

YOUR IDEAL CIRCUIT— See page 379

Practical and Amateur Wireless

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EVERY
WEDNESDAY

Edited by F.J. CAMM

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Publication

Vol. 12. No. 302,
July 2nd, 1938.

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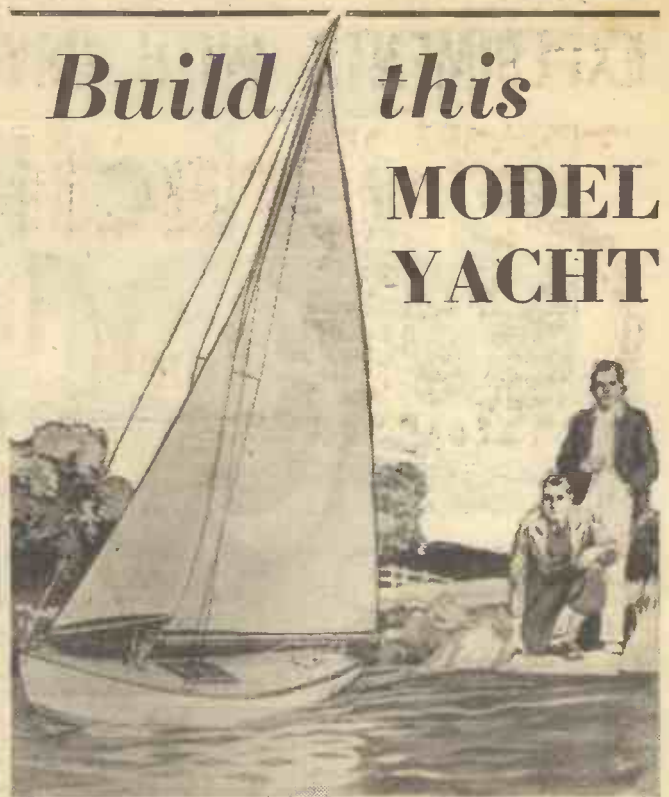
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**6^d
JULY**

EXPERIMENTS WITH CRYSTAL DETECTORS— SEE PAGE 381.



Practical and Amateur Wireless

Edited by F. J. C. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E., Frank Preston.

VOL. XII. No. 302. July 2nd, 1938.

ROUND *the* WORLD of WIRELESS

The Portable Season

THIS time of the year is regarded as the portable season, and the large amount of outdoor listening which is carried on demands the use of a receiver which may easily be transported from the house. The early portable receivers were anything but "portable." Apart from their very large over-all dimensions they were by no means light in weight, and a large number of valves had to be used to obtain adequate sensitivity. We have designed a new portable each year, in which the size has gradually been reduced, and in this issue we describe yet another new model, but this time have incorporated standard components. In spite of this the receiver is most compact and contains a frame aerial winding. Four standard valves are employed and adequate volume is obtained on several stations. In any part of the country it should be a simple matter to obtain entertainment from one or more stations and the receiver follows modern design in that external controls are fitted. To simplify construction and tuning the latest type of condenser has been provided and in this issue we include a scale which may be cut out and pasted to the front of the cabinet to lend an air of originality to the general design.

Police Radio Improvements

WE recently announced that small loudspeakers were to be fitted to police cycles fitted with radio and now news has been received that police cars are also to have this type of speaker as a standard fitment. It will simplify the reception of messages as both the driver and other officers in the car will be able to follow the message and time will be saved by avoiding instructions to the driver after the message has been written down by the operator. It is understood, however, that code is still to be maintained to ensure secrecy.

Unveiling of the Australian War Memorial at Villers Bretonneux

THE last day of the visit of the King and Queen to France will witness the unveiling by the King of the Australian War Memorial, at Villers Bretonneux, in the presence of President Lebrun. The ceremony will be broadcast in the National programme (July 1st).

President Lebrun, it will be remembered, was also present during the broadcasts of the unveiling of the Memorials at Thiepval and Vimy in 1932 and 1936.

The Australian Memorial stands close to the scene of some of the fiercest fighting during the War when, on Anzac Day, 1918, the Australians recaptured the village of Villers Bretonneux from the Germans. The Memorial has been designed by Sir Edward Lutyens, and stands at the end of a drive leading through a cemetery.

Their Majesties, with the President of the French Republic, will leave their car at the gate to the cemetery and walk to the scene

flected in a joint programme by the B.B.C. Midland Regional station and the Columbia Broadcasting System in America, to be broadcast for Midland and Regional listeners on July 4th and in the National programme on July 5th. The English contribution will include an interview with Mr. Carter, resident steward at Sulgrave Manor. This old manor-house was presented to the Sulgrave Institution in 1914 to commemorate the hundredth anniversary of peace between England and the United States, and was restored by Americans.

"China" Clay

IT is claimed that some two-thirds of the world's output of china clay comes from one district of Cornwall: it is used in innumerable commodities, from sunburn lotion to shoe leather. On July 6th (West of England and Regional), S. P. B. Mais will come to the microphone with Alfred Davies, general manager of a china clay firm with its centre at St. Austell, Pit Captain "Marsh" Arthur and Clay Worker Jack Mannell. Listeners will hear how china clay is obtained, what it does, and how its workers live.

Dance Music from America

SATURDAY NIGHT relays of dance music from America are to be broadcast by the B.B.C. during the summer quarter. Details are not yet available, but the first programme will be taken on Saturday, July 9th.

Bow Bells and Beyond

RUSSELL MUIRHEAD, in this new series of talks about Sunday afternoons in London, to be given from July 7th to August 25th, will deal with what can be seen in the open air in the streets and alleys of the city. While guide-books deal adequately with the more orthodox ways of spending such periods—the museums, picture galleries, and so forth—the less formal atmosphere of a broadcast talk suggests something more out-of-the-way. Besides, it isn't everyone who wishes to spend a fine afternoon indoors. Perhaps the most useful feature of the talks is that they will show how on Sunday many parts of London can be thoroughly enjoyable, which during business hours are practically inaccessible to the wanderer.

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of the unveiling. This scene will be described by the B.B.C.'s Director of Outside Broadcasts, Joly de Lotbinière, who will be located close to the Memorial. Listeners will also hear the Ceremonial Service and the speeches by the King and President Lebrun.

Joint Programme with United States

THE historical link between Sulgrave Manor, the Northamptonshire home of the Washington family in the seventeenth century, and Mount Vernon, the home of George Washington in Virginia, will be re-

ROUND the WORLD of WIRELESS (Continued)

Third Test Match at Manchester

HOWARD MARSHALL will broadcast from Old Trafford during the third Test Match between England and Australia, which will open on July 8th. The well-known cricket commentator will be heard at frequent intervals during the days of play.

"Beyond Compère": All-comedy Show

BECAUSE he believes that one man's mirth is another man's boredom, Ronald Frankau, with the microphone wisdom that he has accumulated during

INTERESTING and TOPICAL NEWS and NOTES

Max Kester will produce the show—his first production after a long period of script writing and "vetting."

Variety from Peterborough

MARIE BURKE, the well-known musical comedy star and broadcasting artist, will top a strong bill to be broadcast in the

Bristol A.R.P.

J. D. FRY, Air Raids Officer for Bristol, will explain the progress of the local Air Raid Precautions plans on July 4th in the West of England programme.

The Tynwald Ceremony

AGAIN the Isle of Man's historic legislative assembly will be featured in the B.B.C. Northern programme on July 5th—the day of the annual Tynwald Ceremony on Tynwald Hill—"whereat new laws are promulgated in conformity with the ancient custom of the Isle of Man." The proceedings on the hill will be described by a B.B.C. commentator. This assembly of the Island's own governing body will be preceded by a service in the church of St. John, Tynwald Hill, which will also be broadcast.

"My Lady of the Chimney Corner"

ALEXANDER IRVINE, author of that great story of the heroic fortitude of a working-class Irish family in the latter half of the nineteenth century, "My Lady of the Chimney Corner," is now seventy-five years of age. For a long time he has lived in California, having gone to America when he was a young man. He is returning to this country, as he says, for a last glimpse of his own Ireland, and on July 7th he is to broadcast an extract from his immortal book. The Chimney Corner at Pogue's Entry, Antrim, the setting of his story, has now been preserved for all time. Alexander Irvine has recently written a life of Goldsmith which is being published in the United States.

Northern Entertainment

"MORECAMBE Merriment," on July 6th, will be a microphone tour of four of the shows at this Lancashire resort.

"A Lincolnshire Night's Entertainment," including a broadcast from the Pier Pavilion, Skegness, and another from Cleethorpes Pier Pavilion, will be given on July 7th.



In a tent at Lavernock, near Penarth, on the spot where Marconi carried out his tests, a group of Welsh radio enthusiasts are taking part in a competition with other British amateurs, to establish the greatest number of contacts in communication with the world. A condition is that the transmitting apparatus must be portable and electric mains must not be used. Listening and sending was carried out in relays of twenty-four hours.

more than a hundred broadcasts in ten years, has decided to try out a new idea in a coming B.B.C. production.

For the next edition of his high-speed revue, "Beyond Compère" (National, July 6th), he has devised fifteen three-minute items, all but one of which are of contrasting comedy.

"It is remarkable," he says, "to see how tastes in comedy differ all over the country. I normally have so many different publics that I find it absolutely necessary to have at least four types of repertoire. For instance, radio listeners don't know me as a naughty cabaret artist; cabaret audiences don't listen to the radio, and music-hall goes like something quite different from either. So it seems to me that by introducing many different types of comedy into one broadcast, one is far more likely to give a laugh to everybody at some time or other."

Incidentally, Ronald Frankau has been fortunate in securing for the broadcast that brilliant comedy pair, Mr. Murgatroyd and Mr. Winterbottom, which means that he and Tommy Handley will make another welcome appearance at the microphone. René Roberts is also in the cast; so are Monty Crick, pianist and composer, and the Radio Graces.

Midland programme from the new Embassy Theatre, Peterborough, on July 8th.

Atmospherics

ON July 5th in the National programme listeners will hear the second production of Lord Dunsany's adroit trifle "Atmospherics." It was first produced some eighteen months ago in a programme entitled "Double Track," where it was one of two short plays about railways. "Atmospherics" presents the familiar quandary of the harmless traveller who finds himself in a railway compartment with a homicidal maniac. While the situation is an old one, there are almost unlimited solutions and that produced by Lord Dunsany is ingenuity itself.

Silver Band

THE Coventry Colliery Band, which was started by a few miners and their friends in the village of Keresley, near Coventry, in 1930, and was taken over by the management of the Colliery two years later, is to broadcast a programme on July 3rd. The conductor is George W. Cave, who was appointed in October, 1936, and has adjudicated several times at the Crystal Palace and Belle Vue Festivals.

SOLVE THIS!

PROBLEM No. 302

Jackson built the Hurricane All-wave Three receiver but when tested no signals could be obtained. He accordingly decided to test each stage and connected one tag (negative) of his meter to the chassis. He found, however, that he could obtain no reading at the top caps of the H.F. and detector valves. He assumed, therefore, that the H.T. supply was defective. He was wrong in this assumption. Why? Three books will be awarded for the first correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 302 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, July 4th, 1938.

Solution to Problem No. 301

Brodersen overlooked the fact that the second valve in his set was the detector and accordingly the variable-mus control should not have been applied to it. The following three readers successfully solved Problem No. 300, and books have accordingly been forwarded to them: J. Hough, 5, Barnes Avenue, Ravenstall, Rossendale, Lanes.; J. G. Stonestreet, 1, Cambridge Flats, Cambridge Street, Rugby; G. A. Canning, 47, Beauchamp Road, Emscote, Warwick.

What is Your Ideal Circuit?

ask The Experimenters

Brief Details of a Few of the Circuits which are Considered
Ideal by Different Classes of Constructor

HOW would you reply if you were asked to describe what is, in your opinion, the ideal circuit? It would be very interesting if that question could be put to every reader of PRACTICAL AND AMATEUR WIRELESS and the replies sorted and filed. Unfortunately, it would not be possible to handle all of those replies even if they were forthcoming, so we have taken a simpler step of putting the question to five or six friends who could be classed as "typical" readers.

