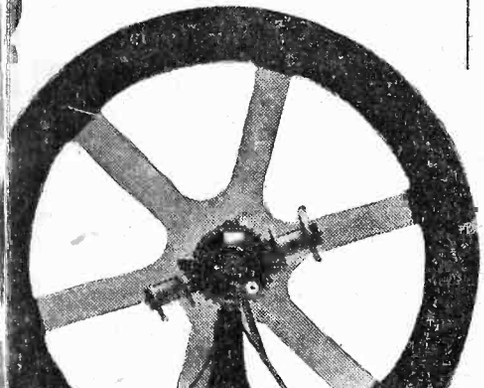
By H. J. BARTON CHAPPLE,
Th.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.



A group of neon lamps all of which have some particular purpose for television reception.

diameter of 20in. is satisfactory, and ound the edges of this disc must be unched a single turn spiral of thirty holes, paced apart twelve degrees radially. To ceive the B.B.C. transmissions, this iral of holes must turn towards the centre in a clockwise direction. Then, when the disc is rotated in its correct direction, namely, anti-clockwise, the scanning operation will be in order, that is, hole movement from bottom to top and strip direction from right to left.

Unless the holes are accurately positioned, both in a radio and circumferential direction, a *mechanically* distorted image will result. For a correctly marked out 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

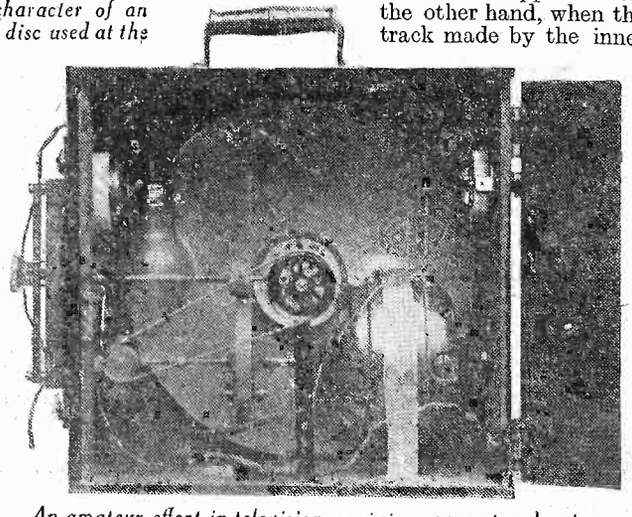


Illustrating the "flimsy" character of an ordinary television screening disc used at the receiving end.

ircumference, or outside dge of the disc, the *inside* dge of one hole will be on he same arc as the *outside* dge of the following hole, s shown in the rough iagram of Fig. 1. Each ole is square-shaped and very small, but we need not worry about how the hole ize is calculated; that can e deferred until a later date. Unless the apertures conform to this standard, faulty disc will result, and his can be most disconcerting and, furthermore, many people fail to recognize that the distorted mage 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 lop-sided, 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 refiling will erase these faults when the errors are small, otherwise nothing short of a new disc will remedy matters.

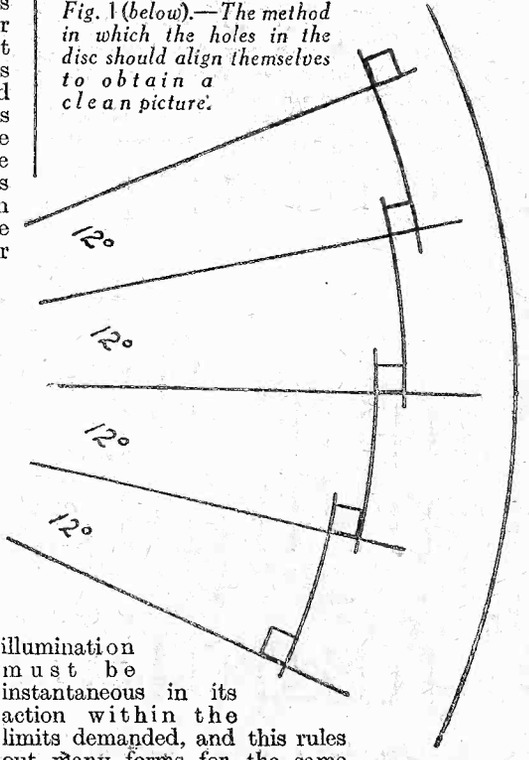


An amateur effort in television receiving apparatus showing the disc and neon lamp together with the motor driving the disc through a belt and gearing.

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 illumination must be instantaneous in its action within the limits demanded, and this rules out many forms for the same

Fig. 1 (below).—The method in which the holes in the disc should align themselves to obtain a clean picture.



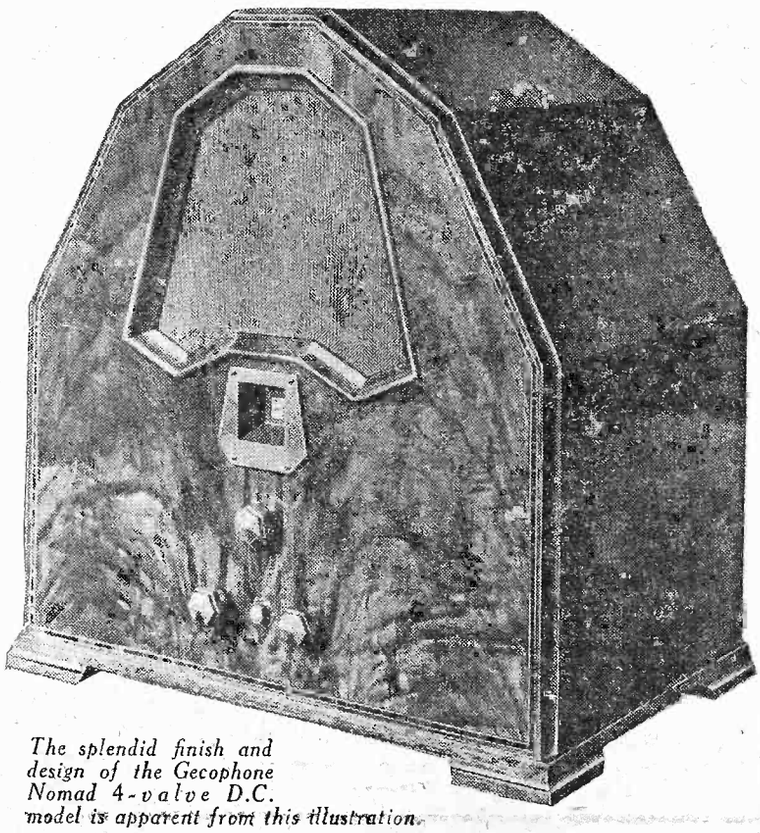
(Continued on page 746.)

Receivers and their Records

We shall be glad to advise readers regarding purchase of complete sets

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 Gecophone "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 current has been kept down to the neighbourhood of 70 watts, which represents roughly a fifteen hours working at a cost of one unit of electricity. The *Nomad* receiver takes the form of a four-valve table model with built-in moving coil loud-speaker; the cabinet is of polished inlaid walnut—*a well-made piece of furniture*—with all controls situated in front. To ensure good selectivity there are three tuned circuits employing two high-frequency stages feeding a screen-grid detector. The aerial is loosely coupled to the first grid circuit, and transformer coupling has been adopted throughout. The screen-grid detector in its turn is resistance-capacity transformer coupled to the DPT pentode output valve, which feeds a new model G.E.C. moving coil loud-speaker. Thoroughly efficient means have been taken to make the receiver perfectly safe, even in the hands of the raw beginner; there is no risk of an electric shock. The entire chassis on which the components have been built up is adequately earthed, and, in order to reduce mains hum to a minimum, the detector stage is separately screened, within the outer general screen, and thus also brought to earth potential.

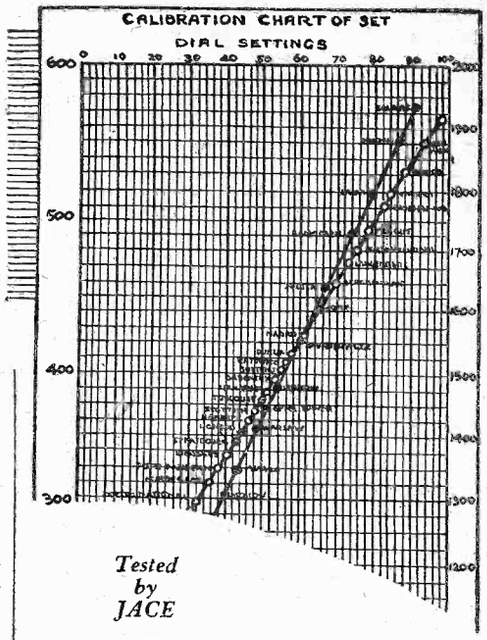
GECOPHONE NOMAD FOUR-VALVE RECEIVER (D.C. MODEL)



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

The voltage range is 200-260 volts, the terminal board being arranged for three tappings to meet individual requirements, namely, 200-220; 220-240 and 240-260 volts. It is, therefore, only necessary to change one lead on this board to suit your mains.

The valves employed are Osram DSB screen grid in the first H.F. detector and first L.F. stages, a D.S. screen grid in the second H.F. stage, and an Osram DPT power pentode for output to the speaker. All valves except the last one are of the latest metallised pattern. They are run in series (being indirectly heated with 16 volt heaters) and a 210 volt 75 watt pearl-gas filled lamp is used to drop the supply voltage by the required amount. One ampere 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.



