Practical and Amateur Wireless. April 11th, 1936.

OSTAINING QUALITY REPRODUCTION

Practical and Amateur Wireless

Edited by F.J. CAMM

A GEORGE NEWNES Publication

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April 11th, 1936.

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Please send me free of charge literature giving full particulars of the new Cossor A.C. Mains Superhet Model 374.

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Hungary’s Relays

Whereas the broadcasts from Budapest (294.5 m. 546 kc.) are frequently marred by noise interference, it is often possible to secure a clear reception of the same programme through Miskolc on 208.6 metres (1,438 kc.). The transmitter is only rated at 1,250 kilowatts, but in that portion of the band provides a powerful signal. Occasionally on 297.4 metres (1,112 kc.), Nyiregyhaza, relaying the capital, may give a good signal, but only in the later hours of the evening when Alexanda, sharing the same channel, has closed down.

Proposed 100-kilowatt for Lithuania

The Lithuanian Government has voted the sum necessary for the construction of a 100-kilowatt transmitter to replace the present 7-kilowatt station at Kamaz, operating on 1,935 metres (1,155 kc.). Work on the construction of the buildings will start this year. It is also proposed to install short-wave plant for the relay of the programmes to overseas listeners.

A Bid for Supremacy

From Paris comes the news that the proposed Poste Nationale (150 kilowatts) is to be situated at the village of Allovia, between Bourges and Vierzon. It is reported that twin 150-kilowatt transmitters are to be installed, and will be constructed in such a manner that 300-kilowatt power may be obtained. The station will work on the channel now used by Radio-Paris, namely, 1,649.7 metres (1,182 kc.), and should be ready by the end of 1937.

New Paris Broadcasting House

The French Ministry of Posts and Telegraphs has allocated the sum of ten million francs for the construction of central broadcasting headquarters in the capital. The actual amount to be spent on its equipment and decoration will by far exceed the credit, but it is said that the balance will be borne by the organisers of the 1937 Paris International Exhibition.

Denmark’s Proposed Short-Wave Broadcaster

To provide a service for their shipping in all parts of the world, the Danes propose to build a powerful short-wave broadcasting station which would not only supply daily news bulletins, but also a relay of the Copenhagen programmes.

Reduced to its Simplest Expression

In the future, the Copenhagen and Copenhagen stations will broadcast the call of Kopenhagen, Kullenborg og Danomarka Korttempenderg to two words; namely: Danmark Radio. The interval signal is to be retained.

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Imminent Opening of Radio Marconi

Work on the high-power station at Bologna (Italy) has progressed so satisfactorily that it is expected the official ceremony of its inauguration may take place on April 21st next.

Remarkable Short-wave Broadcast

By means of a new magnetron transmitter, the Philips works at Eindhoven (Holland) have succeeded in transmitting signals on an ultra-short-wave channel of 7.30 metres to a distance of roughly forty miles. The aerials of the transmitting and receiving stations were respectively 284 and 309 ft. high.

Weather Reports and Forecasts

In view of the rapid development of aviation services, and greatly increased activity, the Air Ministry has extended its daily schedule of weather reports and forecasts. They are now broadcast from Borough Hill (Northants) on 1,186 metres (223 kc.) at the following times: G.M.T. 06.45 (Summer only; not Sundays); 07.15, 07.30, 08.00 (Summer only); 08.45, 09.00, 09.15, 10.15, 10.30, 11.15, 11.45, 12.15, 13.15, 13.30, 14.15, 14.45, 15.15, 15.45, 16.15, 16.30, 17.15, 18.15, 18.30, 19.15, 19.45. As these reports cover the greater part of the British Isles, they are proving of considerable interest to the ordinary listener.

U.S.A. High Fidelity Station

WXYR is the call sign of a transmitter working at Long Island City (New York) on 195 metres (1,550 kc.). High-fidelity broadcasts are made daily from G.M.T. 06.00-09.00. In view of a recent poll taken from the radio audience, the schedule will shortly be extended until 03.00.

Broadcasts from Newfoundland

Although only rated at 500 watts, transmissions from VONF, St. John’s, Newfoundland, on 251 metres (1,195 kc.), and operated by the Dominion Broadcasting Company, Limited, have been heard in the United Kingdom.

Radio in the Pacific

A WIRELESS station is to be installed on the Phoenix Islands, situated on the Suva-Honolulu steamer route, and lying some 600 miles to the North of the Fiji Isles. Although practically deserted, the islands will be the base of a scientific expedition, composed of astronomers, to view the total solar eclipse which is taking place in 1937.

In Close Touch with Europe

The average radio fan in the United States hears much of the European radio programmes in the course of a year. During 1935, the National Broadcasting Company relayed 229 broadcasts, and the Columbia System, provided as many as 149 foreign transmissions to its listeners.

An Income to Play With

The gross revenue of the National Broadcasting Company of America for the year 1935 amounted to $3,148,931, or roughly $8,290,000. Figures for the Columbia Broadcasting System for the same period have not yet been officially published.
ROUND the WORLD of WIRELESS (Contd.)

Parsifal Concert

As in former years, a special concert will be given on Good Friday, April 10th, in the Queen’s Hall, at 7.30 p.m. Sir Henry Wood will conduct the programme which will consist of excerpts from "Parsifal," and the "Prelude," and the Grail scene and Finale from Act 1 will make up the first part of the programme (7.30 to 8.30 p.m.), while Part 2 (from 8.45 to 10.20 p.m.) will consist of the following scenes: Act 2—Klingsor's Magic Garden, the Flower Maidens, and the scene between Kundry, Parsifal, and Kling- sor; Act 3—the Good Friday Music, the Prayer of Amfortas, the Procession of Knights, the Healing of Amfortas, and the closing scene. The B.B.C. Symphony Orchestra and the Philharmonic Choir, augmented by a contingent of boys from the London College of Choristers, will take part; and the soloists will be as follows: Muriel Brunskill, Walter Widop, Herbert Heyner, Norman Walker, Victor Harding, Elena Brunskill, Walter Widdop, Herbert Heyner, and Myra Owen.

The Two Easters

HENRY WARREN, who broadcasts fortnightly talks on the Midlands countryside, has devised for April 12th a mosaic programme of poetry and music on the theme of the Two Easters—the Easter of the Christian Church and the Easter of Nature. This is not his first experience with this kind of programme, for he previously devised a mosaic on "Men and the Countryside." He has successfully prepared a special programme for the Scottish Youth Hostels Association in co-operation with the Scottish Youth Hostel Association, and its scope will cover Scotland at least from Spey-side to Galloway. The Scottish Youth Hostel Association are co-operating in supplying information for walkers and climbers, and the bulletin should prove very useful to those who are planning holidays of a week-end or longer.

Easter Concert Parties

TWO well-known Northern concert parties, which have been on tour during the winter, return to their summer homes during Easter week, and they will broadcast to Northern listeners on April 14th.

Gypsy Music from Harrogate

YASCHA KREIN and his Gypsy Orchestra, who are to broadcast to the Valley Gardens, Harrogate, on April 10th, will contribute another programme on April 12th. A native of Russia, Yascha Krein studied music at the Imperial Conservatoire in Petrograd. Coming to England, he joined the old Queen’s Hall Orchestra under Sir Henry Wood. He resigned in order to become leader of a Viennese Orchestra in Scotland. His present combination was formed three years ago.

A "Sports Causerie"

A "SPORTS Causerie" will be broadcast from Cardiff on April 14th, in which G. B. Thomas, Muriel Orsman, E. Watts Jones, and W. Rowe Harding will review the winter’s activities in Wales in boxing, hockey, soccer and rugby.

Solution to Problem No. 186

Hollis had overlooked the fact that a large voltage drop occurred across the field winding of the energised speaker, thus reducing the valve anode voltages to too low a figure. For the next three correct solutions opened, address your letters to the Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., 89-101, Southampton St., Strand, London, W.C.2.

Solution to Problem No. 185

Oris Cowen (contralto) will be the artist in a concert by the Torquay Municipal Orchestra, conducted by Ernest W. Goess, to be broadcast from the Pavilion, Torquay, on April 14th.

Eugene and his Magyar Quartet

This combination appeared at the Royal Command Performance in 1932. It has been broadcast on three occasions from exhibitions in the Midlands where it has been appearing, but April 13th will be its first Midland studio broadcast. Eugene has toured in many parts of the world. At the age of fifteen he was playing in a café in Buenos Aires. The combination is having a season at Prince’s Cafe, Birmingham. The vocalist is James Benbridge, who was formerly with the Gresham Singers.

PRACTICAL AND AMATEUR WIRELESS

April 11th, 1936
Obtaining Quality Reproduction

In This Article some of the Methods Adopted by Set Manufacturers for Obtaining Quality Reproduction are Discussed

On many occasions, articles in these columns have stressed the suggestion that the development of high-quality reproduction provided a field for experiment which is particularly suited to the radio amateur. It was also stated that in general, the amateur had a better chance of making a good high-fidelity set than the ordinary listener had of buying one, since the almost universal cry from the mass in the street was for sets sufficiently sensitive and selective to give him large numbers of stations, almost irrespective of the quality of reproduction. Finally, it was suggested that the time would come when the commercial set manufacturer would find it necessary to pay more attention to fidelity of reproduction, and to put on the market at least a proportion of models having some claim to realism of tonality.