We were amazed at the variety and divergence of the views expressed, but we did at least draw the conclusion that the "ideal" circuit does not exist. That is, that there is no one circuit that will meet

for operation, so a voltage of 500 could easily be provided for H.T., and an energised speaker could be employed, the field winding being used as smoothing choke.

Quick S.W. Tuning

The skeleton circuit which he drew was similar to that shown in Fig. 1. We have omitted all but the essential particulars, reproducing the circuit in the form that he drafted it in a few minutes on an odd piece of paper. He suggested using three standard, ready-made three-range tuners, but made provision for connecting the aerial input directly to the grid of the frequency-changer for normal short-wave reception. His opinion was that the H.F. stage was

it was proposed to fit a double-ratio slow-motion drive to this vernier condenser; the low ratio would serve for short-wave reception and the higher one for quick trimming on the broadcast bands.

From Fig. 1 it will also be noticed that a 5,000-ohm resistor, in series with an on/off switch, is connected so that it can be placed in parallel with the aerial circuit for local-station reception. The switch would serve as the customary local-distance switch. Since A.V.C. would not be incorporated—and he opined that it served no useful purpose on short waves, where high-speed fading is far more common than slow fading—it was proposed to strap together the two diode anodes, using this part of the valve as a single diode second detector.

In general, our opinion was that this constructor had made a wise selection as far as his own immediate requirements were concerned, although we should probably have been inclined to favour tuners covering two short wavebands, and would probably have included delayed A.V.C.

Semi-automatic Tuning

The second constructor we "cross-examined" had entirely different views and requirements. "What I want," he said, "is a battery set that will give me good reception and decent quality from about three medium-wave and one long-wave stations without the need for twiddling knobs. I used to enjoy doing that and scouring the world, but nowadays I use my set for listening. Of course, I want to be able to bring in a few alternative Continental stations occasionally, but not as a regular thing." Apparently he had become "automatic tuning" conscious.

His idea of a suitable circuit was one with a single H.F. stage, followed by an

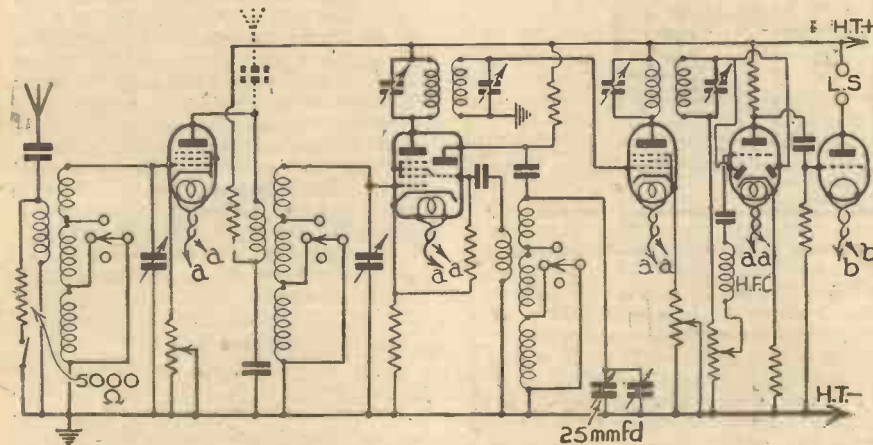


Fig. 1.—An interesting 3-band receiver in skeleton form to show the main essentials.

the requirements of every type of constructor—much less every kind of listener.

Sensitive Three-band Receiver

The first person to whom we popped the question happened to be a constructor and experimenter of wide experience. He is by no means a musician, although he appreciates quality of reproduction to a modest extent. His main requirement is that he should have a large number of stations "on tap," and that reception of any one of them should be reasonably reliable at most hours of the day. This is roughly how he described his ideal arrangement. The set must be a superhet, because selectivity is a prime necessity. It must tune to wavelengths between 17 and 50 metres, as well as covering the broadcast bands. Tuning should be relatively easy and quick on short waves to permit of "following" amateur transmissions. A.V.C. is not essential, because a certain amount of fading on the more distant stations is not troublesome to one who generally listens to each for only a short time. An output of not less than three watts is desirable for use on those occasions when reception of the local stations is being enjoyed.

It was estimated that, to fulfil all of these requirements, the set should have five valves arranged as input H.F. stage, triode-hexode frequency-changer, one I.F. stage, double-diode-triode second detector and intermediate L.F., and a large triode output valve. A.C. mains were available

not essential on short waves, neither was the increased selectivity which it provided. Further to simplify short-wave tuning he would remove the trimmer from the oscillator section of the three-gang condenser, replacing it by a 25 mmfd. variable condenser that would serve for quick

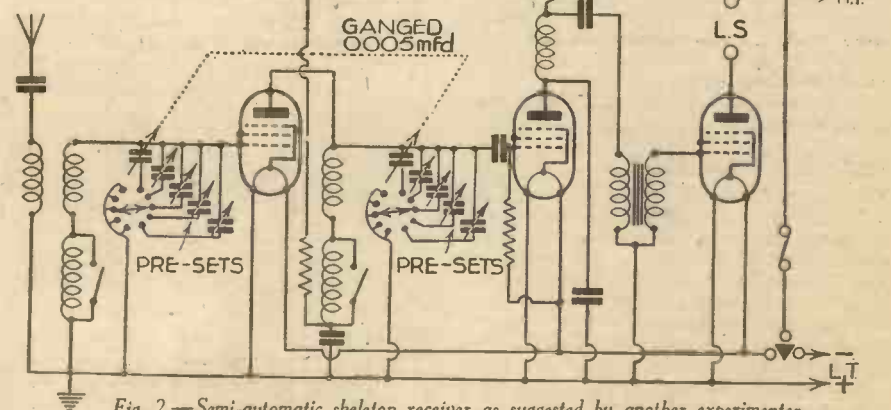


Fig. 2.—Semi-automatic skeleton receiver as suggested by another experimenter.

tuning on the amateur bands. He averred that aerial tuning was fairly flat on this band, so that it was easily possible to change over from one amateur station to another on the same band by means of the 25 mmfd. condenser alone. By the way,

H.F. pentode without reaction, this to be followed by a Q.P.P. output stage. Ordinary dual-range coils would serve, and tuning could be carried out by means of a two-gang condenser "supported" by two banks of pre-sets with a pair of rotary

(Continued overleaf)

(Continued from previous page)

switches for bringing the appropriate pair into circuit. The switches (five-way) should be ganged for operation by means of a single knob, and a suitable assembly could easily be obtained from two or three makers. Skeleton circuit is shown in Fig. 2.

Pre-set "Tuners"

With regard to the pre-sets, he would use those of the moulded type designed really for use as trimmers and padding condensers. Since the range of capacity variation of these is usually fairly small, he would choose condensers of different capacities, each of which could be set for the required transmission. His method of

lines of that in Fig. 3. A triode detector was used and reaction could be applied, but was not necessary unless other than local stations were wanted. A band-pass filter acted as the input tuning circuit, and this was adjusted to give a band-width of about 15 kc/s. After the detector was a first-quality push-pull transformer feeding a couple of Cossor 41MP power valves. These have a rated maximum undistorted output of $1\frac{1}{2}$ watts each, so he estimated that a total output of about two watts could be obtained when the valves received "all that the detector could give them." To make this as great as possible he used a type L.F. valve as detector and applied nearly 160 volts to the anode. A 250-volt full-wave rectifying valve was used, smooth-

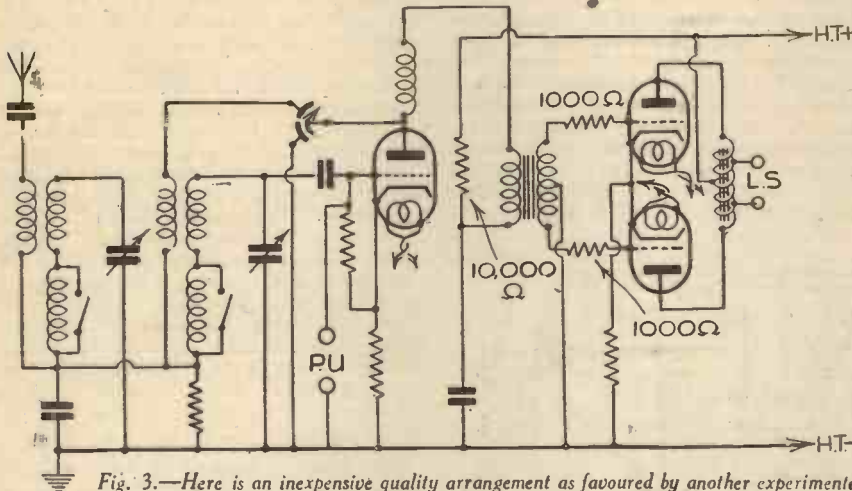


Fig. 3.—Here is an inexpensive quality arrangement as favoured by another experimenter

determining the approximate capacity needed would be to complete the set with the gang variable tuning condenser, decide on what transmissions he required, find the positions of these on the dial, and then estimate the approximate proportion of the total capacity in circuit from the dial reading.

In order to avoid appreciable capacity change after the condensers had been adjusted for each station he proposed to run melted paraffin wax over them. This would be done while listening to the station, so that if any capacity change occurred while the treatment was being applied it would be possible to "readjust and start again." It was proposed to retain the normal wave-change switch, this being used in conjunction with the automatic tuning switch assembly as well as with the variable-tuning condenser. Well, the idea struck us as being sound enough, and we look forward to trying out the set if he continues with the construction—and we believe he will.

Inexpensive "Quality"

Our next "subject" was a "quality fan," but for financial reasons he could not make a set of the rather elaborate type he would like. His ideas ran to a five-stage "straight" set with band-pass tuning between the two H.F. stages, a diode detector, intermediate L.F. stage, and a pair of high-power triodes in push-pull for the output. But that was his dream; in reality something much simpler and far less expensive would have to serve. In this instance he had put his ideas into practice and made a two-stage three-valve set which, when connected to a really good outdoor aerial, would give results approaching those that he desired.

The circuit was worked out along the

ing being effected by means of a 20-henry, 100 mA choke with a resistance of 400 ohms. As the rectifying valve actually gave an output of 260 volts at 60 mA and the total anode-current consumption was approximately 60 mA, the smoothed H.T. voltage was about 235 volts, of which about 8 volts was required for bias. That left nearly 30 volts to be dropped by the tapped output choke and 200 volts for the anodes of the two valves in push-pull.

Despite the simplicity of this general circuit arrangement the results were extremely good. He used a Stentorian "Senior," permanent-magnet speaker, and this did full justice to the output stage. In fact, the set was found to be pretty well what our friend called it: "The poor man's luxury-quality receiver."

Your Suggestions Wanted

In a later chat in this series we hope to tell you about some of the other circuits which are the "ideals" of somebody or other. You might not agree in many cases, but if you do or do not we shall be glad to learn your views. What is more important, we shall be glad if you will drop us a line to tell us what your ideal circuit is like. Don't be afraid if it is perfectly simple and ordinary; if it suits your purpose there is every justification for its use, and it might well be that details of it would be appreciated by other readers. In sending particulars we shall be glad if you will also say why the circuit is in your opinion ideal.

There are no prizes, but it will be in the interests of all concerned if we can pass along your suggestions to thousands of other readers.

READ "THE CYCLIST"
2d. Every Wednesday.