Tested by JACE

As may be seen from the illustration, all the controls are on the front panel. The central knob acts as tuner, and operates a triple gang condenser. The dial aperture 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. It works very smoothly and greatly assists in the tuning-in of distant transmissions. The left-hand knob serves a triple purpose as, according to its position, it enables the receiver to work on medium or long waves, and in addition puts the set right for the electrical reproduction of gramophone records. The two wavelength ranges are 230-550 metres and 1,000-2,000 metres, and the illuminated dial is very accurately calibrated in this manner.

Beneath 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 the receiver is installed within a few miles of the local station, in most instances reception on the plate aerial alone will give sufficient volume. This device, of course, detracts considerably from the efficiency of the circuit, but may be found useful in certain circumstances. Where an outdoor aerial is used, socket 1 is the normal and more sensitive position for the capture of distant transmissions, whilst aerial socket 2, incorporating a very small series condenser, enhances selectivity, and will assist in separating 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

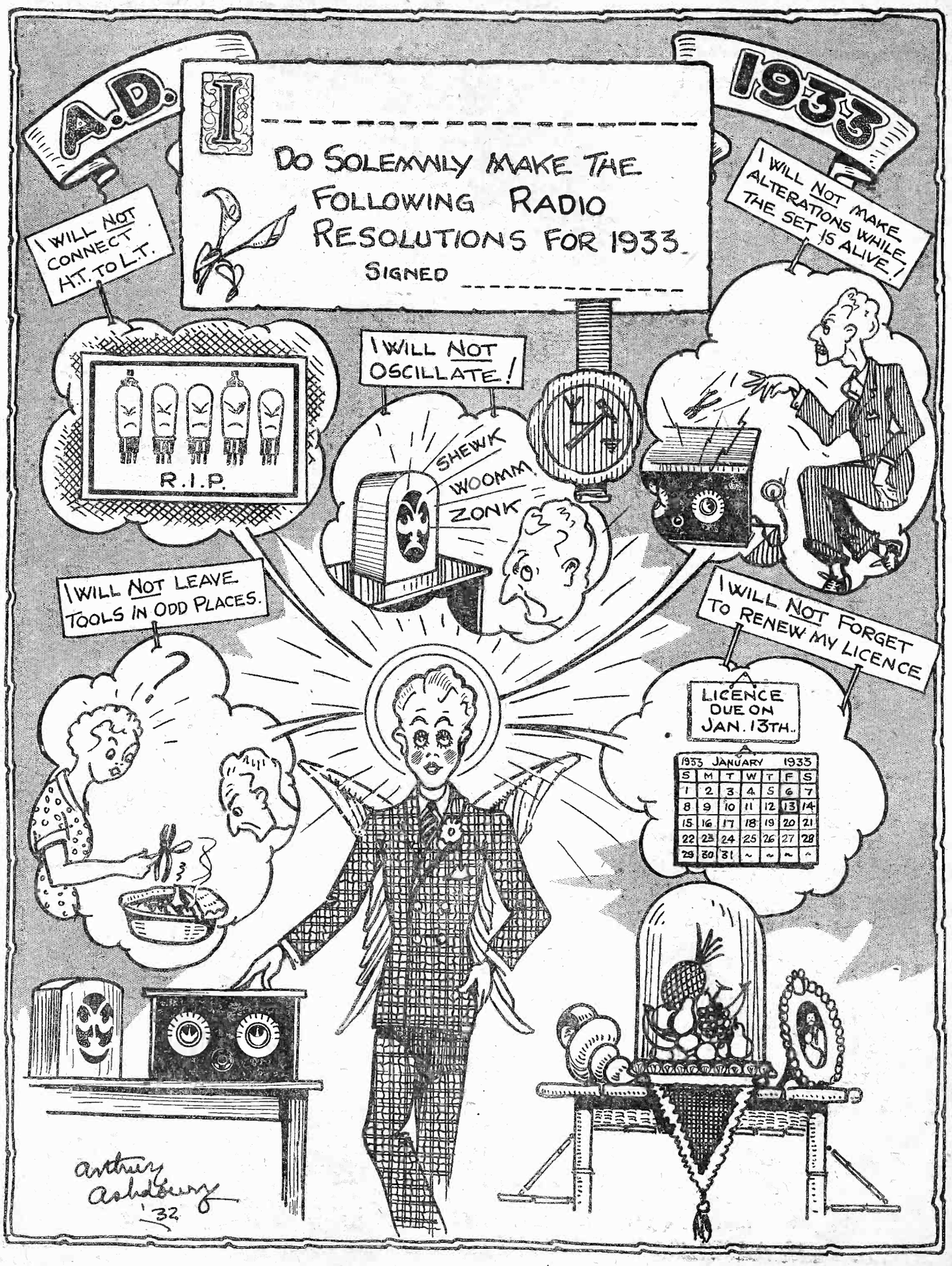
is desired. On the other hand where a long aerial has been erected, in most instances socket 2 will be a necessity. Provision has been made at the back of the receiver for the use of a pick-up, but as the volume control is ineffective, in this case, an external potentiometer is recommended, and with 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.

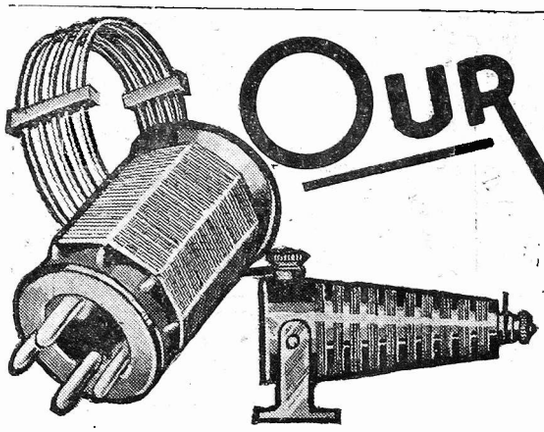
On test, the *Nomad* showed a remarkable degree of sensitivity, and in this respect gave superior results to any previous four-valve set made by these makers. The receiver was very quiet in operation; the decoupling of the circuit and smoothing were found to be adequate, as the method adopted prevents any perceptible mains hum. Both for radio and for gramophone records the reproduction from the speaker was thoroughly satisfactory. It is an entirely new production in which the input transformer is fitted in the loud-speaker chassis itself, the field winding being run in series with the heaters of the valves. Although covering a good tonal range, the bass is free from any boom, and speech is natural, providing volume has not been pushed to an extreme limit. In the anode circuit of the pentode valve a well-designed heterodyne filter eliminates the objectionable 9,000-cycle whistle without affecting the quality of the tone. The undistorted output is ample for all ordinary requirements; it reaches almost 1 watt, and consequently volume is such that on most transmissions signals will fill a large-sized room. Using a 35–40ft. aerial in a north-western district of London, the *Nomad* proved its efficiency by capturing transmissions from a number of European stations on the medium waveband during daylight hours. Broadcasts from the B.B.C. National and Regional stations, and from Fécamp, Poste Parisien, Leipzig, Langenberg, Brussels, Munich, were well heard; on the long waves, Huizen, Radio-Paris, and Warsaw were also logged. During the evening a larger number of transmitters was logged. These included more distant stations such as Lahti and Reykjavik (when Radio-Paris had closed down); also Motala, Kalundborg, Oslo and Leningrad (on its own wavelength). With some patient manipulation of the controls it was found possible to separate Königs Wusterhausen from Daventry and Eiffel Tower from Warsaw; but no difficulty was experienced in getting Brussels clear of Florence, and in securing good reception of Rome, Stockholm, Sottens, Midland Regional, and, at times, Mühlacker. On the lower waveband some of the smaller stations gave sufficiently loud signals to be of entertainment value. For the reception of the London Regional and National broadcasts use of the plate aerial was indicated, to prevent valve overload, and with volume reduced there was no sign of distortion. 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.

A NEW RECEIVER

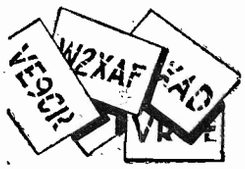
I HAVE just completed a test of the new *Six-Sixty* type 3-32 chassis set. This is a receiver of the console type, mounted in a handsome walnut cabinet, the fret of which is of a striking conventional pattern. On the front of the panel there is an oxidized metal dial of a unique design in which a plaque 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 wavelength 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 tuning is knife-edged, and the reproduction is what we expect when a Celestion permanent-magnet moving coil is used. This year the majority of manufacturers have paid more attention to mains-driven receivers to the detriment of those battery-operated, and it is quite delightful to handle a battery set such as this which will be assured of a welcome by those people who are looking for a new set, and are unable to take advantage of the electric mains.

JACK.


A.D.
1933
I
DO SOLEMNLY MAKE THE FOLLOWING RADIO RESOLUTIONS FOR 1933.
SIGNED
I WILL NOT CONNECT H.T. TO L.T.
I WILL NOT MAKE ALTERATIONS WHILE THE SET IS ALIVE!
R.I.P.
I WILL NOT OSCILLATE!
SHEWK
WOOMM
ZONK
I WILL NOT LEAVE TOOLS IN ODD PLACES.
I WILL NOT FORGET TO RENEW MY LICENCE
LICENCE DUE ON JAN. 13TH.
1933 JANUARY 1933
S M T W T F S
1 2 3 4 5 6 7
8 9 10 11 12 13 14
15 16 17 18 19 20 21
22 23 24 25 26 27 28
29 30 31
arthur ashbourne '32



OUR SHORT-WAVE SECTION



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, calls to his aid a more experienced fellow enthusiast, who soon puts things right.