While we lay no claim to the gift of prophecy, and are quite content to suggest that our previous articles were based upon pure reasoning, we cannot refrain from pointing out that the state of affairs which we then forecast has now come about. A very large proportion of the principal manufacturers are now advertising receiver models which are described as “fidelity” sets, and, from our own observation, these quality models do represent a very substantial advance in reproduction. Not only so, but the general standard of quality in all reputable makes has very definitely advanced.

It may be said at the outset that this article will exclude all those luxurious fidelity sets which are sold at prices between 20 and 150 guineas, because they are quite beyond the reach of the average listener and, moreover, are usually attempts to combine high performance by way of the number of stations receivable with naturalistic reproduction, and include gramophone equipment with auto record changing and most elaborate and expensive cabinet work. We will confine our remarks to ordinary table models costing, at the most, 20 guineas, and it must be remembered that even at that price, which includes cabinet work, cost of assembly and advertising charges, the design must be such that the intelligent constructor should be able to produce as good at lower cost.

The Superhet

There has been a general impression that really high quality reproduction cannot be obtained in a superhet, and it therefore may come as something of a shock to find that quite a number, in fact the majority, of sets advertised as the high-fidelity type, come under the superhet class. It will, therefore, be necessary to describe both straight and superhet sets in the quality range.

Analysis of a large number of commercial sets brings out one point which is common to practically all makes, and that is that set makers as a whole have realised what we have pointed out so many occasions, namely that the loud-speaker is still by far the weakest chain in the link. It is simply useless, and a waste of time and money, to provide circuits of wide frequency response, to design receivers with nicely adjusted valves and automatic devices for avoiding overloading, and to fit last stage valves giving a large output of undistorted power, if the speaker cannot reproduce the extreme top and bottom frequencies, or if it produces a crop of resonances at all sorts of places in the musical scale. There was a time, and that not so very long ago, when the speakers commonly fitted in commercial sets were tiny little units of poor performance, which could be made at the cost of only a very few shillings apiece. To-day, any set put forward as a quality receiver, will be found to contain a speaker of generous design and having a really good performance characteristic. For the sake of cheapness, energised models are chiefly used in mass sets, but with the latest improvements in special magnet alloys, the permanent magnet models are of almost identical performance.

The Choice of Speaker

The lesson which the constructor must learn from the set maker in this connection, therefore, is to start designing his quality set from the output end. Obtain the best speaker you can afford, and design your set around it. A speaker of this year’s design, costing in chassis form from 1½ to 2 guineas, may be taken as fully equivalent in performance to the speakers employed in the average commercial fidelity table model, so that the constructor has no disadvantage on the score of the speaker.

Working back from the speaker towards the aerial, we next come to the output stage. Two factors have to be considered here, the actual power output in milliwatts, and the class of valve, namely triode or pentode and, in the case of battery sets, whether Class “A,” Class “B,” or Q.P.P. working.

With regard to total output, a last stage capable of a big undistorted output is advisable so that even on the loudest passages there will be no distortion. Bearing in mind that 20 milliwatts represents the minimum for reasonable volume for quiet passages, a 24-watt output valve gives a factor of safety which is adequate where only moderate volume is required, but a 5-watt output stage is generally considered the minimum for serious high-fidelity work. There are, however, very few commercial sets at prices up to 20 guineas giving more than 3 to 3½ watts undistorted output, and practical tests show that while such sets do give really good reproduction so long as volume is kept within reasonable limits, there is a tendency to overload if the volume control is advanced too far. We, therefore, repeat our own conviction that the constructor desiring quality must exercise his discretion in handling the volume control so that he confines himself to a 2½ to 3 watt output stage.

The popular Stentorian speaker, designed for use with any receiver to obtain correct matching.

Another quality receiver, Mr. F. J. Cunn’s two-color superhet.

The Holl-Marb Cadet, a top-priced receiver designed for quality reproduction.
and that he will be well advised to go one better than the commercial makers and fit at least a 5-watt valve.

It is a well-known question that a triode output stage has the best possibilities with respect to tonal fidelity, and is also less easily overloaded, quite a large number of the higher fidelity sets use this valve. The rather greater sensitivity of this type permits some saving in cost, and manufacture problems connected to the triode. The pentode has a further allure in this connection, since the higher top-note response of this type of valve compensates in some degree for the attenuation of upper frequencies brought about by the sharpness of the tuning.

Comparisons
This brings us to the fundamental difference between the average commercial fidelity set and the average amateur fidelity set. The former is an attempt to combine a better standard of quality with a degree of selectivity which will still give a very large selection of stations, whereas the quality enthusiast who builds his own set is usually perfectly willing to sacrifice stations for still better reproduction. As a whole, the commercial quality set is usually crammed with tone compensating devices calculated to provide a final output containing a reasonably balanced quality being that it is a genuine replica of the original performance. The net result is certainly pleasing, and satisfies a very large proportion of listeners, but it lacks the individuality and naturalness which can undoubtedly be obtained in a simpler and far less expensive way if only the desire for pure tone listening can be put aside. Again we say, stick to the triode—a good hefty fellow—or, better still, two in push-pull, and avoid as far as possible all tone correction circuits.

In practically every commercial fidelity set the speech amplifier is a triode, and here we are in thorough agreement with the set maker. Usually there is no other L.F. amplification between the diode and the output valve, and the output is produced by certain stages of the double-diode-triode combination is employed. It is probable that the degree of amplification obtained by this arrangement is obtained a little more clearly that is possible in the pre-detector stages, but even so, for the amateur builder, an addi- tional L. F. stage is a very good proposition, as it is easily the most prone to introduce hum, and calls for great care in both design and layout. Get all your voltage amplification in the high-frequency stages is a good motto for the home constructor.

The H.F. Stage
There is little to be said about the high-frequency side of those commercial receivers using a straight circuit. In most cases the aerial input is of the band-pass filter type and the inter-valve couplings high-frequency transformers of conventional type. The superhet, on the other hand, have interesting features in that some stations of the band accepted is variable. This variable selectivity, as it is termed, is achieved by adjusting the coupling between the two windings, either by variation of the value of one of the coupling components or by adjusting the position of one of the coils with respect to the other. By these means the set can be used as a conventional highly selective superhet for all stations listening, or, with the band width increased to maximum, as a less selective set for quality reproduction.

The new arrangement is, of course, that as soon as the selectivity is reduced for quality reception, in come the interfering stations—and difficulty also exists between the output stage and the detector. The result is that there is a considerable degree of high-note attenuation, which accounts, no doubt, for the readiness with which tone compensating devices and similar aids to synthetic "quality" have been adopted.

While, therefore, set makers must be given due credit for their efforts to improve the general standard of reproduction, and while it must be admitted that they have been successful up to a point, it must not be imagined that the fidelity problem has been brought very much closer to solution. The whole problem simply bristles with difficulties, most of which are, so far, not within either the manufacturer's or the listener's control, but due to the existence of far too many stations. At the best, a set must meet conflicting conditions. The commercial solution is synthesis—the building up of pleasant quality without too much heed to the inconvenience of reproduction. This is perhaps unavoidable, since the commercial set must be capable of satisfactory operation under all conditions, anywhere. But the home constructor, who has only to cater for his own personal and local conditions, can often achieve far better results, since cheapening devices are not used, and many correcting and compensating circuits are unnecessary.

H.C.

Canoe Cruise on the Avon
THE British Canoe Association hold their annual cruise on the Avon, the strategy for Easter Monday being from Warwick Castle to Tewkesbury. About forty canoes (mostly collapsible) will be taking part, carrying in all about seventy men. It is proposed to leave on April 13, H. E. L. Sheppard, leader of the meet, will describe from the Midland Regional the day's cruise in an eyewitness account just after the Second News.

Service from St. Martin's
ON Easter Sunday, evening service will be held from St. Martin's Fields, when the sermon will be given by the Rev. H. E. L. Sheppard, Canon of St. Paul's. Later in the day a short biblical drama by Mona Swann, authoress of "Mary the Mother" and "The Prince of Peace," will be produced by Robin Woodworth. This play, in which music and speech are particularly happily blended, was first broadcast on Easter Day last year. The players will include Ion Swinley, Charlotte Caussin, John Garside, and Lilian Harrison.