TELENEWS

Forcing the Issue

THE name of Mr. De La Berc has been featured many times in connection with motions he has put before the House of Commons concerning television, and although no date has yet been fixed for it he has now tabled another in which he condemns the use of television in places of public entertainment. His forceful views are based on the monopoly which is now vested in the B.B.C., a situation which he quite rightly claims was not envisaged when the charter was renewed by Parliament. He is anxious to see the charter revised to enable the B.B.C. to meet fairly these new developments in public entertainment, and quite naturally the cinema industry, who are now making such copious enquiries into costs and questions of installing big screen receiver equipment, would like to see the whole position clarified at the earliest possible moment. The London County Council have passed as satisfactory the Baird installation at the Tatler News Theatre, so that exhibitors should meet with no difficulties from their local governing authorities, and although no prices have been announced it is stated that the costs involved will be of the same order as standard talking film projectors. Obviously, the most important part of this projection equipment is the cathode-ray tube, but notwithstanding the very high anode voltages that have to be employed in order to secure a picture of adequate brightness, it is stated that their cost is reasonable. It is anticipated that when the equipment is completely standardised it will be possible to guarantee a working life of 500 hours for the tubes.

An American Set

ALTHOUGH television transmissions in New York are still of quite an experimental nature and the National Broadcasting Station is only on the air for five hours a week (three hours of which constitute the radiation of still pictures and charts), one company has taken the plunge and produced for the market a commercial television receiver. The set itself has a total of 14 valves and is said to cost between £30 and £40. The cathode-ray tube, however, is only 3in. in diameter, while the resultant images are green and white. Furthermore, the set is for vision only, an entirely separate receiver being necessary to pick up and resolve the sound accompanying the television signals radiated from the Empire State Building. The radiated power is 7.5 kilowatts, the respective carrier frequencies being 46.5 megacycles for vision and 49.75 megacycles for sound. While it is claimed that the results are good with this set, the very small picture size makes it more a toy than one for sustained entertainment value. It will certainly have a novelty appeal among those Americans favourably situated for the reception of signals, and it is said that before long a receiver with a 5in. diameter cathode-ray tube will be marketed by the same company. Instead of the more conventional superheterodyne vision receiver a T.R.F. circuit is employed, while tube deflection and focusing is electro static, the frame synchronising impulses being derived from the 60 cycle electric light mains. As this is the first attempt to place any form of television receiver in the hands of the American public, it will be interesting to see what reaction it will have on the market itself.

EXPERIMENTS WITH CRYSTAL DETECTORS

EXPERIMENTS with crystal detectors are not included in the activities of the average enthusiast, and therefore it is proposed to show that while a crystal detector is a very simple piece of apparatus, it offers unlimited scope for the experimenter without involving him in any heavy expenditure.

In spite of their absence from the general market, crystal receivers are still widely used. In fact, there is a strong indication that they are regaining their original popularity due, no doubt, to the demand for perfect quality and to the power of the present-day transmissions.

The fundamental circuit of a crystal detector and its associated tuning arrangements are shown in Fig. 1, where it will

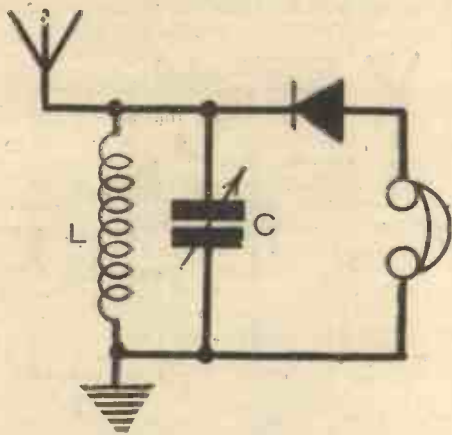


Fig. 1.—The simplest type of crystal receiver.

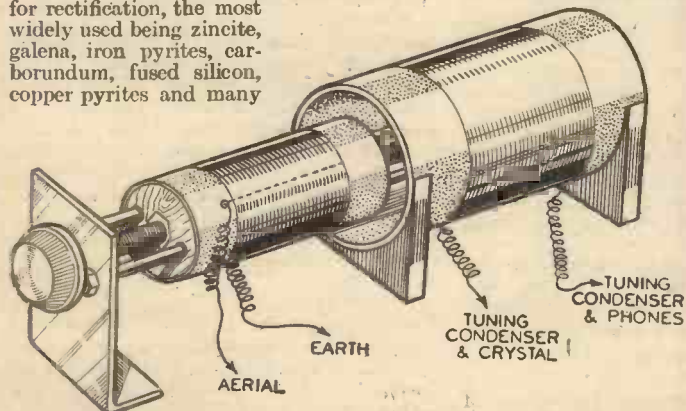
be seen that it represents the last word in simplicity.

The newcomer to radio cannot do better than select such a receiver for his first constructional effort, and, if it is used properly and allowed to form the basis of experimental work, it can prove to be a valuable source of information and interest.

The chief defects of a receiver of this type are its apparent lack of sensitivity and selectivity, but as these are due to the characteristics of the crystal used for detection they can become useful subjects for investigation so far as the experimenter is concerned.

Various Types

There are many forms of crystal suitable for rectification, the most widely used being zincite, galena, iron pyrites, carborundum, fused silicon, copper pyrites and many



others sold under various trade names. They can be divided into three sections, namely, those which are used in conjunction

An Article of Interest to Experimenters who are Keen on New Ideas with Old Components

with a small spiral of fine wire, commonly known as a "cat's whisker"; those used in contact with another crystal; and, finally, those which require the application of a small external current to obtain the greatest efficiency.

Whichever form of crystal is used, it must be appreciated that each specimen of any one kind will possibly show different characteristics, as so much depends on the exposed surfaces and the actual chemical formation of the piece under consideration. It is not fair, therefore, to condemn any combination or arrangement until exhaustive tests have been applied.

All crystals possess a certain resistance. It can vary between 3,000 ohms and 0.1 megohms, and one has to compromise between these approximate limits to obtain the most satisfactory results. For

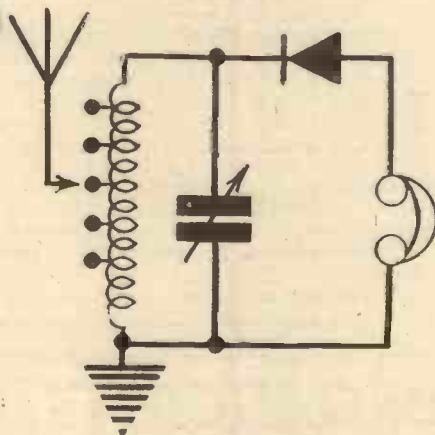


Fig. 2.—Selectivity is obtained in this circuit by tapping the coil.

example, if a crystal having a low resistance is used, considerable "damping" will be introduced across the tuned circuit (CL) with the result that the tuning or selectivity will be flattened out and it will become difficult to separate one station from another. On the other hand, if this trouble is reduced by using a crystal having a high resistance, the sensitivity of the detector will be less. Practical examples of these characteristics are

Fig. 4.—Loose-coupling is obtained in a simple manner on the lines indicated in this diagram.

It is possible, however, to use two crystals in contact with each other, or the carborundum-battery arrangement, to obtain good sensitivity combined with reasonably high resistance, thus allowing the general performance to be improved.

A Simple Scheme

The simple circuit shown in Fig. 1 is only satisfactory for use in an area which comes within the effective field of one transmitting station, as its selectivity is bound to be on the low side, due to the single-coil tuning circuit and the fact that the aerial is connected to one end. The selectivity problem forms most interesting material for experimental work and, in this direction, several suggestions are given below.

The first modification is to provide tapping points on the coil to allow the aerial to be connected down the coil, i.e., towards the earth end. This will have the effect of improving the selectivity, but sensitivity will start to decrease. The idea is shown in Fig. 2, while Fig. 3 shows another system which makes use of two coils, one for the aerial and the other for the detector. This method comes under the heading of inductive coupling and it will be found that the number of turns and the position of L1 with relation to L will directly affect the selectivity.

A Variation

A further variation of this method is given in Fig. 4 and, incidentally, it is amazing the results which can be obtained with it, providing a little care and patience are expended. It will be seen that the aerial,

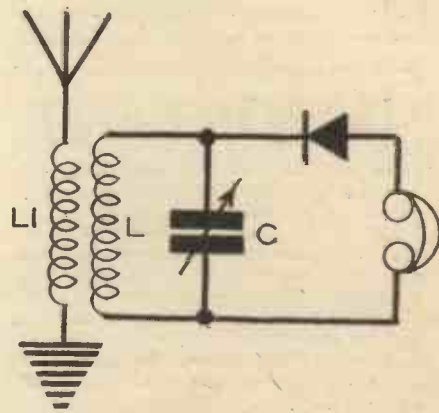


Fig. 3.—A loose-coupled aerial circuit is a still further improvement.

or primary, coil is wound on a separate former which slides inside the former of L, a screwed rod being provided to allow the position of L2 to be adjusted within very fine limits. Experiments should be made to determine the number of turns on L2 or, to carry the idea a step further, the whole system can be arranged as shown in Fig. 5. In this arrangement, tappings are provided on L2 and L, and a simple stud switch provided for each set of windings so that still further adjustments can be made to determine the optimum settings for the circuits.

With a good aerial system and an efficient detector, it will be possible to receive Continental transmissions at satisfactory 'phone strength and, if the output of the

given when one is exploring the surface of a crystal to find the best contact spot for highest efficiency.

receiver is fed into an amplifier, perfect loudspeaker results are obtainable. When experimenting with the winding of such coils, I would strongly advise the use of large-diameter formers and wire of, say, 20 or 22 S.W.G., as it will be found that air-cored coils of less

however, be such that it secures a good grip on the crystal and provides perfect contact. The "two-crystal" type of detector is rather more difficult

to construct, and, therefore, I would suggest securing a commercial product such as the "Diamond" semi-permanent crystal detector, made by the Jewel Pen Company.

One of the most efficient detectors is, of course, the carborundum type, which is shown in Fig. 6. The crystal is held firmly in the cup or clamp C, and the circuit completed by a fine steel point P, which is arranged so that its tension can be adjusted at will. The small battery B can be a single dry cell giving $1\frac{1}{2}$

volts, this being in series with the headphones and the crystal and a fixed resistance of, say, $\frac{1}{2}$ megohm.

If the crystal is finely pointed, the steel needle can be replaced by a steel disc, though the former allows greater selection of sensitive spots. With the carborundum detector, even more than with the other types, it is absolutely essential for the cup or holder to make perfect contact with the crystal to ensure a low resistance between both sides of the circuit. Experiments can be made with different values of applied voltage, and in this direction it may be an advantage to use a potentiometer across the battery.

When using any form of crystal detector,

it must be remembered that the surfaces of the crystal and the contacting points can become oxidised by the action of the

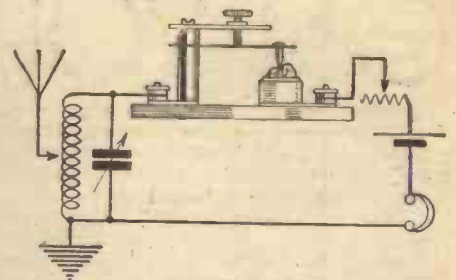


Fig. 6.—A carborundum type detector.

atmosphere, and therefore, if protecting glass covers can be fitted, it is always advisable to do so. Similarly, the crystals should not be handled, otherwise a film of grease will be deposited on their surfaces.

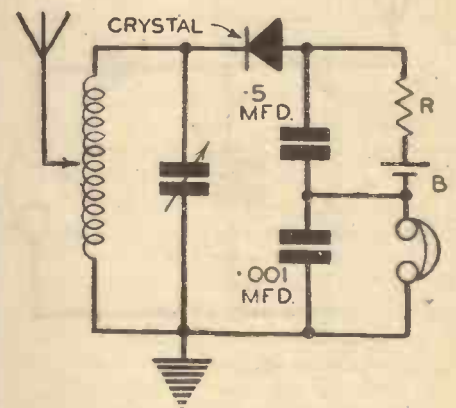


Fig. 7.—Circuit of a crystal receiver incorporating the carborundum type detector.