There are, however, many enthusiasts who carry on alone owing to being unacquainted 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; threshold howl; dead spots. The reader who is troubled by any one of these will not wish to read a detailed description of each and all. Probably, owing to experience, and information obtained from other sources, he is fully acquainted with them and knows exactly the kind of trouble he is up against. Under the circumstances, the information he will appreciate is, how to overcome and get rid of the trouble. In order to assist him, I give the following list of experiments which may be tried individually until one is found which definitely overcomes the particular trouble experienced.

Body Capacity Effects

A metal panel or sub-panel earthed 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 direct 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.

SHORT-WAVE RECEIVER TROUBLES AND HOW TO OVERCOME THEM

By ALF. W. MANN

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 to earth, and gives an idea as to where interaction is taking place. The receiver should be tuned to a powerful signal, preferably on the broadcast band, in order to carry out this useful experiment.

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 experiment, this trouble can be completely obliterated.

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 shops for sealing parcels. This should have a width of 1½ins. or 2ins. Cut off a strip which will just go round a bottle having a diameter of about 3ins. 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. 18 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 sticks to the paper. The ends of the coil may be anchored by smaller strips 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 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 tuning 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.

2	turns	with	.0003	tuning	condenser,	from	20-30 metres
4	"	"	.0003	"	"	"	30-50 "
6	"	"	.0003	"	"	"	45-60 "
8	"	"	.0003	"	"	"	60-80 "
10	"	"	.0003	"	"	"	70-100 "

KEEP YOUR DATA SHEETS IN OUR SELF-BINDER. *See page 727.*

The BEGINNER'S SUPPLEMENT

Conducted by
F. J. CAMM

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 different aerials, and in various parts of the country. This is achieved with the aid of the special coil. It 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.

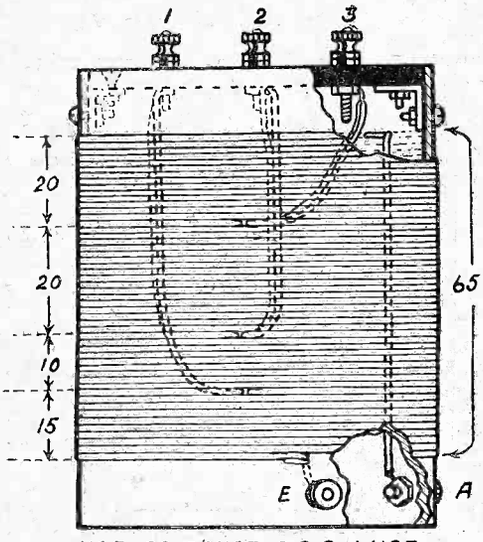


Fig. 1.—Details of the Tuning Coil.

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.

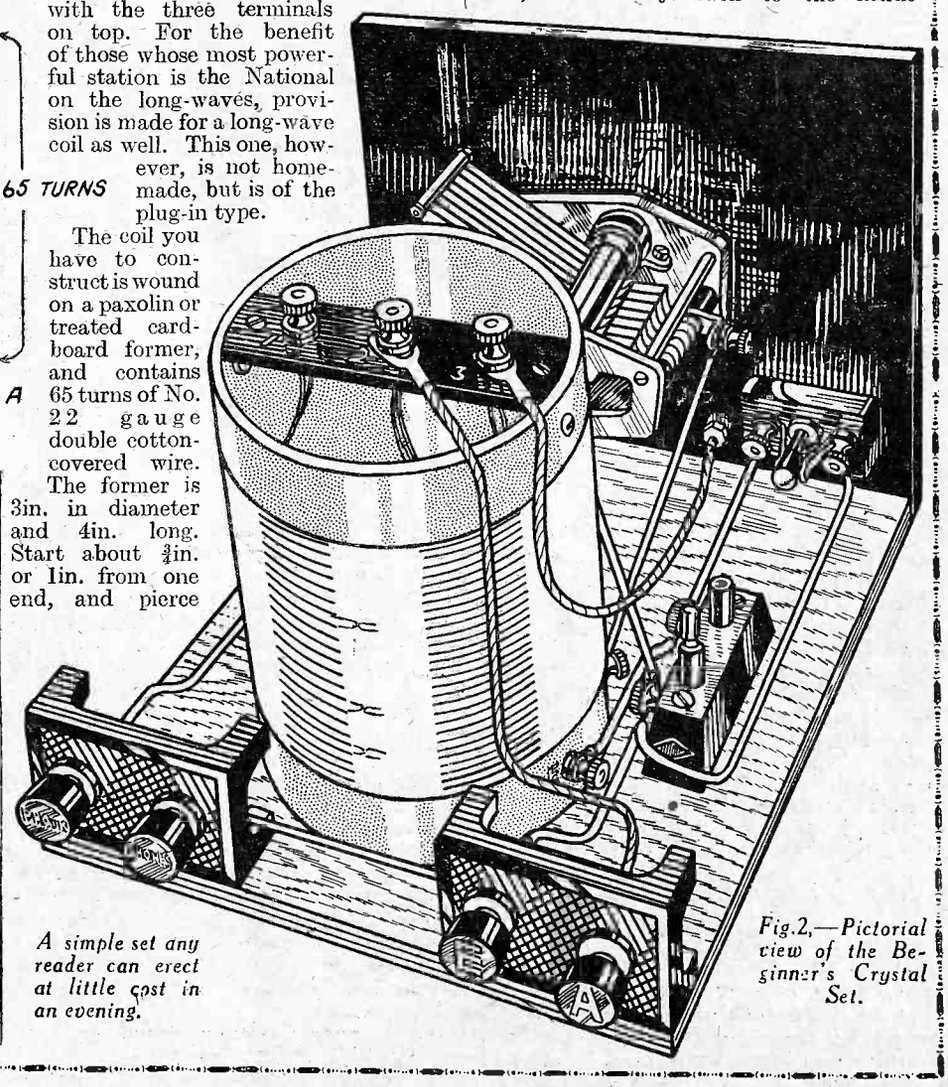
No Soldering

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. The former may be of ebonite or wood, and measures 6in. by 6in., whereas the latter is of ⅜in. plywood 7in. by 6in. Panel and baseboard may be joined together with small screws as shown or panel brackets can be employed.

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 ¾in. 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



A simple set any reader can erect at little cost in an evening.

Fig. 2.—Pictorial view of the Beginner's Crystal Set.

through the first hole. This should leave you with a loop of wire coming through to the inside about four or five inches long. This loop will form one of the tappings, and will finally be fixed to terminal No. 1 on the top of the coil. (See Fig. 1.) Do not do anything with it for the moment, however, but continue with the winding. Put on another 10 turns, winding in the same direction as the first 15 turns, and make another loop like the first one. Now wind on 20 turns, and make the third and final loop. This also is brought through to the inside. The last lap in the winding consists of another 20 turns, when you should finish off by cutting off the end of the wire with just enough to spare to thread through two holes, and leave a short length for connections. The coil will thus consist of a total of 65 turns.

The next job is to mount the terminals on the coil. To fix the two lower ones, marked A and E on Fig. 1, you simply drill two holes in the tube itself. Before tightening them up they must be connected to the two ends of the coil. The cotton covering is scraped from the connecting wire at the lower end of the coil, and secured under the fixing nut of terminal E while the upper end of the coil is connected in the same way to terminal A. To support the top three terminals, a small strip of ebonite is used as shown. It is wedged in the top of the coil and held in place with two small "Trix" or "Meccano" brackets. The three loops of wire from the inside of the coil are each cut at the end, scraped bare, and secured under the three terminals as in Fig. 1.

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 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.

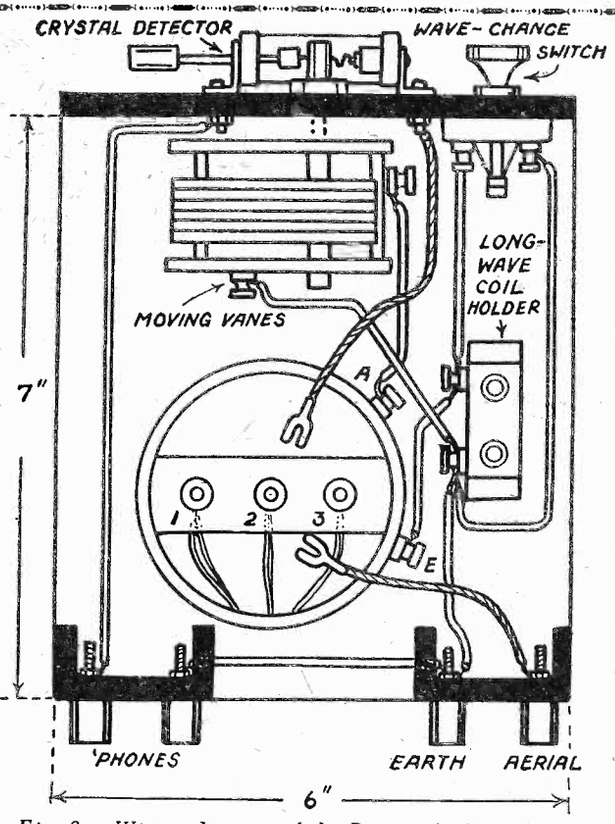


Fig. 3.—Wiring diagram of the Beginner's Crystal Set.

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 ⅜in. 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.