Shakespeare Festival
ON April 14th First Night Impressions of the Shakespeare Festival at Stratford-on-Avon, which is to begin on Easter Monday, are heard from M. A. Martin, News Editor of a Birmingham newspaper, who has attended most of the Festivals in the past twelve or fifteen years. This year the sessions will be broadcast for only three nights longer than last year. B. Idon Payne directs the Company. The play for the Birthday (April 23rd) will be "Much Ado about Nothing." The unfamiliar Shakespeare play to be included this season is

**EASTER PROGRAMMES**

"Troilus and Cressida." The accommodation in the gallery of the Memorial Theatre at Stratford-on-Avon has now been extended.

"Quayside Nights."
THE fifth edition of "Quayside Nights" will be broadcast live from Brixham on April 14th. Walter Barnes, a fisherman, will recite what is known as "The Fisherman's Alphabet," originally written for the Fishing Exhibition; Jabez Lake, known as the Fisherman Poet of Brixham, will read one of his own poems and will also sing fishermen songs; Charlie Howe will give a Wren Ballad; Trawler Regatta; and some young folk from the Seaman's Orphanage will sing sea-shanties. The song will be given in the local club at the same time. Brixham was the home of the composer of "Abide With Me," and this famous hymn-tune will be played on the bells of Brixham Church.

Leicester Dog Show
A NOTABLE Easter Tuesday event in that way will be the Annual show of the Leicester Canine Society. The judging is completed early in the day, and in order to give a microphone impression of the Show at as many stations as possible recordings will be made. There will be descriptions of preparing dogs for the Show, preparing dogs for the Show, and the methods of judging, and, in order to get good background noises, there will be a microphone on the terrier benches. The recordings taken at the Cranby Halls, Leicester, during the Leicester Dog Show in the Children's Hour on April 14th, and again in the evening programme.

Cabaret from Northern Ireland
LISTENERS who like broadcasts from roadhouses will hear that another fifteen minutes' broadcast has been arranged from the Heart o' the Heart o' the Roadhouse, Ballynahinch, on April 13th. The Heart o' the Roadhouse, it is now almost as popular among listeners as it is among its patrons.

"An Ambiguous Escape"
If you were motoring over moors on a dark winter's night and came across an escaped convict, whose story convinced you of his innocence and made you feel in his wrongful imprisonment, what would you do? That is the problem which faced a retired judge in F. M. Cornford's radio play, "An Ambiguous Escape," to be broadcast on April 14th in the Northern Ireland programme. How Sir Robert, the retired judge, a man he encounters on the moors, a stationmaster and a prison warder find themselves involved in this amusing and exciting play. But there is a remarkable and unexpected twist at the end, redressing the undercurrent of philosophy. S. A. Bullock, who produced the play in the National programme some time ago, is to produce it again on April 14th.
I have just heard of a new use for the radio, and in view of the hundreds of hapless husbands who have to sit and listen to the waggles of wives' tongues, I must pass on this hint, although it is probable that it will already have been discovered by many. Incidentally I was informed of it by a friend who suffers from the familiarity of the greeting, I do not lay claim to such noble parentage. However, I should be glad if you would note as hot as I in some respects.

Now I am no relation and have no kinship to Mr. Therm, or the writers open their letters with the greeting, "Dear Mr. Therm." Now I am no relation and have no kinship to Mr. Therm, or the writers open their letters with the greeting, "Dear Mr. Therm." However, I should be glad if you would note as hot as I in some respects.

Other papers please copy!

Family Name

It seems that I must make clear to some of my readers the relation which exists between me and a well-known figure which appears almost every day in the daily newspaper and which also may be seen sometimes on one of London's omnibuses. I am prompted to make this statement due to the fact that some of the letters which are now reaching me are being addressed to Mr. Therm, or the writers open their letters with the greeting, "Dear Mr. Therm." Now I am no relation and have no kinship with the delightful little man who bears the name of Therm, although he may be as hot as I in some respects. His father was one Thermos, a Greek, but I cannot lay claim to such noble parentage. However, I should be glad if you would note as hot as I in some respects.

A New Use

I have just heard of a new use for the radio, and in view of the hundreds of hapless husbands who have to sit and listen to the waggles of wives' tongues, I must pass on this hint, although it is probable that it will already have been discovered by many. Incidentally I was informed of it by a friend who suffers from the above malady, and he says that he discovered by many.

What Next?

A FRIEND who is on one of the dailies told me of some of the peculiar comicalities of the present time to time and of some of the events which occur up their usual routine. But I think of one of the prizes was a lady who rang up the editor to complain that the B.B.C. announcer who was reading out the news bulletin was chewing a sweet. She was asked how she knew this and she said that it was obvious as her radio was perfect and she could detect the slightest thing, and that she was disgusted to think that the announcer should speak with his mouth full. After carrying on at some length the editor told her that he could do nothing, and that she ought to ring up the B.B.C. "But I can't do that," she exclaimed. The Editor asked her why not, as they were the correct people to whom complaints should be made. Her reply laid the Editor out for the rest of the night, for she calmly said: "I can't get on to them because I haven't paid my licence this year." Now can you beat that?

Trouble Tracking

I KNOW that many readers are interested in problems which arise in various receivers and in the methods of locating trouble, and therefore the following details will no doubt be appreciated, although I should like to state, before going any further, that I cannot explain the matter satisfactorily. The set was a simple two-valve all-mains outfit, operated from A.C. supply, and utilizing a high-efficiency detector followed by a pentode. The trouble was that at odd intervals a terrible crackling noise would set up and it was found by the user that by stamping on the floor the noise would sometimes be stopped. Obviously, you will say, there was a loose connection; but read on. After some weeks it was suddenly noticed that when certain high-light switches were operated the noise would start and in some cases the volume would fall to less than half. A technical man was called in and he replaced the earth connection, replaced the valves and examined every joint (soldering had been adopted) and could find no fault at all. Still the trouble persisted. You would never dream what was found eventually to be the cause, and probably it would not happen again once in a million times. The set was tuned by a two-gang condenser of a well-known make in which a bakelite dielectric was employed and the two condensers were controlled by a single spindle. This was hollow, and running through it was another spindle connected to a single-plate condenser used as a trimmer across one section of the gauged unit. The noises were found eventually to be due to the central spindle touching the sides of the main spindle, in spite of the fact that both spindles were connected to bushes which were provided with eyelets and were earthed. The way the trouble was finally cured was by connecting a cable to the very end of the spindle (just behind the control knob) and taking this direct to earth.

The Applausograph

You will remember my mention of the relay recording device and also the suggestion which followed it concerning an instrument which recorded how listeners were listening? Now comes another machine, but this time one which has been tested and approved and which judges the popularity of an entertainment by the amount of applause which is given. This machine has been developed by the Marconi Company, and is very much more sensitive than the human ear, which, of course, could not distinguish between 500 people clapping and, say, 550 people.

It consists of a machine having a microphone, amplifier, and a registering meter. The microphone picks up the applause, converts it into electrical impulses, which are then amplified and passed to the meter. This consists of a glass-fronted box having two rollers, one at each end. One of these rollers carries a roll of graph paper, which passes beneath the glass cover to the other roller. Between the surface of the paper and the glass is a long needle which is called the stylus bar. This bar is supplied with a steady flow of ink, and the whole apparatus may be compared to the barograph which is used for recording changes in atmospheric pressure.

The mechanism inside this box is designed to pass the paper from one roller to another (Continued overleaf).
at a speed of 9 ins. in three minutes, and as soon as the item being judged reaches its conclusion, the apparatus is switched on and the position of the needle is noted. As the volume of the applause mounts, so the microphone picks it up; it is amplified and passed to the mechanism connected to the stroboscope. This immediately begins to move under the influence of the applause, and traces a thin black line upon a chart. It will be seen, therefore, that the greater the applause, the greater will be the detection of the needle, and consequently the higher will be the line rise upon the chart. This will be a permanent, visible, and valuable record of applause given to any particular item is easily and accurately recorded.

These charts are made of semi-transparent paper, and those for each item will be placed upon a ground glass screen having a light stock beneath it. They will be superimposed one upon the other, and the light shining through will give an instant and accurate comparison, thus the judging will be absolutely fair to everyone and will definitely be decided by the audience alone.

A Radio Cow

VISITORS to the Ideal Homes Exhibition who are radio fans are very interested in the radio cow which is supposed to be gifted with remarkable intelligence.

Television at the football match.

This animal, named Chrisie, is led up and down the players' exhibits and the visitors simply whisper in its ear, when it loudly proclaims the answer to the problem which has been set, or gives the date of any event of the day. Of course, every modern scientifically-minded person immediately says that there is a loud-speaker inside it, and that a human being is secreted therein. But the very fact that there is an unseen and unexposed loud-speaker is the voice.

But the mechanism which picks up the audience's voice, selects the necessary answer, and gives tongue to it, is of an ingenious and intricate nature, and in this case has been devised by the Philco Company, who are also responsible for the public-address equipment on this particular stand.