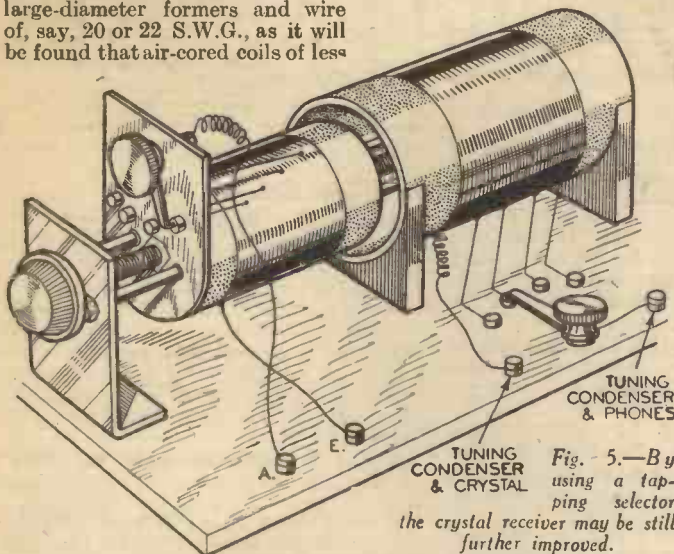


Fig. 5.—By using a tapping selector the crystal receiver may be still further improved.

than 2 inches in diameter are not so efficient for the circuits concerned.

There are many other variations which can be tried. The crystal can be connected down the coil instead of at the top end. For long-wave work, the aerial can be tapped into that section of the coil, while M.W. breakthrough on the L.W.s can be reduced by inserting a suitable loading coil in series with the aerial lead-in.

Detectors

The simple "cat's-whisker" type of detector can be readily made at home, it only being necessary to provide a holder for the crystal and an adjustable support for the "whisker." The holder must,

IMPORTANT BROADCASTS OF THE WEEK

NATIONAL (261.1 m. and 1,500 m.)

Wednesday, June 29th.—Figaro, Acts 1, 2 and 3, from Glyndebourne.

Thursday, June 30th.—Commentary on Individual Darts Championships, from Royal Agricultural Hall, Islington.

Friday, July 1st.—The Unveiling of the Australian War Memorial at Villers Bretonneux, by The King.

Saturday, July 2nd.—Commentaries on the King's Cup Air Race and Lord's Varsity Match.

REGIONAL (342.1 m.)

Wednesday, June 29th.—Dance Cabaret, from the Royal Bath Hotel Ballroom, Bournemouth.

Thursday, June 30th.—Irish Dance Music.

Friday, July 1st.—B.B.C. Ballroom.

Saturday, July 2nd.—The Shooting of Kara-Wenzel, a tragedy of lonely childhood, by Morna Stuart.

TELEVISION

Wednesday, June 29th.—The Old Firm's Awakening, a comic opera. Animals from the Zoo.

Thursday, June 30th.—Finals from the Centre Court at Wimbledon. Picture Page, 159th and 160th editions.

Friday, July 1st.—Tennis from Wimbledon. Rogues' Gallery, a revue of highwaymen's songs.

Saturday, July 2nd.—Tennis from Wimbledon. On the Spot, by Edgar Wallace.

MIDLAND (296.2 m.)

Wednesday, June 29th.—Birmingham Centenary Pageant Rehearsal, from Aston Park, Birmingham.

Thursday, June 30th.—Malvern and District Schools Music Festival, from the Winter Gardens, Malvern.

Friday, July 1st.—Handel organ concertos, from The Institution for the Blind, Edgbaston, Birmingham.

Saturday, July 2nd.—Instrumental programme.

NORTHERN (449.1 m.)

Wednesday, June 29th.—After Dinner, light entertainment.

Thursday, June 30th.—Checkmate, a Chess Ballet, by Arthur Bliss; orchestral programme.

Friday, July 1st.—Southport Night's Entertainment.

Saturday, July 2nd.—Dancing Here and There: Dance music from the Palace Hotel, Buxton, and the New Central Pier, Morecambe.

WEST OF ENGLAND (295.7 m)

Wednesday, June 29th.—Dance Cabaret,

from the Royal Bath Hotel Ballroom, Bournemouth.

Thursday, June 30th.—Three Thumb Prints, by Cedric Wallis.

Friday, July 1st.—Training for the Land, from the Farm Institute, Sparsholt.

Saturday, July 2nd.—Composers of the West—Pearsall: choral programme.

SCOTTISH (391.1 m.)

Wednesday, June 29th.—Concert Party programme.

Thursday, June 30th.—Scottish Dance music.

Friday, July 1st.—Round the Tower: News from Bellahouston, a talk.

Saturday, July 2nd.—A Festival Concert by prize winners from the eighteenth Edinburgh Musical Festival and the twenty-eighth Glasgow Musical Festival, 1938.

NORTHERN IRELAND (307.1 m.)

Wednesday, June 29th.—Dance Music, from the Northern Counties Hotel, Portrush.

Thursday, June 30th.—Irish Dance Music.

Friday, July 1st.—A Ballad Concert.

Saturday, July 2nd.—Finn the Red, an improbable Irish legend, by J. R. Mageean.

ON YOUR WAVELENGTH



By *Thermion*

Radiolympia

WHEN I first heard that television and radio receivers were to be permitted at Radiolympia, to work from a radio-frequency input (in contrast to the previous scheme of having only a low-frequency input from a central distribution box) I had some qualms regarding the confusion which might be caused by the visiting public. I am now relieved to see that there will not be any such confusion and that certain regulations are to be enforced to ensure that consternation will not be caused by uninformed visitors turning up the reaction control. The working receivers have to be placed out of reach of visitors on the stand and will be in charge of a qualified operator. You will still be able to judge the overall H.F. gain or the general L.F. response of the receiver, however, and on some stands receivers may be found working "on the front" but these will have an L.F. input as in previous years and the controls will thus be ineffective.

The television receivers will, of course, be similarly disposed, and there will be no risk of the pictures being lost or distorted due to every passer-by being tempted to twiddle the knobs. I think all fans will find this year's exhibition will eclipse all previous records, and in spite of the absence of the variety show—which should, of course, have no place in an exhibition of this sort—I do not think for one moment that the attendance will fall off. Rather do I feel that more interested visitors will attend as they will be assured of being able to judge of the performance of the receivers in every section, rather than to hear merely a speaker reproduction of a quality broadcast from records in the B.B.C. operating booth.

The I.B.U.

THE International Broadcasting Union, which has as its members most of the broadcasting services of Europe and Overseas, has just held its annual summer meeting at Ouchy (Lausanne) under the presidency of Monsieur A. Dubois (Holland). This meeting was of particular interest this time, because the business included a preliminary examination of the European wavelength plan in the light of the decisions of the Cairo Conference and was followed by a

special conference of experts on the subject of broadcast talks.

The World Conference on Telecommunications, which was held at Cairo in February and March this year, decided upon certain readjustments of the bands of wavelengths reserved for broadcasting. It decided in addition that the wavelength problem in European broadcasting should be examined and possibly revised at a conference of European Administrations which will take place in Switzerland next February.

After the summer meeting of the U.I.R. the first of the conferences of experts on programme matters will be held. It will be devoted entirely to problems concerning talks. Fifteen written reports prepared by experts of different countries will serve as the basis for these discussions.

The Council of the U.I.R. also examined at Ouchy some proposals made by the Programme Committee (under the presidency of Monsieur C. A. Dymling, Sweden) concerning a suggested international transmission for the New Year 1939, which will consist of an exchange of greetings; and also a fifth World Concert which will be given during the autumn of 1938. A report will also be presented on the compilation of an international vocabulary of radio terminology.

The Juridical Committee (presided over by Dr. L. Sourek, Czechoslovakia) examined a number of problems which are of an international character or have an international bearing, notably the question of the unauthorised use of broadcast programmes.

Second-hand Sets

I HAVE received another interesting letter on this subject. This is what J. W., of Derby, says:

"Your paragraph re 'Second-hand Sets' (Practical and Amateur Wireless

June 18th) was of particular interest to me. A short while ago I wished to acquire a second-hand set for occasional use in a garage office, and asked to hear a locally built (commercial) mains S.G.3 priced at 45s. in a dealer's window. It worked, but that was all; both volume and quality being about freezing point. However, as my examination of the 'innards' revealed that the valves appeared newish and that the first two valves seemed to be in each other's holder, I decided to chance it. The variable-mu valve was in the detector stage, and plain S.G. in H.F. holder. The dealer told me that one control, which made no apparent difference when operated, was the volume control for the P.U. Yanking out the chassis I found a coil wire adrift, which proved to be the reaction lead! You will probably have guessed the rest. I surmised at the time that new valves had been bought to restore the lost volume, swapped about in desperation, and then 'packed up' in exasperation. The speaker was an 8in. Rola P.M., so ultimate result was jubilation."

Humour

TWO readers send me some examples of radio puns, which they say they have extracted from a magazine:

- If she wants a date . . . Meter!
- If she comes to call . . . Receiver!
- If she wants to be an angel . . . Transformer!
- If you think she is picking your pockets . . . Detector!
- If you think she is false . . . Tester!
- If she proves your fears are wrong . . . Compensator!
- If she eats too much . . . Reducer!
- If she is wicked . . . Convertor!
- If she is impetuous . . . Resistor!
- If she is annoying . . . Cursor!
- If she is wrong . . . Rectifier!
- If her hands are cold . . . Heater!
- If she is unsteady . . . Stabiliser!
- If she seems out of tune . . . Tuner!
- If she wants a holiday . . . Transmitter!
- If she talks too much . . . Interrupter!
- If her views are wrong . . . Corrector!
- If she is thin . . . Amplifier!
- If she is fickle . . . Eliminator!

S O S

HAROLD WILLIAMS (G₃LK), of 21a, Brunswick Square, Hove, Sussex, has asked me (if I am not foully "moidered" at dead of night by out of work crooners) to announce that his QRA is badly screened by tall buildings so he has erected a number of antennas with a view to collecting reports and thereby deciding the most effective. He will greatly appreciate reports on his 7,105/14,210 kc/s transmissions. He will be pleased to acknowledge and correct reports.

New Lucerne Plan

AFTER the Cairo Conference to decide wavelength changes necessitated by new stations coming on the air, as well as by the great increase in the power of present transmitters, it is likely that there will be a new Lucerne Plan in January and a reshuffle of the existing wavelengths. Even so, the problem of the pirate stations will remain. It is difficult to find a basis for agreement on these matters. If you take the populations of the various countries concerned, China with its 480,000,000 should have the greatest say. One effective method of curing the pirates is to jam them. One finds rotten little bankrupt states grabbing the cash for sponsored programmes, operating on pirate wavelengths, and holding their fingers to their noses to the rest of the world. They ought to be stopped.

How Many "Tubes" ?

I SUPPOSE I ought to have said "Toobs" so that my "ridm" loving friends would understand. However, in America, where the standards of commercial veracity differ from ours, there has been a move, I learn, to count dial lamps, tuning indicators, barretters and ballast devices in their descriptions of the number of valves a set contains. The R.M.A. has settled upon a definition for the word "tube." This definition says that a tube is: "A device used in radio equipment in which an electric or magnetic field causes or controls electronic or ionic conduction through a vacuum or a gas. This definition shall not be construed to mean dial lamps used for illumination only, ballast or other resistance devices; thus, rectifiers cannot be included in the description of the number of valves a set contains."

"As She Is Spoke"

HEADLINE in a trade paper: "Two Pye Push Button Sets—One With No Manual Tuning." At the next Radio Show I want to see the device known as "No Manual

Notes from the Test Bench

Press-button Tuning

SEVERAL readers have asked how to incorporate push-button tuning in existing receivers. There are two methods—either the existing condenser may be removed and a push-button unit inserted in its place, or a complete tuner may be built and added. In this case a frequency-changer stage is the simplest arrangement, making this up after the style of a simple short-wave converter, but using ordinary tuning coils. This can, of course, only be used with a receiver employing H.F. tuning. Separate push-button units are available from several firms, and details of the various models will be published in these pages shortly.