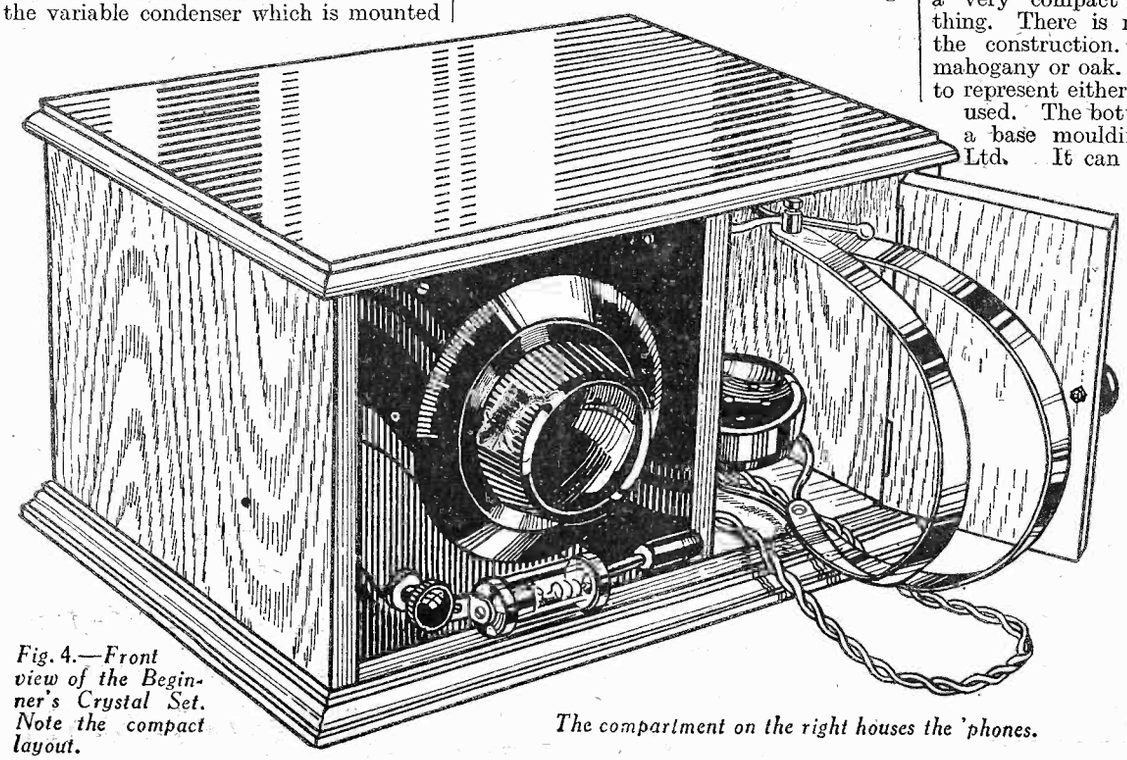


Fig. 4.—Front view of the Beginner's Crystal Set. Note the compact layout.

The compartment on the right houses the 'phones.

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 one from the aerial to No. 2. Then listen-in by turning the tuning knob slowly

round and trying various settings of the crystal. Having discovered a sensitive point on the crystal, leave it alone, and concentrate on the tuning. If it is not sharp enough, and you can hear two stations at once take the aerial tapping to No. 1 terminal instead of No. 2. If, on the other hand, there is no appreciable overlap, try both aerial and crystal lead on terminal No. 3. This will make the signals somewhat louder, but not so sharp as regards tuning. Still another arrangement is to leave the lead from the detector joined to No. 3, and to connect the aerial lead to terminal "A" on the bottom of the coil. Usually, this position gives the loudest signals, and the flattest tuning. Don't forget that each time you alter the connection of the aerial lead you alter the setting on the tuning condenser so that you will have to readjust that as well. For instance, if a station tunes in at 50 deg. on the dial with the aerial on No. 2 terminal you will find that on moving the aerial to No. 3 you will have to tune lower for the same station, probably about 30 deg.

The best thing is to experiment until you get the most suitable combination for your particular aerial, and locality, and to leave it at that. You will find that the setting of the flex from the crystal will not have much effect on the tuning, but that one particular connection will give the loudest signals. This will probably be No. 3 terminal or terminal "A"—it depends on the resistance of the crystal and 'phones.

So far, no mention has been made of wave-changing. Well, to tune in to the long waves you plug in a Tunewell or Lewcos 175 or 200 coil. For listeners situated near London the National long-wave station is not usually as loud as either the London National or London Regional, and under these circumstances a long-wave coil is hardly necessary, since the National programme is always relayed by either London National or London Regional. However, for others the long-wave station is often the loudest, and it is these listeners who will profit most by buying a long-wave coil. After it is plugged-in, the switch does the rest. Just push it in for the long waves and pull it out for the short, there being no need to remove the coil each time.

LIST OF COMPONENTS.

One J.B. popular variable condenser, .0005 mfd.
One Becol ebonite panel, 6in. by 6in.
One baseboard, 7in. by 6in.
One Paxolin or card former, 3in. diam., and 4in. long.
Half oz. 22 s.w.g. D.C.C. wire.
One small strip of ebonite 3in. by 1in. by ¼in.
Two small Clix brackets.
Four small nuts and bolts, screws, etc.
Five small terminals.
One crystal detector with Shaws "Hertzite" crystal.
One Bulgin coil-holder.
Two Belling-Lee terminal mounts.
Four Belling-Lee terminals—"Aerial," "Earth," "'Phones."
One Ready Radio on-off switch.
One Hank Glazite connecting wire.

ACCESSORIES.

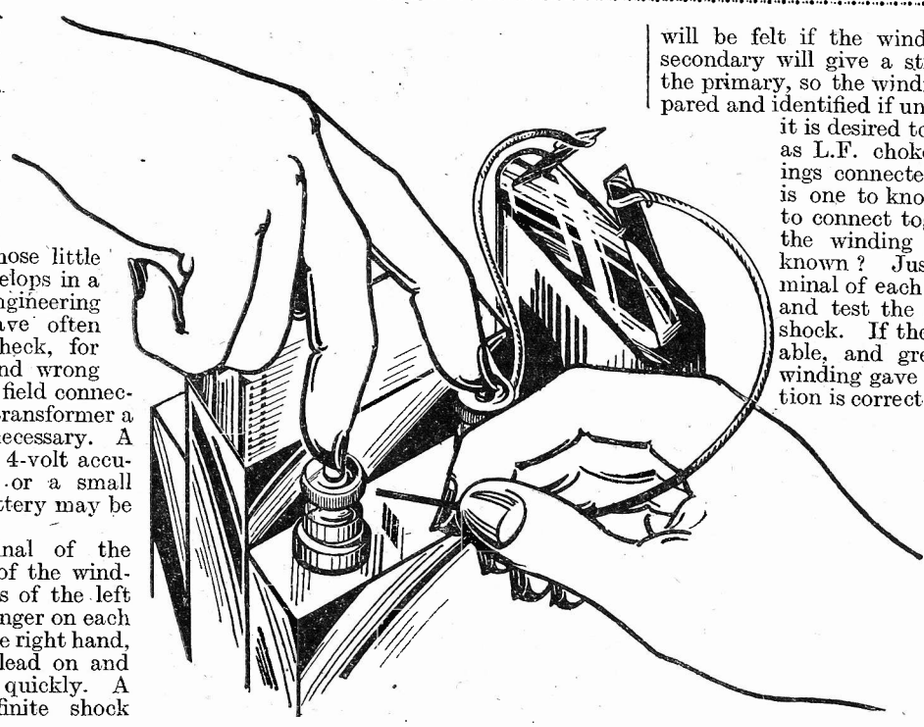
One pair Browns Featherweight Headphones.

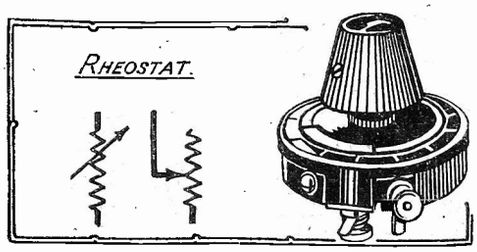
TESTING BY SHOCK

By A. E. OAKLEY

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 dodges 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 connections. For testing a transformer a few volts only are necessary. A flash lamp battery or 4-volt accumulator 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 winding, 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 compared and identified if unknown. Suppose it is desired to use a transformer as L.F. choke, with the windings connected in series. How is one to know which terminals to connect together, seeing that the winding direction is unknown? Just connect one terminal of each winding together, and test the free terminals for shock. If the shock is appreciable, and greater than either winding gave alone, the connection is correct. If, on the other hand, the shock is nil or almost so, one end of the connection only must be changed over, because the windings are connected in opposition. Many applications of this method will suggest themselves to the ingenious experimenter.

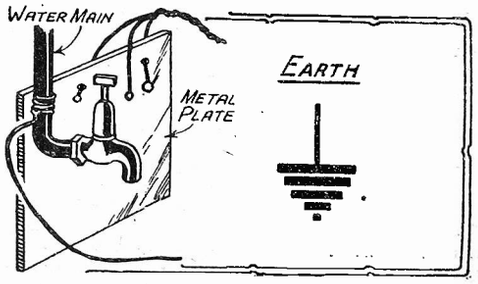


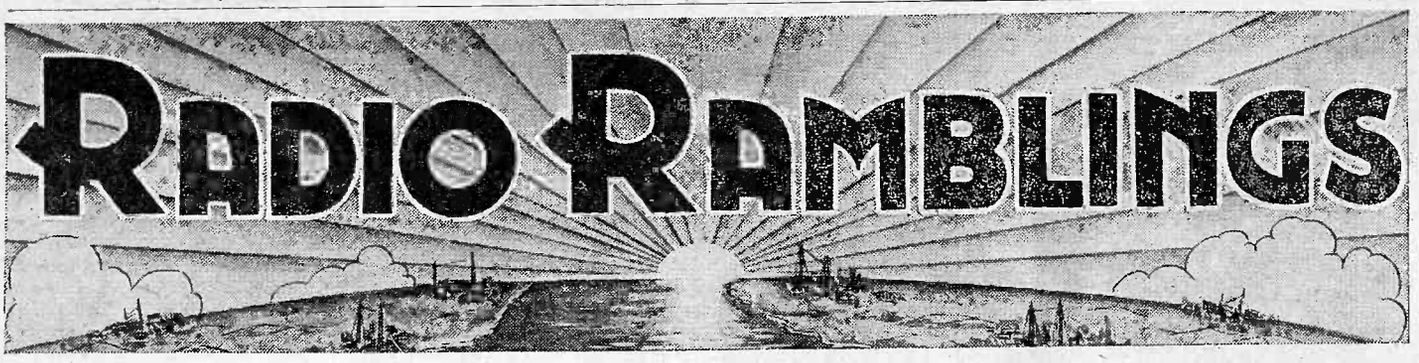


WIRELESS SHORTHAND No. 4

If you are a beginner, you should collect our Data Sheets. *YOUR* Self Binder for them awaits you.