These robot mechanisms are extremely interesting, and it is most amusing to stand outside a crowd watching a demonstration and listen to the comments. Some most ingenious statements are made, whilst there are a number of ridicule remarks. One remembers going to a very early demonstration of one of these robots, and in this case a sound-on-film truck was included. The most ingenious device which the inventors assured me, could not make a mistake provided he himself asked the question. Intonation had a great deal to do with this. Of course, the audience of the mechanism, and he had recorded practically all of the well-known historic dates, and other public-interest areas which were later asked by the audience. It was very expensive to operate, but gave a remarkable display of intelligence.

A New Experience

EXPERIMENTS on quite a large scale are now being conducted by a Harley Street specialist, with a view to inducing sleep through the medium of both sound and colour. The doctor claims that with the correct lighting, coupled with soft music and talk suggestion, it is possible to bring about the condition of drowsiness and finally sleep, so that the subject is awake refreshed. But this is not the only use that can be made of the new medium of the television screen. When the B.B.C. will operate to the extent of radiating music and literary programmes the work will be under way in this line. By the same token, it will be possible to take the audience's attention away from the television screen to other points of interest. The doctor claims that certain programmes will, in fact, induce a very sleep-like state of mind, and that this will be of extreme value to those persons who are deaf and dumb. At present they are unable to take advantage of ordinary radio in the home, but those who know and use the lip language are looking forward to the new service with keen anticipation.

The clarity of the pictures received should ensure that deaf and dumb people will be able to see lip movement, and so enjoy at least some sections of the programme, a factor denied to them with sound alone. To this end it is suggested that some manufacturers should give serious consideration to the marketing of a vision set alone and so reduce the cost to those who from force of circumstances have no use for the accompanying sound. Furthermore, there may be many people with ultra-short-wave adapters fitted to their ordinary radio sets who would welcome this policy, so the suggestion is one which merits consideration.

Radio Cow in action.

A Deaf and Dumb Television

A lecture given recently on various aspects of television the subsequent discussion brought out very clearly that the high-definition television set would prove of extreme value to those persons who are deaf and dumb. At present they are unable to take advantage of ordinary radio in the home, but those who know and use the lip language are looking forward to the new service with keen anticipation. The clarity of the pictures received should ensure that deaf and dumb people will be able to see lip movement, and so enjoy at least some sections of the programme, a factor denied to them with sound alone. To this end it is suggested that some manufacturers should give serious consideration to the marketing of a vision set alone and so reduce the cost to those who from force of circumstances have no use for the accompanying sound. Furthermore, there may be many people with ultra-short-wave adapters fitted to their ordinary radio sets who would welcome this policy, so the suggestion is one which merits consideration.

Baffle Boards

MODERN moving-coil speakers of reliable quality have a response between approximately 50 cycles and 8,000 cycles, provided that they are correctly mounted. The former quality reproduction is obtained when a large baffle-board is used. If a good response at 50 cycles is desired this baffle should be at least 3ft. square, and if 800 cycle reproduction is advantageous the size should be increased if space permits. If the speaker is mounted in a cabinet the baffle size is measured by adding the diameter of the cabinet face to the depth of the sides. If a very deep cabinet is used, however, a bouncy effect is often produced owing to the resonance. A very deep cabinet is used, however, a bouncy effect is often produced owing to the resonance. A very deep cabinet is used, however, a bouncy effect is often produced owing to the resonance. A very deep cabinet is used, however, a bouncy effect is often produced owing to the resonance.

Delay Switch

WHEN the voltage required on the anode of the output valve greatly exceeds that required by the preceding valves it is very desirable to use an indirectly-heated rectifying valve in the mains unit, otherwise a voltage surge will occur during the breaker. This will be due to the fact that the lamp is not actually a parallel connection in the L.F. and H.F. circuits. A case in point is the quality type set using a valve. The output stage preceded by indirectly heated L.F., det., and H.F. valves.

Notes from the Test Bench

Portable Receivers

As summer is approaching, many new readers will probably be thinking of building a portable receiver. The framework and aerial type of portable has lost its popularity during recent years and it is now customary to use a semi-receiver in conjunction with a three-out aerial. This type of aerial can consist of approximately 20ft. of flexible wire, which may be conveniently coiled inside the receiver cabinet when not required. When reception is desired in the open, the wire may be uncoiled and thrown over the branch of a tree, and a moderately efficient earth will be provided by tying a piece of bare wire to a screwdriver and pushing the shank of the latter into the ground.

Frame Aerials

THE frame portable is not obsolete, however, and we are now receiving a number of inquiries concerning the construction of frame aerials. Many readers ask us to let them know the number of turns they should use, but we omit to state the size of the frame. The number of turns required is, of course, governed to a great extent by the dimensions of the normal-sized frame (between 12in. square and 15in. square) approximately 70ft. of wire should be used for medium-wave winding, and approximately 100ft. for the long-wave winding. If the frame is fitted with a reaction winding this should have a length of about 15 to 20ft.

The Doctor's view.
An experimental toroidal coil, shown complete, and in section. Note the spaced winding on the larger core.

I

n common with many components used nowadays in radio receivers, iron-cored coils are the result of the work of a number of radio engineers, rather than one individual. Their evolution dates back about eighteen years, and corresponds with the introduction of power for our leading industries for telephone systems. To be strictly accurate, the use of iron cores in such circuits dates back long before 1916, and it is believed only little while after Pupin originated the idea. The early loading coils, however, were fitted with iron cores consisting of bundles of fine iron wires to be followed later with laminated iron strips, and similar variations.

Subsequent experiments indicated that greater intelligibility of speech could be obtained by increasing the frequency spectrum, and this necessitated an increased efficiency at the higher audio frequencies. Engineers quickly discovered that subdividing the known types of cores partially brought about the desired result, although not to the extent required, and the first patents, Nos. 103,188 and 107,007, filed in 1916 by the original Western Electric Co. disclosed for the first time means of manufacturing cores from powdered iron.

It is an interesting fact that criticisms of then-known methods of iron core manufacture apply, perhaps in a more critical sense, to some present-day versions: "Attempts to increase the permeability beyond a certain point are frustrated by accompanying excessive hysteresis and eddy current losses, and by impairment of magnetic stability."

Iron Core Characteristics

It would be as well, at this stage, prior to describing the various commercial systems of manufacture, that a concise idea be obtained of the various core features. These have been clearly set out and described in [PRACTICAL AND AMATEUR WIRELESS] many times before, but it is necessary to summarise them here.

To understand in detail the technical aspect of each of these investigations necessitates a profound knowledge of magnetism, electricity, mathematics, and coil practice.

However, it is significant that even those engaged in this branch of electro-chemical engineering have so far been unable to evolve experimental means or formulae for assessing the actual specific hysteresis-loss per cycle, beyond estimating that it increases with frequency. The A.C. factor, known as "retardation loss" is also unknown at radio frequencies. Owing to differences in technical circles as to the means of considering dielectric losses, their effect on a standard coil of known characteristics.

It seems clear that greater perfection in the operation of iron cores for H.F. circuits will not be attained until exact formula has been evolved to cover the above-mentioned points. There are indications that research will bring about some interesting modifications to existing ideas on the subject.

In this Article Some Interesting Particulars Covering the Manufacture of Powder-iron Cores, and Their Characteristics, are Given. By C. V. COLLE

The maximum amount of iron powder that could be introduced into the "given space" is obviously an amount equivalent to a solid iron bar of equal dimensions. It follows that the iron powder would have to be highly compressed to make one homogeneous mass, necessitating a truly colossal pressure. In actual fact, owing to the 2 to 10 per cent. insulating binder, the most highly compressed powder iron core can never reach the same specific density, and hence the same weight, as a solid iron bar.

Apart from the necessary insulating binder to make the minute iron particles adhere to each other, the latter usually have a fine iron oxide coating which ultimately reduces the weight of the compressed mass. Assuming a standard square bar powder core is to be made 1 kins. long by ½ in. square in a steel die fitted in a press having, say, a pressure of 200,000 lbs. per square inch, the factors which will govern the permeability of the finished core will be: (1) the size of the iron particles, (2) the composition of the iron particles, (3) the method of coating the particles to insulate them electrically, (4) the quantity of insulating binder to insulate the particles magnetically and to render the mass homogeneous.

Testing an Iron Core

A most interesting test which the reader can apply is to measure the D.C. resistance of a powder bar core and a solid iron core of similar dimensions, and to the sizes given above. The solid iron bar will show a resistance which is but an infinitesimal fraction of an ohm, whereas the powder core (such the Standard Telephones type) will offer some 7,000 to 10,000 ohms, measured from end to end with point contacts. Considering the weight of the powder core is little short of the solid bar, the test shows a truly wonderful insulation between the iron particles. One may assume that the higher the resistance the more perfect the insulation and the lower the losses. Presumably, if these features could go hand-in-hand with the existing weight of iron particles and not by employing a

A group of "Gecalloy" cores and cellulose acetate formers, manufactured by Salford Electrical Instruments Limited.
prepared by a "rusting" process, which entails adding 10 per cent. by weight of water and heating and stirring the mixture until dry. Large eddy current losses are avoided by compressing the treated particles into bars not thicker than 14 in., but preferably into thin sheets. The pressure employed is such that the particles are interlocked by distorting them beyond their elastic limits. Cores from the thin sheets can be built up from thinner sections with suitable insulating materials between each sheet.