Earth Connections

THE recent details about earth troubles has led to a comment regarding the use of battery sets without earth connections. It is pointed out by some readers that their simple battery receivers may be used without an earth and that results are just as good as when an earth is employed. There may be two reasons for this. Firstly, the earth connection is inefficient and thus is not functioning properly, or, secondly, the batteries are so placed that they are close to a stone floor or wall. In this case they will often act as capacity earth connections, and at one time it was quite a common thing to place the batteries on a large sheet of copper (or copper gauze) placed underneath the carpet. If this type of connection is found workable it will often prevent interference which may be introduced via an earth connection.

Mains Smoothing

A MAINS receiver was recently tested in which the H.T. supply was low. It was eventually found that the trouble was due to a damaged rectifying valve which had been over-run. The output is governed by the capacity of the smoothing condenser joined across it, and the most usual value is 4 mfd. In an endeavour to remove hum the constructor had placed a 10 mfd. condenser across the rectifier, and as this had not proved effective had placed a further condenser of the same value in parallel. It will generally be found, however, that increasing the capacity of this condenser will not improve hum troubles, and it is the condenser on the set side of the smoothing choke which should be increased in capacity, although it is generally of little use going beyond 8 mfd. If this does not remove the hum it is not due to an insufficiently smoothed H.T. supply.

Tuning." I know there are a number of sets without manual tuning, but I want to see one with no manual tuning.

Autumn Talks

ADVANCE details of the three autumn series of talks designed primarily, though not exclusively, for Discussion Groups are now available.

As last year, one series with the title "Men Talking" will be given over to impromptu discussions. These will be quite unrehearsed. In the studio will be a group of men and women who will start talking a few minutes before the microphone is made alive and will carry on after the broadcast is over. Listeners will thus be in the position of hearing a completely spontaneous conversation on which they are not only permitted but encouraged to eavesdrop, and then to continue the discussion themselves in their own Group. There will be eleven talks, all on the National wavelength, starting on Monday, October 3rd, from 8.0 to 8.20 p.m., and I feel that this idea could be carried even further. Eavesdropping is a good idea, properly applied.

Three years ago Discussion Groups listened to a series of talks entitled "Ways and Means," in which was embodied a comprehensive analysis of the economic structure of Great Britain. A new series, entitled "Class: An Enquiry," will be a study of the social structure of the country to-day. The first of a series of eleven talks will be heard on Tuesday, October 4th, from 7.30 to 8.0 p.m. in the National programme. The question of what constitutes differences of class will be examined and the bad effects of class distinction, such as snobbery and inequality of opportunity, will be weighed against the good.

American Valves

MY post-bag shows that there are still many experimenters who find interest in trying out circuits originating in other countries. One of the drawbacks of such experiment is the fact that some components and valves abroad are not of the same high quality or performance as the English counterparts. This is especially so in the case of valves, and I have had many complaints regarding these. It appears that in America it is customary to sell two classes of valve—those which are "good" and those known as "seconds." Far too many experimenters appear to be influenced by the low price of the latter and then blame a circuit because it does not work properly.

THE STEEL-TAPE RECORDER

Some Interesting Details of the Latest Marconi-Stille Apparatus

FOR many years experts have investigated the many problems associated with various methods of recording and reproducing sound waves for gramophone, talking film or broadcasting purposes. The Marconi processes for electric recording on gramophone discs and the successes obtained with the "Visatone" film recording and reproducing equipment are now well known, and the Marconi Company have developed a new model of the Marconi-Stille Recorder and Reproducer Equipment for broadcast and other purposes.

A consideration of the various methods of sound recording and reproducing which might be applicable for broadcasting purposes shows clearly that the magnetic system which the Marconi-Stille utilises, possesses many important advantages over other systems.

Apart from the magnetic method the other processes which can be adapted to the recording and reproduction of sound for broadcasting purposes may be divided into two main groups, viz.: (1) Optical or film methods and (2) Mechanical or gramophone methods. There are many systems or processes which although they differ in detail can be classified under these groups and possess the same general features.

The magnetic recording system has the very important advantage over other methods in that recording and reproduction can be effected simultaneously and this affords a very simple method of checking any loss of sensitivity or deterioration of quality in the complete recording reproducing process.

Amongst other important advantages which the Marconi-Stille system possesses may be briefly mentioned the following:

- (1) An uninterrupted record of 35 minutes duration is provided, which is very much longer than that obtainable with the majority of other methods.
- (2) The apparatus is very simple to handle and no chemical methods of developing, as in the film method, or any apparatus requiring delicate mechanical adjustments, as in the wax recording methods, are used. As the process used is electrical throughout, no

specialised knowledge, apart from that which is already possessed by the technical staff of a broadcast studio, is required to operate the Marconi-Stille recorder.

- (3) The record can be reproduced indefinitely with inappreciable loss of sensitivity or deterioration of quality.
- (4) When a record is no longer required, the programme recorded on the strip can be "wiped out," and a new programme recorded thereon. This process can be carried out indefinitely.
- (5) When required, a special continuous record can be made which will repeat any given announcement or phrase of music automatically and indefinitely without any attention.

Use of Two Machines

In many cases the demands of a broadcasting service cannot satisfactorily be met by the use of only one machine, and in such cases the use of a second machine offers a number of facilities among which may be briefly stated the following:

- (1) One programme can be recorded for any length of time, and if longer than 45 minutes, can be reproduced immediately after its close.
- (2) A continuous programme of any duration can be reproduced.
- (3) A programme of 30 minutes' duration can be recorded simultaneously on two machines.
- (4) Two programmes each of 30 minutes' duration can be reproduced simultaneously, if the control of one be undertaken by the control room.
- (5) One programme can be recorded while a second is reproduced if both are of 30 minutes' duration and the latter is controlled by the control room.
- (6) It is a simple process to piece together various programme items to make a continuous composite programme which can be reproduced without any break or interruption.

It is also easy to "wipe out" parts of a programme and insert a record of completely different matter in the place thereof. For instance, in the case of a dialogue between two speakers A and B, the replies of B

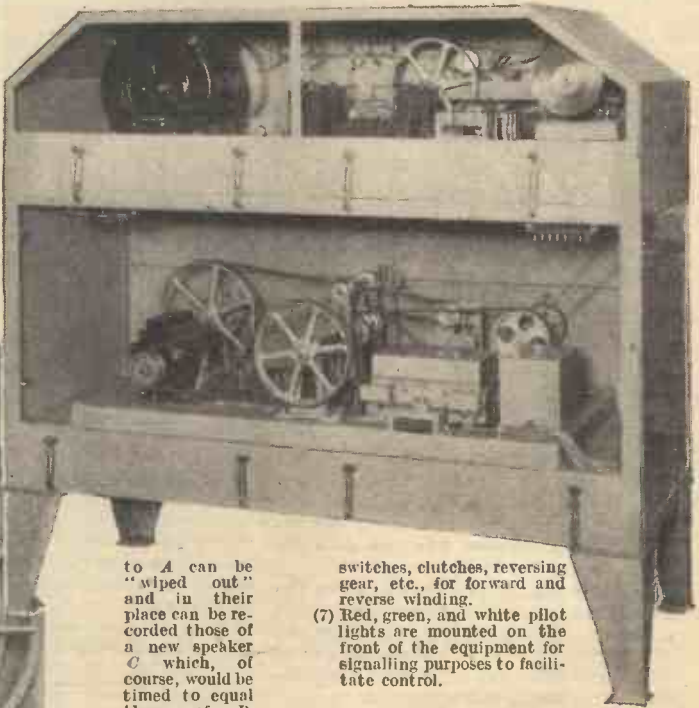
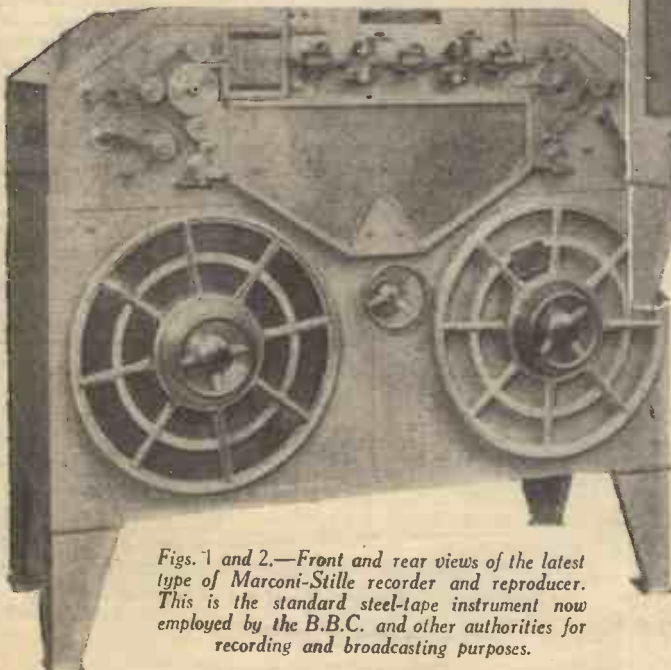
commodated in a single amplifier rack. In addition a control panel and jack-field are supplied for mounting in the control room.

It should be noted that two different programmes cannot be recorded simultaneously unless the further addition of a second control panel and a second programme meter are undertaken.

Improvements

The latest model of the Marconi-Stille equipment, the Type M.S.R. 3 incorporates several important improvements as a result of the wide experience gained with the earlier model. Amongst these improvements may be briefly stated:

- (1) Simplification of the "heads" which ensures greater reliability in obtaining high-frequency response, decreased distortion and improved signal-to-noise ratio.
- (2) A slow-speed synchronous motor which drives the tape at a constant speed through a special type flexible coupling, and an oil-damped flywheel.
- (3) Provision of two tape reservoirs, each of which contains a slack loop of tape, both before and after the constant speed drive, thus ensuring complete mechanical decoupling between the latter and the unwinding and rewinding mechanism.
- (4) The tape is rewound backwards at approximately twice the normal forward speed, thus saving considerable time when a part or whole of the record is to be repeated in a later programme.
- (5) Expanding hubs are provided for the tape spools, thus ensuring that spools with slightly differing internal diameters are securely held on the hub.
- (6) A single control wheel which operates all



to A can be "wiped out" and in their place can be recorded those of a new speaker C which, of course, would be timed to equal those of B, without leaving any aural indication on reproduction that this had been done.

- switches, clutches, reversing gear, etc., for forward and reverse winding.
- (7) Red, green, and white pilot lights are mounted on the front of the equipment for signalling purposes to facilitate control.

The provision of a second machine does not entail more than the provision of duplicate recording and reproducing amplifiers which are ac-

The operations of starting and stopping the machine, adjusting the levels for recording so that the strength on a loudspeaker at input and output is the same, are all relatively simple to those used to handling broadcast studio apparatus. The apparatus as a whole and in detail has been designed so that it is in accord with normal studio apparatus. The equipment is capable of providing an output signal power of 1 milliwatt and of recording an input signal 20 db. below this power, but lower inputs and higher outputs can of

Figs. 1 and 2.—Front and rear views of the latest type of Marconi-Stille recorder and reproducer. This is the standard steel-tape instrument now employed by the B.B.C. and other authorities for recording and broadcasting purposes.

course be used. It will be found, however, very convenient as a normal practice to work to an equal input-output basis as this greatly simplifies the problem of studio control.

The general principle of magnetic recording has been known for a long time, and was utilised by V. Poulsen in the Telegraphone, but it has only been comparatively recently, as a result of experiment and research into the magnetic phenomena involved and by the utilisation of modern methods of amplification and frequency response correction, that it has been possible to produce practical apparatus which would meet the stringent requirements of sound reproduction for broadcast purposes, and the Marconi-Stille equipment is the result of this work.