See page 727.





JOTTINGS FROM MY NOTEBOOK.
By "DETECTOR."

Etherwave Organ Transmissions from Paris

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 a difficult one 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 curbing if listeners' speakers are not to "blast," and as often as not, in organ music, a mighty rush of sound is immediately followed by the sibilant whispering 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 heartily tired of sponsored programmes, especially those which comprise more talk by the sponsors than by actual music programme. An outcry against the length of time taken up by the advertisers' "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 so doing. Also from U.S.A. comes the demand for "one-man" sets, which would seem to be going back to crystal-set days. It is complained that rarely are two people sufficiently alike or psychologically in tune to be able to enjoy the same wireless programme. This may be so, but I don't think we on this side would care to go back to the days of headphones, bringing either headaches or sleepiness in their wake. It is a strange thing, too, that, no matter what invention comes along to bring brightness to human lives, there are sure to be some people to grumble at some of the aspects it presents.

What We Owe to Bakelite

A NEW super-factory has been just opened by Messrs. E. K. Cole and Co., Ltd., the famous Southend makers of "Ekco" products. The way this firm has progressed in seven years, 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 firm 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, for, in the old 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 cousins across the "herring 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 methods. 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 "blast" 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 "silent practice" for learners of his instrument, for 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 the way, this silvering is a necessary evil, and does not serve the purpose of hiding 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 valve for the detector stage. Nowadays, such a valve is rare indeed, which is a very good thing, for its use in a modern circuit with 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 H.T. voltage, some of the Dutch valves 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 present-donors who are uncertain of the recipient's wants. A token of any value can be purchased and given as a present, this 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?

(Continued on page 742.)

Radio Ramblings

(Continued from page 741.)

Testing with 'Phones and Battery

WHEN testing parts by the 'phone and battery method, it is as well to insert a resistance of about 10,000 to 30,000 ohms in series with one test lead, when making contacts 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 in a component, but it gives no 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 to the potential of 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, allowing a click to be heard every time the 'phones are connected across the terminals. Sometimes, a suspected primary of an L.F. transformer will give a loud 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 across the primary windings, but only if 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 H.T. battery 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 minds will be full of the good things that are associated with festivities and the New Year. It is the season of parties, and wireless will play a large part in making the festivities go well. Numerous tricks and dodges can be played with the amplifying section of your wireless set, and by obtaining a microphone and connecting it in your pick-up circuit, a new avenue of amusement is opened. The numbers of stunts you can arrange are endless, and it forms no part of my duty to enumerate them to you. You will have read of many of them elsewhere, and still more will you discover by your own ingenuity. I feel, however, I should like to say a few words on behalf of your wireless set, as there is a danger that with the very high spirits that usually prevail at most parties, it may possibly be subjected to rather rougher handling than is usual. Try and see that the set is not used in a way which makes it necessary for everybody to handle the dials. This may sound a wet-blanket attitude, but it is a fact that much harm can be done to your tuning-condensers, if wrenched or forced by revellers not used to working them. If possible, keep your set in another room, away from the main body of guests, and instal a loud-speaker on a long lead in the room where dancing or games are being arranged. In this way, the danger of the set being knocked down, or in any other way coming to an untimely end, is obviated. If you use a battery set, *do* make sure that your H.T. is up to the big drain shortly to be taken from it, and the same also applies to the accumulators. See to these at least a week before, because the radio dealers may be closed when it eventually runs out and there is sure to be a rush on the charging stations during the holidays. In the same way, if you have been promising yourself a new valve or two for some time, buy it now, because you will need every ounce of volume your set is capable of if dancing to the wireless or gramophone is anticipated. It is surprising what a large volume of sound is needed for dancing, and it is hardly fair to yourself or your set to give your guests a weak, distorted output, due either to poor batteries or worn-out valves. Finally, take care that no likely sources of danger to your visitors are carelessly left open. Keep all trailing leads away from places where people are likely to trip over them, this particularly applying to "live" leads carrying mains current, and do not put loud-speakers, valves, or components where harm is likely to befall them. When carrying out stunts with the set, or manipulating the switches, take care that at no time a pentode-output receiver is allowed to function without a loud-speaker being connected to the appropriate terminals. I have told you before of the dangers of voltage rise with these valves, when on open circuit. Well, I hope you have the very best programmes it is possible for you to have, and that your sets will excel themselves, and also that the New Year will be one of more prosperity and happiness in wireless, and even excel the one now terminating.

Many Uses of the Photo-electric Cell

STILL further uses are being made of the ubiquitous selenium cell, sometimes termed (in error) a photo-electric cell, and more popularly "invisible ray." You may have read about a well-known hotel or road-side hostelry which is floodlit every time the headlights of an approaching car shone on a carefully placed selenium cell arrangement, and now the presence of smoke passing through a ray of light can be made to give the alarm in the case of fire. Garage doors can be opened and shut, burglar alarms can be set into motion, and articles in course of production can be counted by means of this modern wonder, but don't lose sight of the use for which it was primarily intended—that of television.

Long Pick-up Leads

I WAS talking a week or so ago of the use of output transformers when using a loud-speaker at some distance from the set. Now a correspondent inquires about long pick-up leads, and it struck me that there must be cases where these are inevitable. For instance, if the owner of a quite elaborate and costly cabinet gramophone invests in a wireless set, it might be quite inconvenient for him to move his set to the gramophone or vice versa when he wants to hear some records via the speaker. We are

always cautioned against long grid wiring, and the addition of the capacity due to several feet of pick-up wiring cannot be anything but detrimental to results generally. In this case it is possible to obtain from most transformer makers a suitable transformer to fit to your pick-up which will allow of a gramophone operating an amplifier at any distance from the pick-up. As there is perforce a very limited demand 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

DO you remember the days when we invariably used a variable grid-leak in our sets? The principle was sound in theory, but mechanically more was lost than gained by their use—I say mechanically because it was the problem of the design of such a leak 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 not always best, and sometimes a satisfactory 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 reached, or at least to keep it free from 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

MOST of us nowadays tune in on the loud-speaker as a matter of course, but for really long-distance work, especially on the very short waves, headphones cannot be beaten when knife-edge tuning is employed. Moreover, when two or more tuning controls are used, the circuits can be kept in resonance much more easily if the soft sibilant hissing noise indicating this state of affairs can be easily heard without the distraction of outside noises. The snag comes when a station suddenly comes through with a strength sufficient to shatter your eardrums, and it is not pleasant nor desirable that you should allow your ears to suffer this discomfort. When listening with headphones 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 wireless—one of the finest hobbies it is possible to have. At the end of each year we look back over the events that have occurred, and I for one always wonder what will have happened by the end of the new one.

A Year of Progress

WHAT 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, and the popularity of the arrangement whereby the set and the speaker are housed under one roof, as it were, has been noteworthy. Ganging has once more come to the fore—and I say once more because some years ago it had a minor vogue, which quickly petered out, due to the excessive "trimming" required at both ends of the scale—and the screened-grid valve and the pentode have dug themselves in until they have become standard. None of these things may be termed peculiar to 1932, however, although we might consider metallized valves and the variable-mu's to be newcomers of distinction. Television has not progressed as much as we might have expected, and I am afraid we will not see the 1933 Boat Race and Derby—a dream that seems to have peculiarly captured the imagination of the more rabid radio-seeing enthusiasts. The Empire broadcasts have given a fillip to the ultra-short waves, and I make bold to say that I expect still further developments to take place as regards the work on the very high frequencies. Anyway, I am going to give you my views as to the two most important happenings of 1932, as judged from the standpoint of the serious amateur who requires the very best from his radio. They are, firstly, the advent and extreme popularity of the cheap permanent magnet moving coil and, lastly, but not "leastly," the introduction and firm establishment of PRACTICAL WIRELESS. If it were not for modesty, I should say the last was the most important; but perhaps I should leave that to you.

Test Match Broadcasts

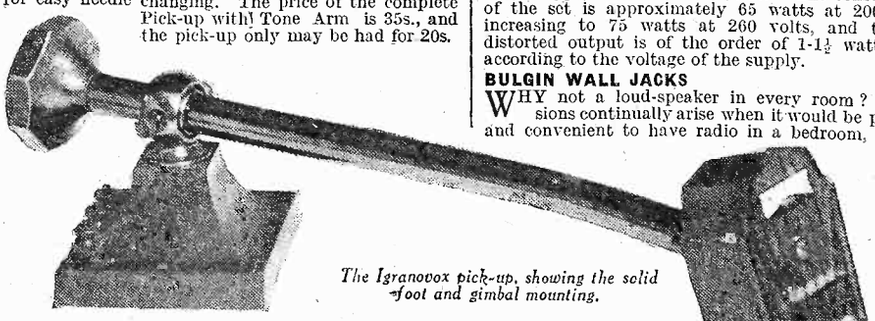
IF you habitually listen on the ultra-short waves in the early hours of the morning you will be interested to learn that every Test Match of the present series will be broadcast by Amalgamated Wireless (Australasia), Ltd., from their station, VK3ME on a wavelength of 31.55 metres. Descriptions of the play will be sent out at intervals from 3 a.m. to 8 a.m. G.M.T., and, if you have time on your hands at these early hours, why not tune in?