The methods employed in preparing the iron particles, insulating, and binding them together are the subjects of numerous patents. It has already been stated that Patent No. 105,198 is one of, if not the earliest granted, and this discloses a process whereby thin sheets of iron obtained by electrolysis are broken up into small pieces and reduced to small particles in a ball mill, to a size which allows them to pass through a hundred mesh screen.

Such particles are then annealed in a furnace to rid them of occluded gases, such as hydrogen. The annealed particles are insulated by thin sheets of cellulose acetate film, which is then dried, but not stoved. The powder is subsequently tumbled in a drum for about 50 hours, pieces of "feathered" zinc (produced by pouring molten zinc into water) being introduced to dry galvanise the coating of varnish applied and air dried, but not stoved. The powder is ultimately compressed at 20 to 40 tons per square inch (this is about half the pressure used on Standard cores) in ring-shaped moulds or dies, the "finished" iron powder can be moulded to any desired configuration, and thickness, within its desirable electrical and high-frequency limits.

Recognition of some of these facts, apparently, led to the claims made in Patent No. 105,388, wherein the use of specially prepared thin sheets of compressed iron powder interposed with solid iron laminations are claimed to improve the magnetic linkages of windings used, and to make the whole heat-resisting. In this final state the iron particles are substantially electrically and magnetically insulated. However, a second coating of varnish is applied and air dried, but not stoved. The powder is ultimately compressed at 20 to 40 tons per square inch (this is about half the pressure used on Standard cores) in ring-shaped moulds or dies, the "finished" iron powder can be moulded to any desired configuration, and thickness, within its desirable electrical and high-frequency limits.

The building up of cores from numerous "sheets" reduces capacitive eddy currents to a minimum—a most important feature.
A Novel Pre-set Condenser

WHILST experimenting, I was unable to find a suitable semi-variable small value condenser, and ultimately constructed a very efficient component from an old bakelite pencil holder as described in the following paragraph. The lower end of the holder was covered for approximately 2ins. with a piece of brass (0.012in.) sheet, and clamped in position with two 4BA brass screws and nuts; the latter also served as terminals, whilst a brass plunger was made of tin, diameter rod, and clamped by the ring inside the holder, as shown. Thus the case was used as the dielectric and the capacity obviously two or more of these fuses can be fixed side by side, utilising the same terminal mounting strip and fibre tube mount, the contact springs being all connected to a common alarm circuit. — W. A. Harrison (Aintree).

An Alarm Fuse

The accompanying drawings show an easily constructed fuse which, when it blows, may be made to give an audible or visual indication of its fusing. The fuse wire is stretched between two points, one

A small capacity pre-set condenser.

that idea of yours to account by sending it to us addressed to the Editor. "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2. Put your name and address on everything. Please note that every sentence must be original. Mark envelopes "Radio Wrinkles." Do NOT enclose Queries with your Wrinkles.

A PAGE OF PRACTICAL HINTS

THAT DODGE OF YOURS!

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

One end of a double-ended connector is soldered to the centre of the 'phone diaphragm, so that the other end in the connector, with one of the clamping nuts, protrudes through the centre hole in the 'phone cap. An alternative method is to fix the end of the connector to the diaphragm by means of a small screw, as shown in the right-hand sketch. When in use an ordinary gramophone needle is fixed in the end of the connector by the small clamping screw. —J. PLAETEN (Brixton).

Automatic Tuning

As I had to design an automatic receiver for some old people, I incorporated automatic signalling at the same time, and the attached sketches show the complete arrangement. It will be seen that in addition to the use of pre-set condensers for tuning to four stations, I also incorporated a fixed reaction circuit and made the condenser selector switch also change the small pilot bulbs housed in a small metal chassis behind windows carrying the station names. The framework is of aluminium, which is light and easy to work, and the entire assembly is very small indeed. Care should be taken to ensure that the choke spacer is large enough to keep the ends of the studs from touching the metal frame. —J. MCLELLAND, (Liverpool).
The Characteristics of these Television Circuits are Described in this Article.

By H. J. Barton, Chapple, B.S.C., A.M.I.E.E.

The electrical time base, having the dual-function of providing the H.F. and L.F. current variations necessary to produce the fluorescent spot movement in a cathode-ray tube, is an extremely important piece of apparatus. Any failure to generate the correct saw-tooth action previously described will result in an imperfectly constructed picture, so that a fair knowledge of its characteristics is essential if the best results are to be obtained by the user.

### Two Important Points

First of all, it should be quite linear in action, that is to say, the velocity of trace must be uniform with time. If this is not so, the picture will exhibit a crowding effect at the end traces in each the horizontal and vertical directions, and a reconstitution of the televised scene in its true dimensional ratios becomes impossible. Again, the flyback or return stroke at the end of each line and picture trace must be sufficiently rapid to remove any diagonal bright white lines across the picture. In developing time bases to conform to the rigid standards of television, many schemes have been tried, and although perfection has not been reached the arrangement shown in Fig. 1 is representative of a good quality time base scheme for use in conjunction with electrostatic deflection.

A simple form of time base, using a neon gas tube in conjunction with a diode valve, has been illustrated before to indicate the principles of action, but this arrangement suffers from many drawbacks. The voltage range between the values for ionisation to start and stop in the neon lamp is limited, while, in addition, the diode valve functioning in a saturated condition is unreliable. It is preferable, therefore, to replace the neon lamp with a gas-filled relay, and the diode valve with a pentode valve whose operating voltage conditions are such that the anode current remains constant over a relatively wide range of anode voltage variations. This fact can be verified by referring to Fig. 2, which shows the static characteristic for a pentode valve under these conditions of working.

#### Action

Referring back to Fig. 1, therefore, the action involved in producing the saw-tooth pulses follows somewhat on these lines.

First of all, the bias conditions for the indirectly-heated pentode valve are set by potentiometer adjustments as shown, the main H.T. supply voltage value being primarily on the total voltage required in order to make the beam of electrons in the cathode-ray tube make a full sweep across (or down) the available screen area on which the television picture is reconstructed.

The steady current from the valve V1 passes into the condenser C, and so charges it up uniformly. Due to this steady feed, the voltage across the plates of C rises uniformly with time, which, as we saw earlier, was necessary to maintain linearity of action in the time base itself. Neglecting for the moment the gas-filled relay, V2, the steadily rising voltage will be imparted to the pair of electrostatic deflecting plates marked “shift” and “scan” respectively in Fig. 1. The changing electrostatic field of force concentrated between the plates, and between which the beam of electrons is made to pass on its journey to the fluorescent screen of the tube, will cause the beam to move horizontally or vertically, depending upon whether the plates themselves are mounted in a vertical or horizontal plane. On the completion of the spot trace across the screen it is necessary to restore the electrical conditions to those which operated at the beginning, and it is here that the gas-filled relay V2 comes into action.

#### The Gas-Filled Relay

Whereas in an ordinary valve the glass envelope is exhausted, with these relays a filling of mercury or helium vapour is given at a certain pressure during the course of manufacture. Furthermore, the current passed through the device is not a flow of electrons in the same sense as a receiving valve, but it is an actual arc discharge between the positively charged anode and the heated cathode. This discharge is brought about by the process of ionisation, and for given conditions of electrode separating distances, gas pressure etc., there is a very definite minimum voltage, which must be reached before the arc or visible ionising discharge can take place inside the valve.

Then, again, the grid performs a function which differs from ordinary valve technique. Variation of anode voltage causes gas ions to pass through the tube, so that a fair knowledge of its characteristics is essential if the best results are to be obtained by the user.

### Limiting Resistance

The grid exercises no further control when ionisation is present, and the discharge current is maintained by internal conditions or reducing considerably the voltage. Since the internal impedance drops to a very low value under ionising conditions, a limiting resistance is included in the anode circuit, as shown in Fig. 1, to ensure that the anode current does not exceed the maker's rating.

Different relays have different characteristics, but in Fig. 3 is reproduced the average characteristic curve for an Osmar gas-filled (mercury vapour) relay type G.T.1, and it is seen that to increase the sweep voltage both the anode and critical negative grid voltages need to be increased accordingly.

Having appreciated the relay's inherent action it is easy to see how the time base functions in its saw-tooth manner. The steady rising voltage across the condenser C (and hence between anode and cathode of the relay) makes the fluorescent spot move at a constant velocity in its direction of trace until the limiting voltage set by the negative grid bias and grid-control ratio is reached. Ionisation occurs at once, the voltage drops, and the condenser is discharged rapidly. This brings about a collapse in the electrostatic field between the pair of deflector plates, and the fluorescent spot flies back to its original datum line. The initial conditions being thus restored, the process begins all over again, and this spot motion (resembling that of a cam action) is repeated a number of times per second.