The Marconi-Stille machine is designed to operate from a medium pressure 50 cycle three-phase supply, and incorporates the necessary mechanism for driving the steel tape at a uniform speed through the electromagnetic apparatus which produces a varying magnetic flux in the tape in the case of recording, or translates the magnetic record into currents of varying amplitude for reproduction purposes.

In the amplifying and control panel are placed all the necessary amplifying, equalising and control equipment, to enable the programme current from the microphone amplifier, which forms part of the normal

winding, i.e., recording or reproducing, the tape is pulled off the spool B by a motor driving the wheel D, the tape then forming a loop in the reservoir at F. The tape is then pulled out of reservoir F and through the heads by the constant speed motor driving the wheel C, after which the tape forms into a loop in the reservoir at E, from which it is drawn and wound on to the motor driven spool A.

The reservoirs F and E are each provided with metal strips H and G, respectively, with which the loop of tape can make contact. Such contact causes a gas-filled relay to actuate electromagnetic relays, which in turn cut in or out resistances in the circuits of the motors driving the wheel D and the tape spools A or B, and thus make the necessary changes in speed to maintain single slack loops in the reservoirs. The provision of the tape reservoirs before and after the constant speed drive ensures complete mechanical decoupling between the latter and the motors drawing the tape from the spool B and winding the tape on the spool A.

The constant speed wheel C is positively driven in the forward direction to control the tape speed, while in the reverse or rewinding direction the wheel is driven by the tape passing over it in the reverse direction.

For reverse or rewinding the tape

purposes the spool B is driven through reverse gearing by the motor used to drive spool A in the forward direction.

The normal forward tape speed is 90 metres per minute.

It will be seen that when recording or reproducing, the tape is drawn past the poles of three sets of special electromagnets, each

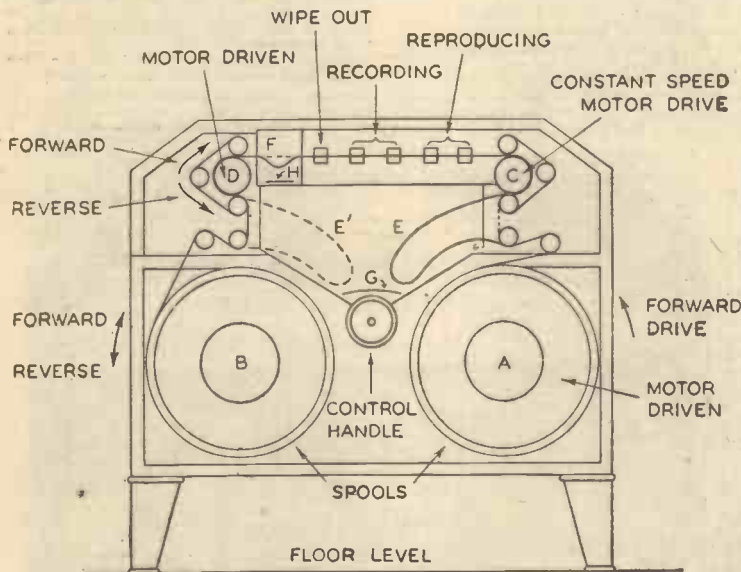
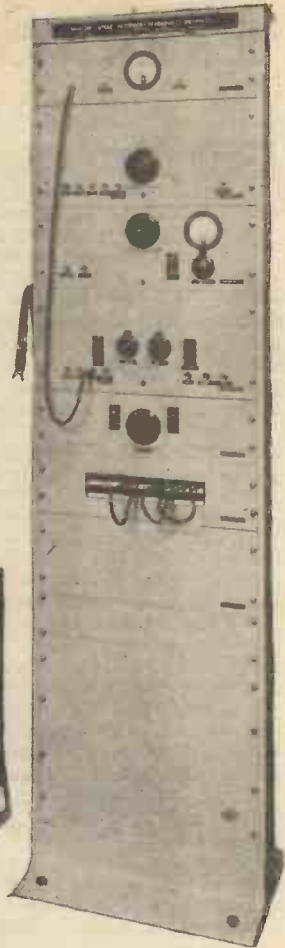


Fig. 4.—A diagrammatic sketch of the machine.



Fig. 5.—The switch panel.



studio equipment, to be recorded on the tape at the correct strength, and when required, either at the instant of recording or at any subsequent time, to be reproduced at the same strength as was put into the equipment.

The power supply unit provides for the rectification and control of the high-tension and low-tension energy for actuating the amplifying equipment, which in the normal equipment is designed for a medium pressure 50 cycle single-phase supply.

A loudspeaker unit which contains its own amplifier and rectifier can be supplied as an addition to the equipment in cases where local facilities are not already available.

Description of Recorder and Reproducer

Considering each unit in more detail, Fig. 4 is a diagrammatic sketch of the machine itself which has been drawn to illustrate the tape-driving mechanism.

From this it will be seen that for forward

from spool A back on to spool B the wheel D is driven in the reverse direction, thus drawing the tape direct from the spool A, without any loops in the reservoirs at F and E, as shown by the dotted lines. The tape then forms a loop at E¹, in the reservoir from which it is drawn and wound on to the motor-driven spool B, the slackness of the loop at E¹ controlling the speed of the motor driving the spool B. For rewinding

set of which has a separate function to fulfill. The first head encountered by the tape is called the "wipe out" head. Its function is electrically to eliminate any previous record on the tape, whilst the second head, the "recording" head, translates the currents from the microphone into magnetic flux variations on the tape. The last head encountered by the tape translates the varying flux into currents again and is termed the "reproducing" head. The recording and reproducing heads are in duplicate, thus providing a spare head for each of these functions. The heads are very similar in construction, but they are used in different circuits.

The "wipe-out" and "reproducing" heads employ a single pole piece only, and no critical adjustment is therefore necessary.

The "recording" head has two pole pieces and is provided with a micrometer adjustment so that the longitudinal separation of the pole pieces can be accurately adjusted. All the heads have a micrometer for adjusting the pressure upon the tape.

The heads of the machine are connected by screened twin leads to their appropriate places on the amplifying and control rack.

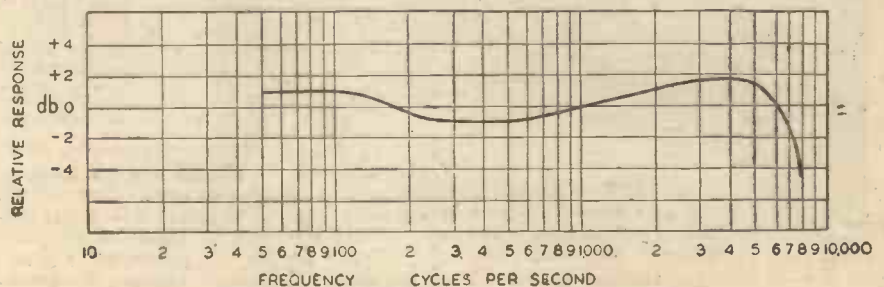


Fig. 3.—A typical over-all frequency response curve.

A PAGE OF PRACTICAL HINTS

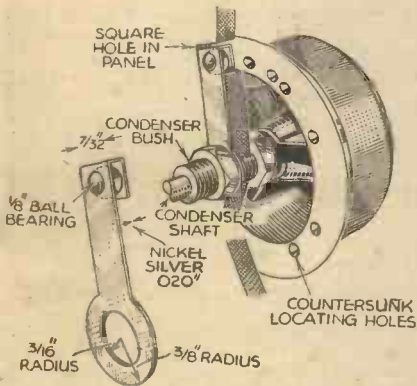
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Setting Device for Tank Condensers

THE accompanying sketch shows a simple ball-catch attachment for setting a "tank" condenser control-knob in pre-determined positions. The rear face of the control knob (dial) is drilled radially with a series of shallow countersunk holes in the desired locating positions; a folded spring (.020in. nickel silver), as illustrated, holding the ball-bearing ($\frac{1}{8}$ in. diameter), is secured between the condenser bushing and the control panel. It projects through a small square aperture in the panel, incidentally preventing any slipping, and



A suggestion for locating the control of a tank condenser.

allows the ball to engage in the locating holes in the dial.

It is evident that, despite the simplicity, the addition is designed to be completely obscured by the control knob, so as not to detract from the appearance of the panel lay-out.—WM. A. HARRISON (Aintree).

An Inexpensive Home-constructed Relay

THE parts for this relay are to be found in every constructor's junk box. A brass bar, about 2ins. long, carrying at its upper end a magnet from an old head-telephone, is mounted on the base of an empty bakelite shaving-soap case. On passing a current through the magnet, the piece of soft iron, fastened to a strip of springy brass, is attracted to the magnet, causing the ends of the two insulated screws to come into contact, thereby completing the secondary circuit. The leads from the primary and secondary circuit are led out through a threaded bushing which also serves to mount the relay. The current required to operate the magnet may be obtained from an old high-tension battery or from the mains via a 10,000 ohm resistance.

I have used this device with every satisfaction as a keying relay for my transmitter, but, of course, it has many other uses.—A. N. SMITH (2DJT) (Nottingham).

THAT DODGE OF YOURS!

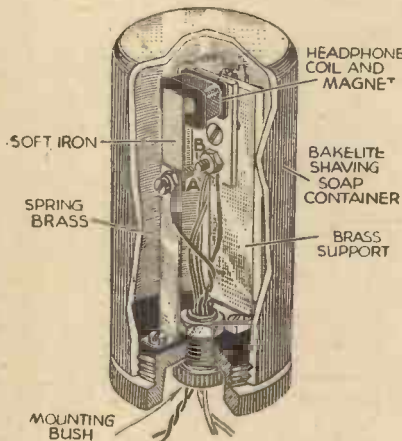
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account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

SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page 400.

Aerial Tensioning Device

OWING to the recent high winds, I found that a tensioning spring on my aerial was stretched from its normal length of 1ft. 6in. to about 5ft. One end of the aerial is fixed to a fairly high tree, and the other end is fixed to a chimney, and naturally, as in a wind the chimney stays put, and the tree moves, something has to give, and to save the aerial from breaking



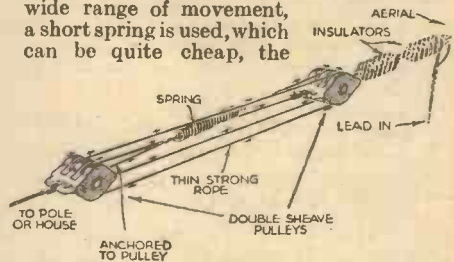
Details of Mr. Smith's home-made relay.

it is necessary to use a spring. I found, unfortunately, that an ordinary spring is not nearly long enough, or elastic enough, unless you are prepared to pay a high price; this defect I overcame by this simple dodge.

All that is needed is a short, stout spring, a length of thin rope, and two small double sheave galvanized iron pulleys. The aerial is joined through an insulator to one end of one pulley and the fixing rope is joined to one end of the other pulley, the rope and the

spring are then threaded and fixed to the other ends of the pulleys; the result being that though the aerial wire moves a great deal the actual spring does not.

The advantages of this are that an even tension is kept on the aerial wire for a wide range of movement, a short spring is used, which can be quite cheap, the

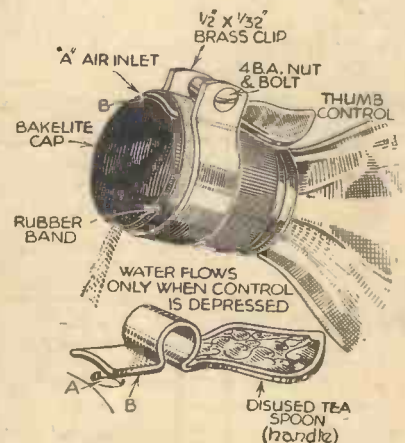


Aerial tensioning difficulties are overcome by this arrangement.

spring is never stretched past the elastic limit, there need be no fear of the aerial breaking.—K. S. FITEL (Leigh-on-Sea.)

A Novel Flow Regulator for Distilled Water

AS I use a large block of accumulators for H.T. supply I experienced a deal of trouble when topping up owing to the close proximity of the filler holes. The idea suggested itself one day, and with the aid of a large wine bottle, and a disinfectant



A flow regulator which has many applications.