COMMENTS ON COMPONENTS

What we Found..

IGRANIC PICK-UP

THE Pick-up manufactured by the Igranic Company, and illustrated below, is a very efficient instrument of rather original design. The entire apparatus is finished in brown, with the base and pick-up head moulded in bakelite. The base is of square shape and so provides a very solid fixing point for the arm, thus reducing the risk of vibration chatter due to an insecure support. The arm is held in a gimbal fitting; a counter-balance weight at the rear of the tone-arm completely avoids pressure wear on the record; and these features, combined with an almost frictionless swivel action on the support, will enable the records to be used practically indefinitely with very little trace of record wear. The magnet system is made up from cobalt steel and the needle holder is rubber damped, with the armature arranged so that the frequency response is practically uniform when used with modern records. The pick-up may be rotated for easy needle changing. The price of the complete Pick-up with Tone Arm is 35s., and the pick-up only may be had for 20s.



The Igranovox pick-up, showing the solid foot and gimbal mounting.

PREH VARIABLE POTENTIOMETERS

SAMPLES of the two types of potentiometer now manufactured in this country 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 "Multiohm" and the other the "Multiohm-Luxus," the latter being of the friction disc type, whilst 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 boldly 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 values were 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 3s. for the ordinary model, and 5s. for the *de-luxe* model, these are components which can thoroughly be recommended.

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

THE "Gala" is a 3-valve "All-In" D.C. table model, of the H.F., detector and pentode type, incorporating the standard G.E.C. features adopted this season, *i.e.*, moving coil loud-speaker, single knob tuning and a heterodyne filter. These are in addition to the automatic station index—which permits tuning in directly to stations by name on a full vision horizontal scale. This is the neatest and simplest arrangement of its kind. The set has a wave-length range covering 200-550 metres on the medium band, and 900-2,000 metres on the long band, and is suitable for use on mains of from 200 to 260 volts, the terminal board being arranged for three tappings, viz., 200-220, 220-240, and 240-260. The instrument incorporates two tuned circuits with a single H.F. valve feeding a screen-grid detector. The aerial is loosely coupled to the first circuit, and transformer coupling is adopted in the anode of the H.F. valve. The screen-grid detector is resistance-capacity transformer coupled to the pentode output valve, which feeds the moving coil speaker. This speaker is similar to that incorporated in the "Nomad" receiver, previously referred to. Its field winding is run in series with the heaters of the valves, and the reproduction is a marked improvement over existing D.C. sets.

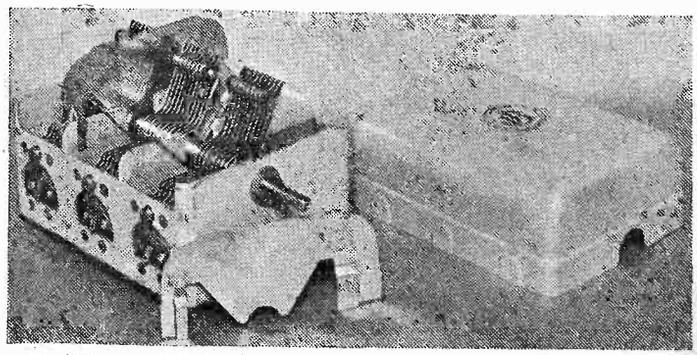
Adequate power is available. Except in areas remote from high power transmitters, it will be found advisable to adopt a reasonably short aerial for the best compromise between sensitivity and selectivity, while for the reception of high-power local stations a small internal aerial which has been incorporated will in most cases be found sufficient. The set has three controls. On the left hand is the volume control and "on-off" switch; in the centre the tuning control, and on the right hand is the wave change switch which simultaneously operates the automatic station index. Two sockets are provided at the back of the neatly-finished walnut cabinet for the connection of a gramophone pick-up. The valves employed in this set are of the Osram indirectly-heated type, with 16-volt heaters. The consumption of the set is approximately 65 watts at 200 volts, increasing to 75 watts at 260 volts, and the undistorted output is of the order of 1-1½ watts A.C., according to the voltage of the supply.

BULGIN WALL JACKS

WHY not a loud-speaker in every room? Occasions continually arise when it would be pleasant and convenient to have radio in a bedroom, nursery or kitchen. A system of wall jacks is easily fitted, and such an arrangement will please every member of the household. But isn't it an expensive matter? you ask. Not at all. Wire is cheap enough, and the Bulgin Midget Wall Jacks cost but 1s. 6d. each. They are arranged for series or parallel wiring, and are finished in walnut or mahogany bakelite. The plugs also cost 1s. 6d. each, one only of these being required for each loud-speaker.

NUGANG CONDENSER

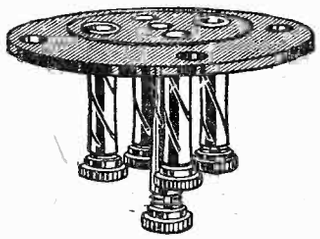
THE condenser illustrated is one of the Nugang series, manufactured by Jackson Bros., and is a very soundly constructed component. This is of the fully screened type, having, in addition to the cover, separate small metal screens which may be clipped on to the plates separating each section of the condenser, and thereby completely screening each section when the cover is on. Each section is provided with a separate trimmer, having a large star-wheel adjustment. Soldering tags are fitted on each side so that connection may be taken from the stators to the coils on one side and to the valve on the other. This greatly simplifies the layout and enables the length of leads to be reduced to a minimum. The end plates of each rotor are split and the sections are accurately matched to within ½ mmf. plus ½%. The entire assembly is very robust and will be found fully up to the standard of Jackson products. The condenser is available in 2, 3 or 4 gang types, with a capacity of .0005 mfd., and the price is 16s., 23s. 6d. and 31s., respectively.



The "Nugang" fully-screened variable condenser, with one of the detachable screens removed to show the method of fixing.

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 construction. This permits a clean lay-out, with most of the wiring "below deck." The newest "Clix" valve-holder, here shown, is an ideal component for



The Clix chassis mounting valve-holder.

this method, whether used on raised wooden base or metal chassis. In appearance a "skeleton," it is yet exceedingly strong and thoroughly sound mechanically. 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 seems to "fall in." The Clix sockets are able to move laterally, and so align themselves to the pins, while their spiral form gives resilience and ensures maximum surface contact without fear of collapse. The valve is inserted with perfect ease, and comforting assurance. The cost is only 8d. each for the four-pin, and 9d. for the five pin models. They are, of course, sold at most radio dealers.

SCREENED STANDARD H.F. CHOKE

FOR all ordinary sets this choke is ideal. Built on the same lines as the super-het model, it is slightly smaller, with an inductance value of 250,000 microhenries. It covers a wave-band of from 100 to 1,800 metres without resonant points or blind spots, and has an approximate self capacity of 2.5 mmf. Screened, as is very necessary in modern sets, its cost is 3s. 6d. The makers are A. F. Bulgin and Co., Ltd., Abbey Road, Barking.

HEAYBERD TRICKLE CHARGER

IN our issue dated December 24th, page 706, 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

Det. 2 L.F. Set with Bandpass Tuning Wanted

SIR,—Lest the Technical Department should run dry of material for those most practical articles which have made your publication what it is—the most practical wireless weekly—I suggest that they should come out with a really up-to-date Det. 2 L.F. set with bandpass tuning. I know I risk being laughed at for my old-fashioned idea by the high lights of the art, who say a set without a S.G. stage cannot be up to date. The 3 and 4-valvers so far published by you undoubtedly take front rank in their line, but I for one have no use for any new set to run after the foreigners with until I get a guarantee against fading, and when you choose to come out with a really hot circuit with a number of variable-mu valves and automatic volume control, I will build it for long distance work, and still keep a Det. 2 L.F. set for household use. There must be tens of thousands of old hands like myself sticking to their first love. I have built and rebuilt my sets time after time when new (or hashed-up old) circuits, coils and tuners came out, and sometimes got a little more selectivity and a little quality, or *vice-versa*. No doubt Mr. A. J. Wood's loose-coupling idea on page 343 of November 5th issue, and Mr. Preston's Bandpass Adaptor on page 537 in December 3rd issue, would go a long way towards solving the selectivity trouble with old sets, but most old hands would sooner work on a complete circuit than on an additional box of tricks. By Det. 2 L.F. bandpass tuning, I do not mean expensive and bulky gangs of condensers with matched and screened coils, but a circuit with 2 separate variables, and everything else adjustable on the panel. No variable condensers to get at, or not inside the set, please. Most components for such a circuit would be found in our old sets or the wireless treasure box, apart from perhaps two new coils. I hope you can see eye to eye with me, and that you will publish a set incorporating these features in the near future.

Wishing PRACTICAL WIRELESS the continued success it deserves.—F. M. B. (London, W.C.).

A Plea for Plug-In Coils

SIR,—The letter of A. Bedding (Clapham) 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. If water be 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. Have handy a small spouted milk jug, put in sufficient distilled water for topping up, that is, to cover the plates well (easily estimated), then by means of a glass 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, release 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 handles acid should have handy a bottle containing a strong soda solution, some of which should be applied to anything brought into contact with the acid, which is then quickly neutralized, and thus prevents injury.—W. BURCHELL (Westcliff).