---

**Fig. 1.** A typical time-base circuit using a pentode valve and a gas-filled relay.

**Fig. 2.** Showing how with a screened pentode valve the anode current is constant after a certain minimum anode voltage is reached.

**Fig. 3.** The characteristic curve of a gas-filled relay.
GET THIS IMPROVED REPRODUCTION FROM YOUR SET!

VOLUME 20% GREATER

The improved—and larger—Manfied " magnet brings a substantially higher sensitivity. The increased loudness makes it possible to balance the set comfortably accommodated by the ear. It materially increases the realism of the performance.

BASS RESPONSE—FULLER AND 15 C.P.S. LOWER

Meticsul bass response goes 15 c.p.s. lower than previous models. Audible response that part of the bass which is of audible frequency and reaches audible volume—in these new models more loudly reproduced. Thus the bass background is stronger and more colourful.

HIGH NOTE RESPONSE—900 C.P.S. CIPHER

Due to the stronger magnet, new hand-made cone, and larger section-wound interlaced transformer, better brilliant and cleaner reproduction of high notes and crotches has been achieved. This does not imply shrillness—in fact, objectional high resonances are conspicuous by their absence.

ATTACK—CLEANER & CRISPER THAN EVER BEFORE

That "forwardness" of tone and the clean, instant response to transients which are so important to realism in reproduction, are, in this new speaker, present to a remarkable degree. Come on. transformer, and the new acceptability of assembly are chiefly responsible.

The simple substitution of this advanced speaker for your present instrument will bring to your radio increased volume and a new amazingly colourful realism. Ask your dealer to demonstrate TO-DAY and hear for yourself.

PRICES:

<table>
<thead>
<tr>
<th>CARTRIDGE MODELS</th>
<th>CASH OR C.O.D.</th>
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<tr>
<td>Senior</td>
<td>£2 5s. 6d.</td>
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<tr>
<td>Baby</td>
<td>£1 10s. 6d.</td>
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<tr>
<td>Child</td>
<td>£1 7s. 6d.</td>
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<tr>
<td>Junior</td>
<td>£1 5s. 6d.</td>
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</table>

For a transmitting licence you would be able to answer the points raised in your letter.

The noises may be atmospherics, or local interference which is not picked up on the local because you use an H.F. volume control which reduces sensitivity on the local.

A sketch of the set or give some further details we will refer to your letter.

We cannot give the value of the points raised in your letter.

The choke in question should be quite suitable, as also should your valve.

The component in question is a valve—holder. As shown by you the grid condenser and the grid and screening grid terminals on the detector are obtainable from our office, price 4d. The grid condenser is also obtainable, price 9d.

The additional voltage is certainly desirable, but remember also to divide into the grid bias required and the resistance without knowing the current flowing.

A. R. (Southend). Write to the Radio-Society of Manchester.

R. E. (N.9). The defect is probably inherent in the set, and it should be divided into the grid bias required and the resistance without knowing the current flowing.

A. S. D. (Harrogate).—The arrangement should be quite satisfactory, and the number of valves would be dependent upon the type of recording.

No doubt, two valves would be adequate, and the arrangements of mike and earphone would have to be chosen for the experiment.

B. L. (W.W.). We have no details of a superhet of the type mentioned in your letter.

R. A. (Leith). The component in question is a standard timing coil, covering the same range as the shortened carrier as a tuned-antenna coil.

The crystal may be obtained from Electradix Radio, Upper Thames Street, London, E.C. 4. The back of voltage can only be due to a resistance in the L.T. wiring, and if the reading across the voltmeter is only 1 volt, whilst all valves are out of the sockets, and at the accumulator it is 2 volts, we suggest that you examine the L.T. wiring.

R. C. (Bournemouth). The leak is joined to the screening grid, and the control-grid is joined to the H.T. potentiometer.

S. E. (Southport). The leak in question is a broken hardwire, and this leads us to suppose that you are using a battery eliminator, which is the cause of the trouble. There should be no leak due to the fact that you use an H.F. volume control which reduces sensitivity on the local.

J. B. (Low-Fell). A complete detector using the crystal is not obtainable.

J. B. (W. C.). The noise is joined to the grid condenser, and the control-grid is joined to the H.T. potentiometer.

S. H. (East Ham).—The crystal may be obtained, price 1s. 6d., from Electradix Radio, Upper Thames Street, London, B.C. 4. A complete detector using the crystal is obtainable from the same source, price 2s.

H. W. (Dunstable). No further details can be given concerning the transmitter, and if you are eligible for a transmitting licence you would be able to answer the points raised in your letter.

A. J. L. (Willesden).—We cannot give the value of the points raised in your letter.

R. W. B. (Durham City). Back numbers of our issues are still obtainable.

R. R. R. (Crewe).—The advice given is valid, but the circuit is so complicated that it is impossible to effect any improvement.

R. R. H. (Heve 2). The additional voltage is certainly desirable, but remember also to divide into the grid bias required and the resistance without knowing the current flowing.

J. B. (St. Andrews).—The trouble may be due to an incorrect bias, or to the wrong type of grid condenser.

G. D. (Skegness).—The points raised in your letter may be the cause of the trouble. There should be no leak due to the fact that you use an H.F. volume control which reduces sensitivity on the local.

J. D. (Low-Field). Details of the set in question may be seen in PRACTICAL AND AMATEUR WIRELESS dated August 31st, 1935, and this issue may be obtained, price 4d., from Electradix Radio, Upper Thames Street, London, E.C. 4. A complete detector using the crystal is also obtainable, price 9d.

R. W. B. (Bideford). We cannot give the value of the points raised in your letter.

R. R. R. (Hove 2). The defect is probably inherent in the set, and it should be divided into the grid bias required and the resistance without knowing the current flowing.

A. R. (West Bromwich).—We have not worked out any experiments on the direction mentioned in your letter, and are unable to advise you on the matter.

G. A. (Blackpool).—The choke in question should be quite suitable, as also should your valve.

B. E. (Lewisham).—A sketch of the set or give some further details we will refer to your letter.

E. H. (High Wycombe).—You do not need to write from the direct source of H.T. supply you are employing, and this may be the cause of the trouble. There should be no leak due to the fact that you use an H.F. volume control which reduces sensitivity on the local.

B. L. (W.W.).—We have no details of a superhet of the type mentioned in your letter.
Components Tested in Our New Laboratory

New Raymart Condensers

Some new micro-variable condensers are being introduced into the Raymart range, and these will eventually supersede the micro-variables types VC15, VC40, and VC100. In general construction they are similar to those condensers, but possess an end plate of ceramic material which has been specially designed and has a remarkably low-loss factor. It is claimed, as a matter of fact, that this is one quarter of that which is claimed for the well-known American Isolantite. The condensers have the usual brass vases, and the ball race which is fitted for smooth operation is electrically short-circuited to avoid noises. A direct connection is provided for the rotor and this avoids many of the difficulties which are met with in a pigtail, such as noises, variation in tuning due to inductive effects, etc. The condenser is

<table>
<thead>
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<th>Grade</th>
<th>Auxiliary Grid Volt</th>
<th>Anode Grid Volt</th>
<th>Current</th>
<th>Average Anode Volt</th>
<th>Current</th>
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<td>135</td>
<td>2.4</td>
<td>5 m/A.</td>
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<tr>
<td>B</td>
<td>129</td>
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<td>2.5</td>
<td>5 m/A.</td>
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</tr>
<tr>
<td>A</td>
<td>129</td>
<td>129</td>
<td>2.4</td>
<td>5 m/A.</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>110</td>
<td>120</td>
<td>2.4</td>
<td>3.8 m/A.</td>
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If the value is used to replace some of the earlier types of pentode of the high output type, there will be a substantial increase in volume without any increase in anode current drain. Although, of course, the L.T. load will be slightly increased. The latter may be of no moment in the majority of cases, and it only extends to 1 amp. The price of the valve is 1a. 6d., and the type number is PM122D.

New Mullard Battery Valve

A new output pentode is announced from the Mullard company, and this is designed for the battery-operated receiver. It is claimed to be the first high sensitivity output pentode ever produced for battery receivers, and in most sets it will be interchangeable with the existing output valve with an amazing increase in volume. The valve is rated at 2 volts 3 amps, and the maximum H.T. is given at 150 volts, which value is applied also to the auxiliary or screening grid. At an average working voltage of 135 volts, with a grid bias of 2.4 volts, the average anode current is only 5 m/A. This particular grid voltage value is not obtainable directly from an ordinary bias battery (which is, of course, in multiples of 2.5 volts) and therefore it is necessary, in order to take full advantage of the characteristics of the valve, to adopt a different method of obtaining the bias. The simplest scheme is to fit a potentiometer across the grid bias battery, as is done in the case of variable-grid valves. Although, of course, a resistance in the H.T. negative lead may be employed to provide automatic bias of the required value. To overcome inevitable variations in the consumption of H.T. current when a given output is demanded of individual valves, a system of grading has been adopted by the manufacturers, and this is arrived at in terms of auxiliary grid voltage, and correct replacement has been ensured by arranging a both valve base and glass envelope with the alternative grade letters A or B. The following table shows the appropriate grades for 120 volts and for 135 volts H.T. supplies:

Another interesting service aid is found in a series of valve adapters for 4-, 5-, 7-, and 9-pin valves. A standard valve base, as fitted with a cable to a standard valve-holder mounted on a small switch panel, and this has sockets which enables meters to be connected to various parts of the valve circuit to measure voltage and current ranges. The Trinkit costs 10s. 6d., and the adapter for 4-, 5-, and 7-pin valves costs 10s. 6d. For 9-pin valves, the price of the adapter is 12s. 6d.