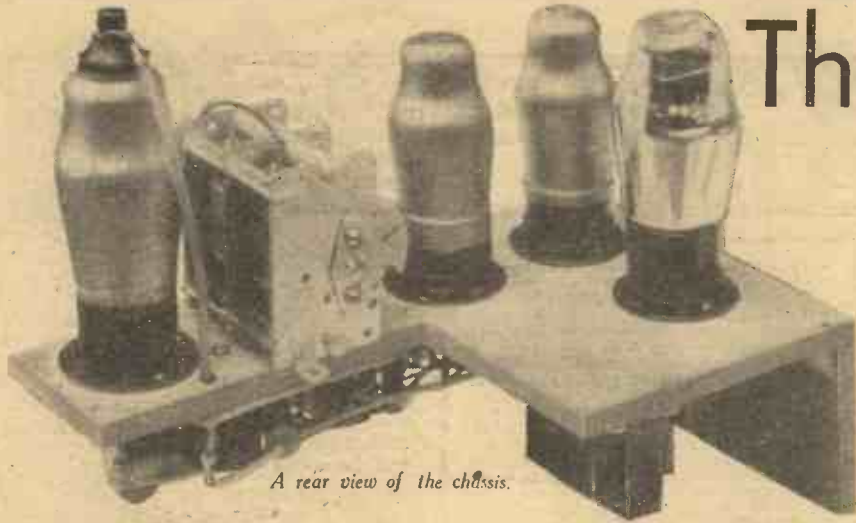
cap, I constructed the thumb control illustrated. The modification of an old tea spoon, as shown, provided a solution to the control piece, and with a thin rubber band "B" clamped underneath the brass clip, the self-restoring of the control was simply attained.

The air inlet hole and the outlet holes were both done with $\frac{1}{8}$ in. and $\frac{3}{8}$ in. drills respectively, and to make doubly effective the closing of the valve, a thin piece of rubber was glued to the underside of the control over the inlet hole.—F. E. WALTERS (London, E.7).

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A rear view of the chassis.

The "COMPASS"

Preliminary Constructional weight Portable Incorporat

EACH year we present during the summer season a design for a portable, and each succeeding model introduces new ideas, always making a main feature of compactness and portability. This year's model, presented on these pages, makes use of standard components, and the finished appearance of the receiver may be judged from the illustration at the top of the opposite page. It will be seen that this is strictly in accordance with modern ideas, with external controls, a large tuning scale, and it is entirely self-contained. We have this year dispensed with the throw-out aerial in view of the fact that the majority of listeners appear to favour the frame aerial arrangement. An important point about this particular receiver is that the dial is given on the opposite page and has to be cut out and attached to the cabinet. This enables an air of novelty to be

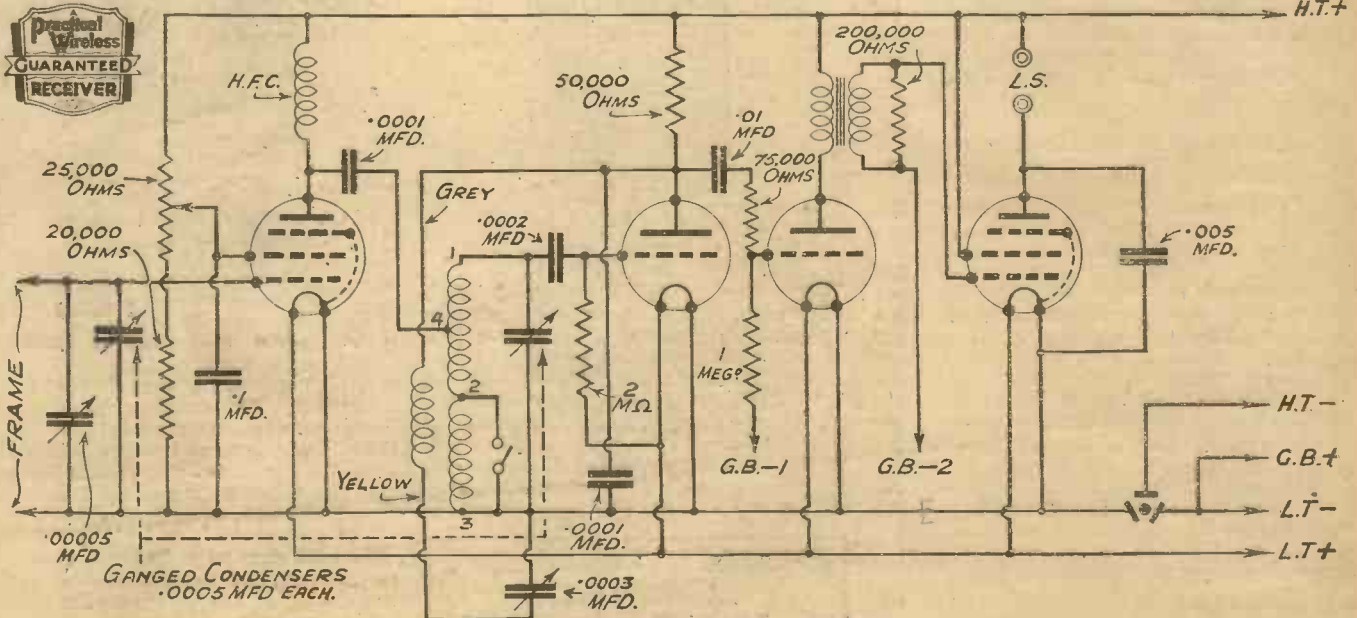
given to the finished receiver and at the same time reduces the initial cost. It will be seen that the condenser is of a special modern type, which avoids the necessity for purchasing a separate slow-motion tuning drive. The cabinet may be made at home, or it may be purchased ready made from the advertisers in this paper, and the same remarks apply to the frame aerial. Details for winding this, together with operating notes, will be given in our next issue.

The Circuit

Although a standard type of 4-valve circuit has been adopted, it should be noted that we have not employed in this particular case a valve of the variable-mu type for the H.F. stage. Instead, a straight H.F. pentode is used here and volume control is effected by varying the screen voltage

through a potentiometer connected across the H.T. supply. The tuning circuit for this valve is the frame aerial, Litz wire being employed for the medium-wave winding, and a section of the two-gang condenser being used for tuning. To ensure accurate adjustments at all parts of the wave-range a separate small trimmer is employed across this section.

Coupling between the H.F. and detector stages is by a tuned-grid winding, a tapping on the coil being utilised to remove damping. This coil is a midget com-



Theoretical circuit of the 'Compass' Portable 4.



S" PORTABLE 4

Details of a New Light- g Standard Components

ponent, unscreened, but placed in such a position that no interaction takes place and wiring is kept to a minimum. The detector valve, a triode, is coupled to the first



at view of the chassis with the H.T. and L.T. batteries in position.

L.F. stage, also a triode, by means of a resistance-capacity coupling, and the L.F. valve is fed to the output pentode through a direct-coupled L.F. transformer of high ratio.

Controls

This arrangement thus introduces five controls—the main tuning, trimming, combined on/off and volume control, reaction, and wave-change. The most important of these controls is the main tuning and it will be seen that we have employed one of the latest types of gang condenser in which a slow-motion drive is mounted integral with the control spindle, and apart from the fact that this does not take up much room it enables a novel type of double-ended pointer to be employed with a flat knob and thus reduces the overall size of the complete set. As already mentioned, a dial for the set is given on this page and should be cut out and attached

to the panel. You can do this by sticking it on the leatherette covering of the cabinet, or, if you wish to make a much better job you can stick it to a thin sheet of cardboard first and then attach it to the panel, covering it in turn with a thin sheet of Cellophane, carefully removed from a package of cigarettes or other commodity.

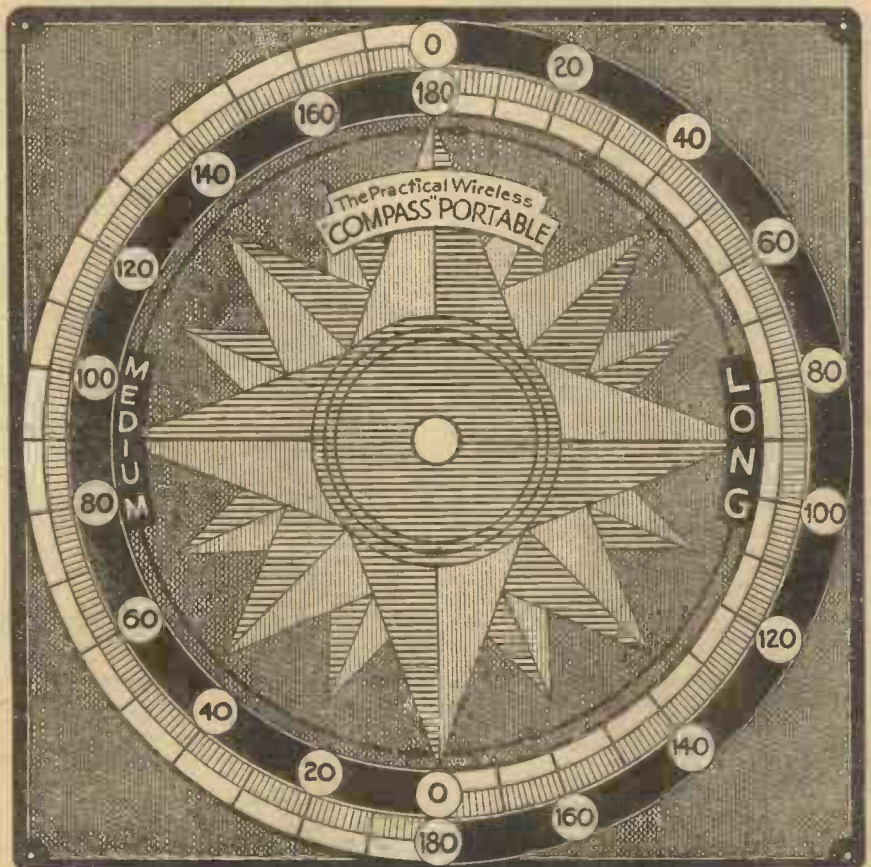
The Layout

It is in the layout of a modern portable that the most interesting design arises, and without using midjet valves and other miniature components there is a limit to the reduction which may be made in the overall size. In this set, so that standard valves and other components could be employed, we have



The finished receiver and cabinet.

had to adopt an unusual shape of chassis, but this may easily be made, if desired, from a standard chassis, merely cutting out a section at one corner. This then enables the H.T. battery to be placed on end behind the tuning condenser, the space between the chassis and the end of the cabinet then being utilised to accommodate the accumulator. The speaker is attached at one end and thus clears the valves and accumulator. The frame aerial is wound on



Cut out this dial and attach it to the front of the cabinet. It may be protected as mentioned on this page.

a separate former, so that the complete receiver may be tested out and any adjustments made before it is placed in position in the cabinet.

Construction

So much for the general design. The constructional work must be undertaken systematically in view of the compact nature of the set and the best procedure is as follows: First, drill the holes for the valveholders—1 in. being needed for V₂, V₃ and V₄, and a 1½ in. for V₁. Next drill the holes through which certain connecting leads pass (V₁ anode lead, gang condenser leads, etc.). Next attach the valveholders, and before any further components are attached the filament circuit should be wired. This must be done at this stage as otherwise it may be found difficult to obtain access to certain parts. In a receiver of this type it is often necessary to wire as one goes along, rather than to assemble all the parts and then to connect them up. An examination of the wiring diagram and the receiver will show that this system of construction will have to be adopted and will, actually, simplify the work of construction. The coil should be left off as long as possible to avoid damage to it, and the component mounting brackets should be attached when it is found necessary to mount the parts which are attached to them.