CUT THIS OUT EACH WEEK

DO YOU KNOW?

—THAT the automatic bias circuit of an output valve should always be decoupled.
—THAT selenium, the well-known light sensitive substance, is insoluble.
—THAT salammoniac is one of the best substances to use for tinning a soldering iron.
—THAT all switches which carry a fairly large current should be of the quick make-and-break type to avoid arcing.
—THAT an electro-magnet may be roughly improvised by winding a quantity of wire round an ordinary nail.
—THAT television images are broadcast with a frequency of 12½ pictures per second, each divided into 30 strips.
—THAT a loud-speaker horn to reproduce faithfully a note of 64 cycles would have to be over 6ft. long.
—THAT only one P.O. licence is necessary for a home receiver and a portable.

Constructional Article on Dual Range Tuner Wanted

SIR,—Being a regular reader 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 17s. are too much for we 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 to know the demand there is among the home constructors for diagrams and all necessary information with regard to the components and their values for the construction of a five-valve portable set. I am in a position to know what is required as I am secretary of a wireless circle which has a membership of over one hundred. I have been a wireless amateur for a good many years and I think your journal is the best yet. Hoping you can publish the required information in the near future.—W. T. GOODISON (Westerham).

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 amateurs. The circuits described are suitable for everyone. Altogether, I consider it a splendid paper and wish it every success.—S. BURNARD (Boscastle.)

The Autokoil Pentode Two

(*Continued from page 729.*)

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 may then be employed to ascertain 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 close to a near-by station. By suitably adjusting the three knobs it will be found possible to obtain quite a good programme which would otherwise be impossible without much more elaborate apparatus. The tone from this receiver is very good indeed, owing to the choice of the constants of the tone compensating circuit in the anode lead of the pentode valve, and providing these are not altered, and the valve which is specified is used, the response will be found extremely good.

No list of stations which can be received has been given, as conditions will vary with individual listeners. For instance, a listener living at Barnet, which is on top of the Brookmans transmitters, will have to employ a much higher degree of selectivity to enable him to hear the Midland Regional, for instance, and consequently 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, that is a point which depends upon local conditions. For those who require it, a full-size blue-print is obtainable for 1s., and a complete set of parts for the receiver is obtainable from Messrs. A. W. Hambling, Ltd.

Thinking in Terms of Frequency

(*Continued from page 724.*)

notice. If two violin strings which are slightly out of tune with each other (that is, they vibrate at slightly different frequencies) are sounded together, the volume of sound will wax and wane rhythmically, the frequency of the "beat" depending upon the extent to which the strings are out of tune. This effect, of course, is due to the fact that, the sound waves being of slightly different frequencies, they will, at a given moment, be "in step," when their energies will be added together; and a little while after they will be exactly opposite in phase, so that they will almost cancel each other out.

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 speaker as a high-pitched whistle, commonly known as a "heterodyne" whistle. In the present congested 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 results, but this can be compensated for in some degree by the use of a pentode output valve, which has a particularly good high note response.

Although heterodynes are a great nuisance when due to outside causes, the principle is usefully employed in the "super-heterodyne" receiver. In this type of set the incoming radio-frequency signal is "mixed" 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 best frequency is *above* audio frequency but *below* normal radio frequency. This "supersonic" or "above-sound-frequency" wave or current carries, of course, the same modulation as the original signal, and is further amplified before detection. The advantage of this system is that supersonic frequencies can be amplified much more efficiently than radio frequencies, because smaller circuit losses are incurred. A reasonably high degree of selectivity, combined with great sensitivity, is thus secured.

What is Television?

(*Continued from page 731.*)

reason as we ruled out selenium at the transmitting end. If you think for a moment you will realize that there are several thousands of minute light variations at the transmitting end during the course of a complete exploration carried out by the scanning spot. Our light source at the receiving end has to respond just as rapidly and faithfully, glowing darkly or brightly with intermediate shades as necessary.

There is more than one way of carrying this effect into practice. For example, a beam of light from a projection lamp can be modulated by what is known as a "light valve," but the simplest method for using in conjunction with our perforated scanning disc is to employ a neon lamp. A few forms of this lamp are shown in the accompanying illustration, but in the most elementary of sets it is possible to use the beehive or spiral pattern neon lamp so useful for domestic purposes, especially as night lights. Or again, the shaped letter pattern normally employed for advertisement signs can be pressed into service. In the centre of the lamp group will be noticed what are termed flat plate neons. These are the best (and of course the most expensive) for television reception, as the metal plate glows uniformly over the whole flat surface, and this in turn is scanned by the perforated disc. Each of the lamps mentioned is filled with a gas called neon at a very low pressure, and the characteristic reddish orange glow is brought about by the neon atoms becoming heated through atomic bombardment. Unfortunately, the intensity of this form of illumination is fairly low, but in a well-built piece of vision apparatus having the neon lamp properly modulated by the incoming signal, the images are bright enough to be watched in comfort in a dimly lit room. The family group shown looking in at a "Televisor" in the illustration will indicate what I mean in this connection.

Since the image built up from the spiral of holes round the edge of, say, a 20in. disc, seldom exceeds 1in. in width, it is necessary to place a lens or combination of lenses in front of the rotating disc and light source in order to enlarge the image. This, of course, is quite a simple matter and a single convex lens, together with a double convex lens, gives a magnification quite sufficient for ordinary purposes.

CLUBS and SOCIETIES

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

VISIT TO A BIRMINGHAM BROADCASTING STUDIO

The Smethwick Wireless Society paid an interesting visit to the studio of Messrs. Wm. Bayliss, Ltd., Sheepcote Street, Birmingham, on the evening of Friday, November 25th. The large number of members and friends who took this opportunity of seeing an actual broadcasting studio were cordially welcomed by Mr. Gould, who proceeded to demonstrate the reproduction of gramophone records by means of an experimental split-frequency amplifier. By means of channel balancing 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., 33, Freeth Street, Oldbury, nr. Birmingham.

A RADIO LEAGUE OF NATIONS

The Anglo-American Radio and Television Society and the associated society, The International Radio Society, aim to promote goodwill and fellowship between nations. The societies have members in thirty-five dominions, territories, and foreign 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 all communications. Anyone desiring may join. All they have to do is to send their name and address to the Headquarters, 11, Hawthorn Drive, Willowbank, Uxbridge, England. No charge is made and members are under no obligation to the societies.

The societies aim to aid radio and television enthusiasts by supplying them with radio data, etc. The societies have also organised branches throughout the world. The most advanced is at Huddersfield, Yorkshire. This branch has its own club room, S.-W. receiver, orchestra, dramatic society, and morse classes. Joining a branch (2s. 6d. per annum) is optional; membership of society is free. The President is Leslie W. Orton.

A bulletin called *Radio* is presented free to members.

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 for record reproduction, and a number of loud-speakers were placed on the platform behind a screen. The same record and the same portion was used for each test, a particularly good one having plenty of both top and bottom. The speakers were taken in heats of three, the winners of the heats taking part in the eliminating round to find out which speaker, by popular vote, 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 was enlightened as to the makes and names of the speakers, which ranged from models at just over £1 to others costing £8. It is distinctly gratifying to local industry to find that it was local product which secured both first and second places.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff

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

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

SPECIAL NOTE.

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

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

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

BAND-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 I can get any other station as clear as I want it and no background. Can you please tell me how I can cut out this station when listening to Radio-Paris? The circuit is screen-grid, with a pentode output."—(A. 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 from Daventry. As 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 ganged condensers, you should pay attention to the trimming adjustment, and also make sure that you are using non-inductive coupling condensers or resistances, according to the requirements of the particular coils.

TESTING CONDENSERS

"I have some large fixed condensers in my set, and I wish to test them for leakage (if any), especially the two condensers in the R.C. transformer-coupled stages. I understand that any slight leakage in these condensers may result in bad distortion, through placing positive bias on the L.F. valves, thereby cancelling any negative bias from grid-bias battery, resulting in incorrect milliamp reading. Both Det. and L.F. stages are decoupled, also, I have a filter output, the choke being of first-class make, its specifications being D.C.C. resistance, 260 ohms, inductance, 14/28 henries."—(R. W. F. J., Northumberland.)

The simplest test is to connect the condenser across a fairly high value voltage supply, and leave it joined there for some time. Then disconnect 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 fairly good spark, the leakage from the condenser is negligible. The size of the spark will depend, of course, on the value of the condenser. In a dry atmosphere, the condenser will hold its charge for a longer period. To carry out a more efficient test, connect a high voltage, say, 200, to a voltmeter through a .25 megohm grid-leak, and note the reading, if any. Then connect the condenser to be tested in place of the leak. If the reading is less, then its resistance is proportionately more than the leak.

NOISES AND THE PORTABLE

"I have got a powerful portable five-valve receiver, but am troubled by terrible scratching and grating noises. I have read in your pages how to disconnect the aerial and earth to see if the noises are due to external influences, but with a portable I do not see how this can be done. Is it necessary to disconnect the ends of the frame aerial? I might mention that the long-wave section of the aerial is wound with very thin wire, and I have heard that the acid fumes from the accumulator cause the wire to rot when it is thin, and I am suspicious that this may be my trouble. Perhaps you can tell me how to find out without interfering too much with the set, in case I have to return it to the makers."—(P. M., Hounslow.)