A New Wharfedale Speaker

Further to increase the range of Wharfedale speakers a new Super Bronzian is now being added. This is designed primarily for use as an extension model and is fitted with a universal matching transformer. The "Truqual" volume control is fitted to the cabinet, which is further lined with Celotex in order to improve the tone and avoid difficulties due to resonance. Although designed primarily for use with a number of commercial receivers, the speaker will be found also of general use. The price is £3 7s. 6d., or without the matching transformer, £3.

New B.T.H. Pick-up

The Minor pick-up, which has for a long time been popular amongst home constructors, is now a priced model with improvements in design which render it still more a valuable accessory for those who are constructing a radiogram or wish to use their present receiver for record reproduction. In the new model the total weight has been reduced, and the effective weight on the record is now only 21 cts. In addition to this, the clamping has been made lighter, and the impedance has been increased. The results of these changes are shown by the fact that the output level has been raised and is now just over 1 volt at 1,000 cycles. The general appearance of the pickup is practically unchanged, a one-piece bakelite moulding being employed for the casing, and a volume-control is fitted to the rear, operated by a lever in the base. The resistance of this control has also been increased and is now 30,000 ohms in place of 10,000 ohms. The effective frequency range extends from 50 to 6,000 cycles, and the price is 17s. 6d.

50 Tested Wireless Circuits

By F. J. CAMM

(Ed. of "Practical and Amateur Wireless")

Obtainable at all Booksellers, or by post

This is the Lissen Luxfilter which was reviewed last week.
OUR FREE CATALOGUE SERVICE

EDDYSTONE - SHORT-WAVE COMPONENTS

Table 12 of our catalogue contains a comprehensive range of high-class components, covering every phase of short-wave and long-wave work. A full list among the new components listed is an all-dielectric microdistributor for general use. There are ten models varying from 0.75 mfd, to 103 mfd. There is also a new 30 mfd, 20 mfd, and 10 mfd, all having construction with mica and aluminized Mylar, the capacity ranging from 135 mfd, to 10 mfd. This condenser has no lead wires, is extremely compact and has an excellent end for sparging purposes. Other new components include a range of 240 mfd, to 1000 mfd, or 2000 mfd, and a wide-range of filters for universal mounting.

WEARITE COMPONENTS

The new edition of the Wearite catalogue includes many new and improved coils, etc., and a modification of the Universal and Universal Type A coil which is designed for use in expanding the use of a.c. and d.c. telephone, radio, and television work. The coil is adaptable to a wide variety of uses, and in addition there are other modifications rendered the coil adaptable for a.c. and d.c. General Use. Also included in the catalogue are the construction and performance data covering the core types which cover ordinary circuit chokes, bypass chokes, and intermediate-frequency transformers. A means for the estimation of the approximate capacity of the coil is given. The coil can be used on both medium and long waves, and which employs an iron pole piece and a mica or aluminized Mylar choke, enables a wide range of samples to be selected, and at a wide range of switch modes as well as the appearance which they are presenting to unseen audiences, as well as the effect of their voices upon these. Other questions are discussed in chapters dealing with the operation of the "B.D.C. Annual." A complete analysis of a problem reveals that Sothy, with 27 per cent., had more licences to population than any other country in the British Isles, at December 1885. Allowing four or five persons to each household would seem that saturation point may be expected somewhere in the next few years.

The message broadcast by King George V on the occasion of his Silver Jubilee on May 6th, 1935, and his late Majesty's Christmas broadcast to his people are reproduced in extenso. The largest section of the Annual deals with British microwave work, and is divided into programmes for the usual two main channels, and an additional programme for both. The whole division comprises a comprehensive survey of the activities of the Corporation's Engineering Department, the new regulations of microwave apparatus, which is now issued, and the various dangers which may be encountered in the construction of microwave apparatus.

We wish to draw the attention of our readers to the fact that F.C.A. have started a new periodical work, entitled "Wireless, Geo. N clones, 140 Southampton St., Strand, London, W.C.2." T. Hodges, M.P.S. (chemical magic), Mr. L. Moscrop (baritone), and Mr. O. L. Crossley, M.P.S. (chemical magic). The accompanists were Mrs. Mitchell and Mr. Webber. The popular light comedian, Mr. L. Moscrop, and Mr. O. L. Crossley were also present.

WELLINGBOROUGH AND DISTRICT SHORT-WAVE SOCIETY

The first meeting of members of this society took place at the Midland Hotel on March 3rd, and was attended by forty local enthusiasts. After the court business, the meeting-address was given by Mr. R. E. G. Copp, the chairman, who referred to the historical development of the receiver Mr. Hodges gave a short talk on its construction and pointed out that reaction was applied to the receiver. The meeting closed with a vote of thanks to Mr. Hodges, the chairman, and Mr. Thompson, and the arrangements for a meeting were made.

THE CROYDON RADIO SOCIETY

The meeting on Tuesday, March 24th, of the Croydon Radio Society, at St. John's Church, South Croydon, was of rather a novel nature. Five different speakers were called upon to lecture on any subject they liked for ten minutes. The first was the Technical Editor of "Wireless," who read the official notice of the meeting, and Mr. J. M. Newby, who gave a very interesting lecture on the principles of short-wave reception, and Mr. T. H. Hayes followed with a story of the uses of a radio receiver as a music receiver. The lecture was followed by questions, and an informal discussion, together with a demonstration of the receiver described in the talk.

The whole programme was of considerable interest, and was well received. The meeting was well attended, and several questions were asked. The whole division comprises a comprehensive survey of the activities of the Corporation's Engineering Department, the new regulations of microwave apparatus, which is now issued, and the various dangers which may be encountered in the construction of microwave apparatus.

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SUPPRESS IT!

Nearly all mains-borne interference caused by electrical apparatus can be eliminated by a new device which is simple to fit and can be easily installed. The device is called the "Plug-in Interference Suppressor." It is a component that will fit between the wall socket and apparatus plug.
LETTERS FROM READERS

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

Reception of U.S. Amateur W2BSD

SIR,—We note that one of your readers, D. C. Locke, of Thorney, raises the subject of the American amateur station W2BSD in the issue of PRACTICAL AND AMATEUR WIRELESS dated March 7th, 1936. For some time past we have been receiving this station almost nightly, and he is probably one of the best U.S. amateur transmitters heard in this part of the country at the present time. The operator is Mr. Ted Healy, and the station is situated at New Rochelle, New York.

In a recent communication he informs us that his carrier is 700 watts, but he can, and does on occasions, increase this to 1 kilowatt at a frequency of 14,170 kc/s.

When reception conditions on the 20-metre band are favourable, his signal strength is regularly R9-Q, QSA 5, and he appears to transmit most of the day and every day, except Saturday and Sunday, and may be heard on occasions retransmitting other smaller-powered U.S. transmitters. Incidentally, the British station he often contacts is GSN1.

In passing, we might mention that the evenings of March 4th and 5th were, in our opinion, the most favourable to the 20-metre band for some months, and some thirty to forty U.S.A. amateurs were logged being heard in these evenings.

Trusting the foregoing may be of interest to Mr. Locke and other readers.—NORMAN F. HOLDEN, B.Sc., H. WORSLEY (Assoc. Member, Chemical College of Tech.) (Cheddle, nr. Manchester).

Correspondent Wanted

SIR,—I have been a regular reader of PRACTICAL AND AMATEUR WIRELESS for some time, and I wish you all the success possible for a very informative and interesting paper. I should like to get in touch with any short-wave enthusiast in the Royston, Herts, district.—J. H. MUSTON (Weymouth).

From a Reader in Cairo

SIR,—In answer to the letter from D. C. Locke (Thorney) in the 7th of March issue of PRACTICAL AND AMATEUR WIRELESS I should like to state that I get W2BSD, New York almost every night, or, rather, morning. A further sample of his calls will be forwarded. —ED.

Reception of VP3MR and W2BSD

SIR,—It may be of interest to Mr. D. T. Donaldson (whose letter appears in PRACTICAL AND AMATEUR WIRELESS dated March 7th, 1936), to know that VP3MR, Georgetown, British Guiana, comes in here at R9, dropping to QRM at occasions, but it is quite good.

It is possible that one of your readers, Mr. Ted Healy, of New York, on the evening of April 11th, 1936, was in contact with the negative main.

I use a very low aerial 15 feet long, and my set is an 0-v-1 with a pentode in the output stage, and all my listening is done on 'phones.—R. P. TILLEY (Norwich).

Good Reception of Addis Ababa

SIR,—On Sunday, March 22nd, at 21.35 G.M.T. I was lucky enough to hear the short waves of broadcasting station Addis Ababa on a wavelength of 25.09 m.

The announcer said that the station (ETB) would be on the air again next Sunday morning at about 21.30 G.M.T. (Addis Ababa time, or 21.35 G.M.T.) with a speech by the Empress of Abyssinia, and every Sunday at this time with other interesting items. The transmitter used was a standard telephone using 2½ kW power and dipole aerial. The mike used was of the carbon type, but even so the quality was quite good. Using an 0-2 receiver the strength was R6-Q SQA 5. No QRM but slight QSB. Reception reports were invited and were to be sent to "Broadcast," Post Box 283, Addis Ababa, Ethiopia.—A. H. MUSTON (Weymouth).

Short-wave Correspondent Wanted

SIR,—I shall be glad to get in touch with a short-wave listener and constructor district. —C. B., Gainsborough.

Address Wanted

IF Mr. Alex. Neill, of Belfast, will forward to Mr. Locke and other readers.—SIR,—I should like to state that I get W2BSD in the issue of PRACTICAL AND AMATEUR WIRELESS dated March 7th, 1936. I am also interested in 5-metre reception, and does on occasions, increase this to 1 kilowatt at a frequency of 14,170 kc/s.

The mike used was of the carbon type, but even so the quality was quite good. Using an 0-2 receiver the strength was R6-Q SQA 5. No QRM but slight QSB. Reception reports were invited and were to be sent to "Broadcast," Post Box 283, Addis Ababa, Ethiopia.—A. H. MUSTON (Weymouth).

Charging Accumulators

SIR,—Mr. Bolton reproduces part of his letter of Jan. 28th to show that I have misinterpreted his remarks in question. But perhaps a fuller quotation will show that the writer's real intentions were not so apparent as he would have us believe.

"Now, if the accumulator was disconnected from the power still switched on, there will be a potential difference of 250 volts between the cable ends, but, naturally, no circuit will flow as the circuit is disconnected. Bearing in mind that the insulation of the mains supply, provided the insulation of the mains supply, under normal conditions the person's body resistance of about 2000 ohms."

Provided the insulation of the mains supply, at this instant, was in good condition. Under normal conditions the person's body would probably be 2000 ohms and we take into consideration the resistance of one's body, plus the resistance of the lamp 17.

In my criticism, I assumed, from the opening and concluding sentences above, that the person's body bridged the gap left by the disconnected accumulator, thus forming a series circuit with the lamp resistance. If, as the writer says, that is incorrect, how, then, can we "take into consideration the resistance of one's body, plus the resistance of the lamp 17?" From Mr. Bolton's drawing, a person touching the positive main, and does on occasions, increase this to 1 kilowatt at a frequency of 14,170 kc/s.

If he is well insulated, nothing happens. If he is in good contact with "earth," a small leakage current flows in parallel with the charging circuit. In neither case has the lamp resistance anything whatever to do with the result. Least of all does a "virtual short-circuit."—JAMES J. BEVERIDGE (Glasgow).

Cut this out each week.

Do you know

- THAT as much as 15 watts may be obtained from a single power valve in a straight mains receiver.
- THAT in the push-pull circuit the undistorted output which may be obtained is nearly four times as much as is obtained from an individual valve.
- THAT an ordinary type of meter cannot be used for measuring the normal current in a 300 watt stage.
- THAT a badly arranged indoor aerial can be the cause of serious hum difficulties due to connection with mains wiring in the walls.
- THAT a mains receiver should always be connected to the mains at the point where the fuse is fitted.
- THAT special paxelion strips are obtainable to assist in the connection of a number of fixed receivers in a receiving room.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL AND AMATEUR WIRELESS. Such articles should be written on one side of the paper only, and should contain the author's name and address. Such articles do not hold himself responsible for correspondence, every effort will be made to return through a stamped and addressed envelope is enclosed. All correspondence should be sent to the Editor, practical and amateur wireless, Ltd., 8-11, Southampton Street, Strand, W.C.2. We reserve the right to use any material contributed or to make slight alterations in our columns and to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers up to date with the latest developments, we give no warranty that the apparatus described in our columns is not the subject of letters patent.
Superhet Tuning

I have decided to build a superhet, and obtained a set of components from a make which I recognised as being of standard and well-known make. Unfortunately, in my enthusiasm, I obtained a ganged condenser which was of the equal-section type and, on taking this back, the stall-holder would not exchange it for me. Is there any way in which I can utilise this condenser to save wasting it? I believe it is possible to use fixed or pre-set condensers to make up the circuit, but should appreciate values and connections for the purpose. — E. W. A. (Perth).

The Monitor and a Mains Unit

Will my push-pull output stage in which I am going to use two valves each of which requires a load of 2,500 ohms and in which the anode circuit should be fitted, when the set is in use and will not fall off the same rating and thus it is possible to use fixed or pre-set condensers to make up the circuit, but should appreciate values and connections for the purpose.

The Earth Connection

I am rather in a quandary regarding my earth connection. I had just read of the importance of this part of the equipment, and whilst trying for foreigners I found that the earth is too dry for the connection to function efficiently we cannot say, but an examination of the ground should reveal the point. If the earth was buried in clay it is possible for the ground to have dried out and the clay to have cracked away from the plate, leaving a very poor connection. I should like to include a push-pull amplifier section type and, on taking this back, the stall-holder would not exchange it for me. Is there any way in which I can utilise this condenser to save wasting it? I believe it is possible to use fixed or pre-set condensers to make up the circuit, but should appreciate values and connections for the purpose.

Coil-winding Data

I wish to wind a coil having an inductance of 200 microhens. I have a length of paxolin tubing 2m. in diameter and would be glad if you could give me the necessary winding formula for the coil in question. — B. Y. O. (Petersfield).

A SIMPLE solenoid coil would, with 28 D.S.C. wire, using a total of sixty-four turns, be approximately 2m. in diameter. I used an unfortunate coil with the lead soldered to it so I do not think that it should be that which is the trouble. — L. A. (Rickmansworth).

The fact that removal of the earth made no difference may be taken as an indication that it is ineffective. Whether or not this is the case, the lead has come off the earth plate, or whether the earth is too dry for the connection to function efficiently we cannot say, but an examination of the ground should reveal the point. If the earth was buried in clay it is possible for the ground to have dried out and the clay to have cracked away from the plate, leaving a very poor connection. I should like to include a push-pull amplifier section type and, on taking this back, the stall-holder would not exchange it for me. Is there any way in which I can utilise this condenser to save wasting it? I believe it is possible to use fixed or pre-set condensers to make up the circuit, but should appreciate values and connections for the purpose.

Divided Mains Supply

I enclose a list of parts which I have and with which I should like to build a powerful mains receiver. You will observe, from my transmitters surplus, 50,000 is supposed to give 250 volts at 60 mA, but I should like to include a push-pull amplifier section type and, on taking this back, the stall-holder would not exchange it for me. Is there any way in which I can utilise this condenser to save wasting it? I believe it is possible to use fixed or pre-set condensers to make up the circuit, but should appreciate values and connections for the purpose.

From the list of your components you obviously have sufficient to build a good five- or six-valve superhet, but if you wish to include a good push-pull stage there are limitations imposed by the mains supply, which is only 60 mA. Really powerful output valves would take about 45 mA, and in push-pull alone would run to 80 or 90, without the remaining valves. In this case the best plan would be to obtain additional mains packs and use the present mains section to operate only the early stages in the receiver, say up to the second detector. The L.F. output stages could then be designed on really sound lines and operated from their own mains pack. In addition to the advantage gained by using a higher output power, the general it may be taken that a battery eliminator would deliver a more constant D.C. mains.

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Special Offer!!! Complete Kit for 13 Mile Short Wave Receiver or Adaptor with Coils, Chassis and Circuit.

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Premier Short Wave Tuning Condensers (L.F.P.), ceramic Insulation. Silver Sprayed Brass Values. Note: Premier 671. 279 each. Double-Lamp, 0.0005, 0.00015, 0.00025, 3/- each. Premiere all-big Short Wave Condensers, 0.00015 with integral slow motion, etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc., etc,
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Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double. In all cases, a minimum of 3 lines per advertisement. Display lines are charged at 4/- per line. Separate columns or advertisements must be prepaid. All communications should be addressed to "MISCELLANEOUS, " Practical and Amateur Wireless, 5 Southampton Street, Strand, London.

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FILTERS.—3-section, 60 watt, 4,500, 3,000, 2,000 ohms, 2/- each; 2-section, 60 watt, 3,000, 2,000 ohms, 1/- each. In sealed cartons, 11/-.


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