The receiver, having its own aerial, must be tested in a different way. First of all, make quite certain that there is no variation in strength of the disturbances as the set is rotated through 360°. If, of course, there is the slightest falling off in strength of the noises in one position, it will tend to show that it is external interference. If, however, there is absolutely no alteration in strength, it points to the fact that it is the set which is at fault, and the following procedure will confirm this. Take the set into the bathroom (provided the bath is made of iron) and lower the set into the bath, or stand it on the bottom of the bath, although it will be better to hold the set in a mid way position. If no noises are heard when the set is screened by the metal bath, then it is external influences which are the cause of your trouble. If, however, the noises can still be heard, it is obviously the set which is at fault. Of course, you will not be able to hear any stations when the set is so screened.

DATA SHEET No. 15

Cut this out each week and paste it in a notebook.

EUREKA RESISTANCE WIRE

S.W.G.	Resistance per yard	Yards per lb.	Current capacity
18	.37	48	3.5
20	.66	85	2.5
22	1.10	140	1.5
24	1.77	227	1.0
26	2.65	340	.5
28	3.91	502	.25
30	5.58	714	.2
32	7.35	943	.15
34	10.13	1,300	.1
36	14.84	1,905	.5

NOISY TRANSFORMER

"When I get near to my set I can hear music and speech coming from the transformer. Is this due to the action of the transformer, or is it some fault either in design or construction? If it is a fault, can I remedy it?"—(R. T., Blackpool.)

The noise is due to looseness, of either the laminations or the windings of your transformer. If the transformer is not enclosed in a case, you can press a finger on the ends of the laminations and see if this stops the sounds. If no amount of pressure will cure it, then it is the windings which are loose, and the result of the continued vibrations will be a breakdown. If only the core is loose, this may be tightened by adjusting the clamping nuts. If these are already tightened right up, pour some molten wax over the laminations and so keep them in position.

DOUBLE BAND-PASS

"I have been experimenting with band-pass circuits, and have found that it certainly does give a wonderful degree of selectivity. After making up a number of different coils and couplings, I have come to the conclusion that a number of such circuits incorporated in a multi-valve receiver, would surely give results as good as a super-het. Is it possible to use, say, two separate band-pass circuits—that is, four coils—in a S.G. detector and power circuit without any ill-effects. I should like your advice on this suggestion of mine."—(F. D. E., Maidenhead.)

The use of a number of band-pass circuits is, of course, well-known, and is employed in one very well-known eight-valve super-heterodyne. In a receiver of the type you mention, namely, S.G., Detector, and Power circuit, the use of a double band-pass arrangement will give a very high degree of selectivity, but in view of the matching difficulty, we would recommend you to use two sets of two-gang condensers, and not a four-gang arrangement. By employing this method you can use a complete band-pass circuit at each end of the panel, and wiring would be much simplified.

SCREEN-GRID VOLUME CONTROL

"I am building a S.G. receiver, and am rather at a loss to know which form of volume control to employ. As far as I can see, there are three methods in common use, the dimming of the filament, the adjustment of the S.G. potential, and the variable-mu valve. As I have not yet decided upon the H.F. stage, I should be glad to know the respective merits of these forms of control."—(O. J. K., Tring.)

The dimming of the filament is now rather out-of-date, although in some special circuits it is to be preferred. The control of the screening-grid potential is quite all right if carried out by a potentiometer adjustment, and not by a series resistance. The variable-mu is, of course, the latest development of the screen-grid valve, and has many advantages to recommend it. On the whole, as you are building an entirely new receiver, we should not hesitate to recommend that you employ this later type of valve, and you will find that it will be simpler to construct and will give you the best type of volume control.

TONE CONTROL

"I have a rather antique four-valve set, employing two L.F. stages. The results are truly amazing, and I must say that although it employs a neutralized H.F. stage it gives me more stations than many of my friends' modern S.G. sets. The only point which I can criticize is the quality of the reproduction, and although I have tried modern L.F. transformers, I cannot always get the type of reproduction which I like. I want, therefore, to fit a tone adjuster of some kind, so that I can vary the reproduction of different instruments. Can I fit something to my present transformers instead of buying a new one, or do you not recommend this course?"—(A. W. M., Surbiton.)

You may vary the reproduction from your present transformer by connecting a tone-control circuit, but as the component is not an up-to-date one you may find that it will not be easy to decide upon the correct values. You may introduce troubles from various resonant points, etc., and we would therefore only advise you to buy a modern tone-control transformer. This can be substituted for your present component, and will enable you to carry out the adjustments which interest you without affecting the remainder of the circuit.

MAINS SET TROUBLES

"A few days ago I bought an A.C. two-valve set which is giving me a little trouble. The aerial stays are copper wire, which, I think, takes some of the power away from the aerial itself. Now for the main trouble: when tuning in to foreign stations the moment I touch the reaction I get a loud beat, then the station required comes in, and after that oscillation."—(E.2., Glasgow.)

We suggest that you effectively decouple your L.F. stage, using 25,000 ohms series resistance and 2 mfd. condenser. Also connect a .0002 fixed condenser from plate terminal of detector valve to earth. Provided aerial is well insulated at its free end, wire stays may be used.

FREE ADVICE BUREAU

COUPON

This coupon is available until Jan. 7th, 1933, and must be attached to all letters containing queries.

PRACTICAL WIRELESS 31/12/32.

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8/11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed.

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 often leads to a very untidy-looking panel, and we suggested 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 bakelite finish. These are illustrated on page 52 of the very complete catalogue which may be obtained by readers by sending 3d. in stamps to A. F. Bulgin and 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, what is most important of all, a response curve for each individual set. 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 operation.
(2) S.G.4 Band Pass Receiver for battery or eliminator operation.
(3) D.C. Mains three-stage amplifier.
(4) A.C. Mains two-stage amplifier.
(5) A.C. S.G.4 receiver.
(6) A.C. Mains two-stage amplifier.
(7) A.C. Mains S.G.4 receiver.

Each of these employs a push-pull output stage, and the undistorted output is given for each one. The pamphlet may be obtained by readers from Messrs. Ferranti, Ltd., Hollinwood, Lancs., on receipt of 6d. in stamps.

BLUE SPOT LOUD-SPEAKERS

NO difficulty should be experienced in choosing a loud-speaker after reading through the lists issued by the Blue Spot Company. From the small loud-speaker unit selling at 15s. up to the complete cabinet Moving Coil at 87s. 6d., there is a most comprehensive range for selection. A Wave-trap at 10s. 6d.; Mains Disturbance Eliminator at 10s. 6d.; Pick-up at 63s., and Receivers up to 22 guineas show that this firm is now catering for every type of listener, and all readers who require information on these products should write to the company at Blue Spot House, 94-96, Rosoman Street, Rosebery Avenue, London, E.C.1.

Broadcast Query Corner

UNDER the above title, with the assistance of a recognized authority on foreign broadcasting matters and a regular contributor to wireless publications both at home and abroad, we are inaugurating a special Identification Service, which should prove of great assistance to our readers. When tuning in well-known stations it happens frequently that listeners pick up wireless transmissions of which they fail to recognize the origin. It is to solve these little problems that the *Broadcast Query Service* has been organized.

In order that a careful search may be made it is essential that certain data should be supplied to the best of the inquirer's ability and knowledge. When sending such queries to the Editor the following rules should be followed:—

1. Write *legibly*, in ink. Give your full name and address.
2. State type of receiver used, and whether transmission was heard on headphones or on loud-speaker.
3. State approximate wavelength or frequency to which receiver was tuned, or, alternatively, state *between* which two stations (of which you have the condenser readings) 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 can, some indication regarding the language, if heard.
6. State whether and what call was given and/or kind of interval signal (metronome, musical box, bells, etc.) between items.
7. To facilitate publication of replies, append a *nom-de-plume* to your inquiry.

Although the service is mainly applicable to broadcasting stations, wherever possible replies will be given in regard to morse transmitters (commercial stations, fog beacons, etc.) and short-wave broadcasts. For the identification, however, of stations operating on channels *below* 100 metres it will be evident to inquirers that a closer estimate of wavelength must be submitted than in the case of broadcasts on the medium or long waveband if successful identification is to be carried out.

All inquiries should be addressed to *The Editor*, PRACTICAL WIRELESS, 8-11, *Southampton Street, Strand, London, W.C.2*, and the envelope marked *Broadcast Query Service*, in top left-hand corner. Stamped addressed envelope should *not* be enclosed, as replies cannot be sent by post, but will be published in due course in each issue of PRACTICAL WIRELESS.

Replies to Broadcast Queries

FARCO (Reading): (1) With the exception of Berlin, Heilsberg, and Hamburg, all German stations on that night relayed dance music from London; the broadcast was also taken by Vienna; as you give no estimate of the wavelength we cannot say through which transmitter you heard it. (2) Radio Normandie, Fécamp. (3) Poste Parisien, Paris (France). BOTOLPH (Boston): (a) WKJ, Rocky Point, N.Y. (207 m.); (b) WAJ, Rocky Point, N.Y. (21.62 m.); (c) WKJ, Rocky Point, N.Y. (31.21 m.) and WEL and WEM, Rocky Point (33.52 m.). NIP (Romsey): Grenoble PTT (France) on 571.2 m. CRESCENT (Kilbirnie): (1) Nurnberg relaying Munich; (2) Heterodyne; (3) Because, apparently, your set to receive Belfast was already on the point of oscillation. SURPRISED (Gloucester). New Leipzig high-power transmitter testing. D.X. FAN (Bedale): (1) WPG, Atlantic City (N.J.); (2) It is presumed that you do not mean metres but dial reading 33 degrees; Valencia (Spain) on 267.6 m.

ADVERTISEMENT INDEX

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