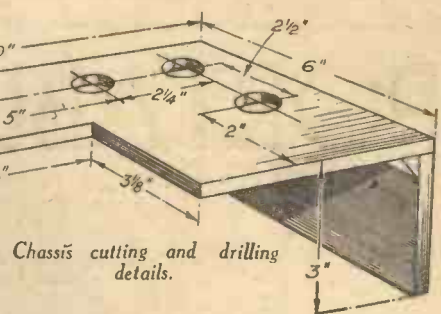
Wiring

The wiring should be carried out with fairly stiff wire, say 22 tinned copper, or the special coloured insulated connecting wire sold for the purpose. If bare wire is employed, insulated sleeving should be slipped over each length as it is placed into

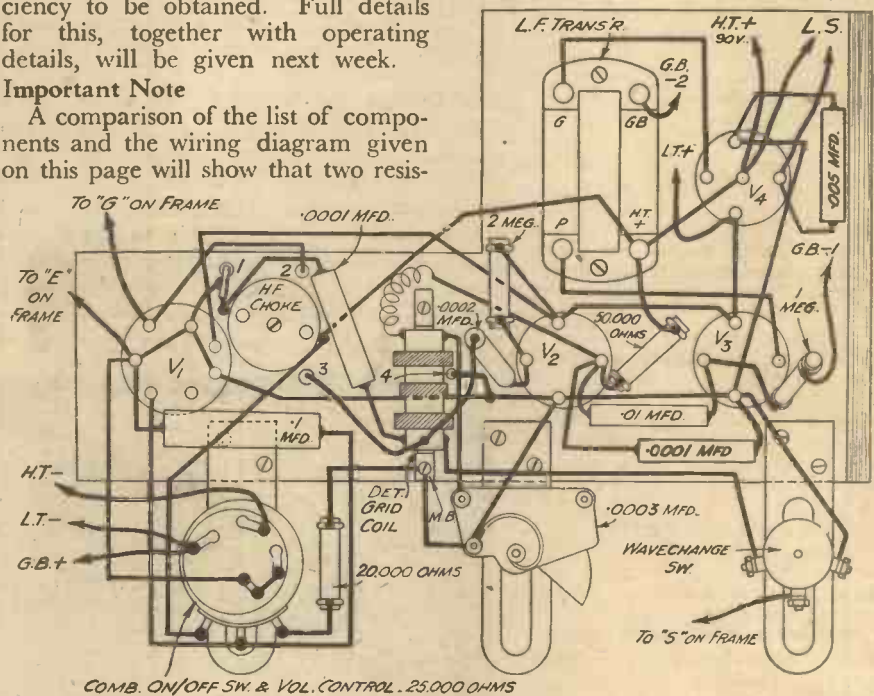
position to guard against short-circuits. It will be noted that in two or three cases the wire-end components are attached by means of the ends and these will have to be cut down to make a neat job. The grid leak attached to V₃ must be very firmly attached to the valveholder as a flexible lead is afterwards soldered to the other end of the leak for attachment to the grid bias battery, and if the resistance is not firmly held there will be a risk of it being pulled away. There are no other difficulties in the way of building this particular set, but the frame aerial will have to be wound with care to enable maximum efficiency to be obtained. Full details for this, together with operating details, will be given next week.

Important Note

A comparison of the list of components and the wiring diagram given on this page will show that two resis-



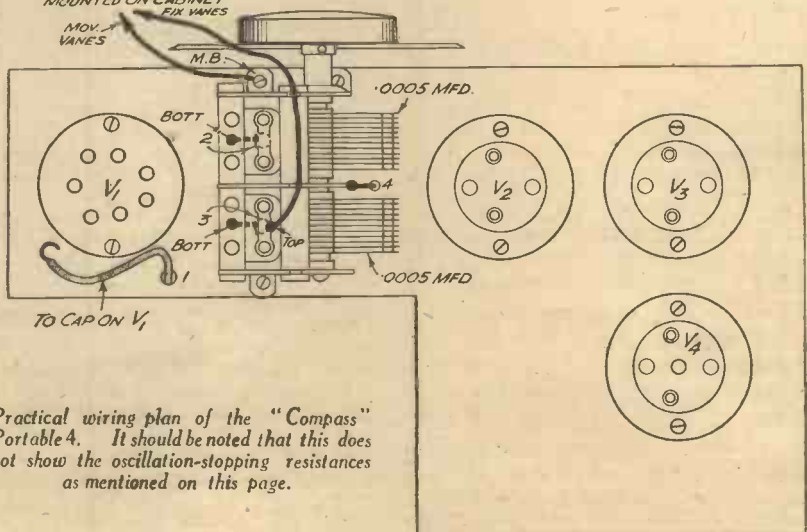
tors are mentioned but are not shown in the wiring diagram. In certain cases these two components will not be needed. One is included in parallel with the transformer secondary and the other is in series with the first L.F. grid. They are merely oscillation preventers and in the original model which we made up they were not necessary.




LIST OF COMPONENTS FOR THE "COMPASS" PORTABLE 4

- One J.B. 2-gang variable condenser, type 3235 No. 4 S./M.
- One Polar mica dielectric variable condenser, .0003 mfd.
- One Polar mica dielectric variable condenser, .00005 mfd.
- One B.T.S. L.F. transformer 3.5-1 ratio.
- One B.T.S. unscreened H.F. choke.
- One Erie potentiometer with switch, 25,000 ohms.
- One B.T.S. Midget coil.
- Three component-mounting brackets, Peto-Scott.
- Four Clix chassis type valveholders: one 7-pin, two 4-pin, one 5-pin.
- Six fixed condensers: one .01 mfd; two .0001 mfd; one .0002 mfd.; one .005 mfd.; one .1 mfd; all type 451, T.C.C.
- Six resistances, Erie: one 50,000 ohms ½ watt; one 2 meg. ½ watt; one 20,000 ohms ½ watt; one 1 meg. ½ watt; one .2 meg. ½ watt; one 75,000 ohms ½ watt.
- Chassis, frame and cabinet. Peto-Scott.
- One accumulator, Exide, type P.Y.4.
- One H.T. battery, Exide, type H.1146.
- One moving coil speaker, W.B. Midget type.
- One 3-point switch, Wearite.
- Valves: Tungram H.P.210; H.R.210; L.D.210; P.P. 222.

TO TRIMMING CONDENSER MOUNTED ON CABINET FIX VANES



Practical wiring plan of the "Compass" Portable 4. It should be noted that this does not show the oscillation-stopping resistances as mentioned on this page.



Practical Television

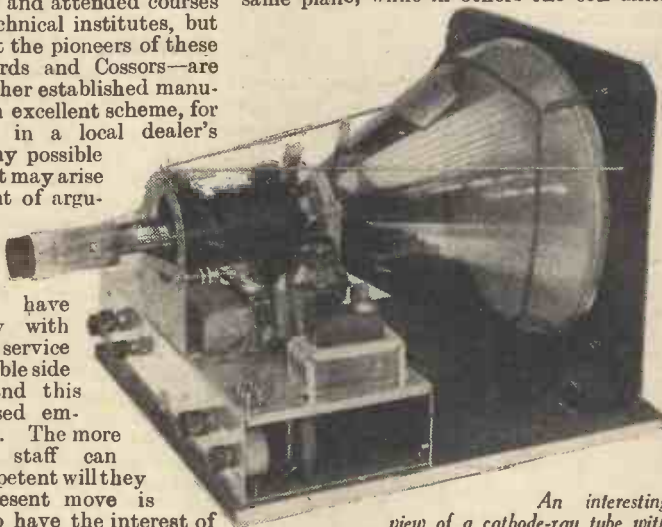
July 2nd, 1938. Vol. 3. No. 107.

Adequate Training

IT is becoming very obvious to all manufacturers of television receiving equipment that as soon as the television service area extends materially as a result of the establishment of more stations in addition to, or distinct from, an increase of aerial power from Alexandra Palace, the problem of adequately servicing the sets sold to viewers will become one of great magnitude. At the present time many are content to deal with service calls themselves, while the dealer acts as a selling agent pure and simple. The time is rapidly approaching, however, when every dealer handling television receiver sales must be in a position to handle in a thoroughly efficient manner every service call except those of unexpected complications. Many dealers have anticipated this and attended courses of instruction at technical institutes, but it is now noticed that the pioneers of these courses—namely Bairds and Crossors—are being emulated by other established manufacturers. This is an excellent scheme, for complete confidence in a local dealer's ability to handle any possible receiver servicing that may arise is an additional point of argument in effecting a definite sales transaction with a prospective customer. Reputable dealers have followed this policy with radio and made their service departments a profitable side of their business, and this applies with increased emphasis with television. The more courses a dealer's staff can attend the more competent will they become, and the present move is welcomed by all who have the interest of television's development at heart. Perhaps some certificate of efficiency would increase dealers' interest in the market.

Tube Deflecting Coils

ONE of the essential factors to be complied with for the efficient deflectional operation of an all magnetic cathode-ray tube is the use of homogeneous magnetic fields in both the line and frame scan directions. The same remark applies to the focusing coil field. If this does not happen to a close approximation then the spot focus will be upset and spot deflection will deviate from the desired linearity of movement. To achieve these points the coils employed have to be specially designed and have a low leakage flux, while the coil inductances should be kept as low as possible to reduce the operational power as well as keep down fly-back time. In some cases the line and frame coils are mounted in a special former as one unit working in the same plane, while in others the coil units



An interesting view of a cathode-ray tube with the deflecting coils in position as mentioned in the accompanying paragraph.

are quite separate and distinct. As an example of the latter scheme reference can be made to the accompanying illustration. This shows a complete unit of a modern receiver built up as a time-base generator and cathode-ray tube mount. All magnetic in operation, the narrow focus coil can be seen immediately to the right of the rubber tipped springs holding the tube neck. Adjustments to the coil's position are provided by the knurled nuts and screws. Next comes the pair of line coils surrounded by an outer shield, the coils themselves being shaped round the neck to give a horizontal line without any form of "flaying" at either extremity. Finally can be seen the laminated arms with hinged ends, between which is the frame deflecting field; the actual coil being wound on the bottom section of this U-shaped unit. Built up in this manner the chassis provides a neat compact unit which can be serviced readily should the need arise; the lock, speed and picture size controls being arranged in accessible positions in two groups of three.

The Wrong Attitude

THAT the people of the North and Midlands are pressing their right for the privilege of witnessing great national events by television has been mentioned before in these columns, but the attitude of one prominent city official was hardly conducive to bringing sympathetic consideration to the claims. He stated that the whole art of television was in a very immature state; the receiving apparatus was expensive and people would be well advised to await simplification of equipment and cheaper apparatus. This is a well-worn argument and shows but little variation from the old one of supply and demand. There is still a big market for high-priced, good-quality television receivers, but in addition there are already available cheaper sets which are well within the reach of those of modest means. Misplaced criticism can only do infinite harm and comments like these should be ignored.

EST. PETO-SCOTT 1919 YOUR RADIO SHOPPING GUIDE

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W.B. Midget speaker, 17/8 cash or 2/6 down and 7 monthly payments of 2/8.
Peto-Scott specified polished wood case, 27/8 cash or C.O.D.
Peto-Scott Metaplex Chassis 4/-.
B.T.S. Midget coil, 3/-.
Peto-Scott ready-wound frame aerial, 17/6.

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6/-

DOWN

COMPLETE KIT Comprising Kit "A" specified valves, speaker, £7:7:0
case, and batteries.
Or 12/9 down and 12 monthly payments of 12/9.

S.T. 900 BATTERY ALL-WAVE KIT WITH FREE BLUE PRINT AND INSTRUCTIONS.

Build now this amazing all-wave receiver tuning from Television to 2,000 metres. Kit "A" comprising ALL parts less coils and valves, but with free station-name dial and full constructional details. 55/6 cash or C.O.D., or 5/- down and 11 monthly payments of 6/8.

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EXTRACTOR KIT. Special offer of this S.T.900 special selectivity device. List Value 13/6. OUR PRICE 10/6

S.T. 900 COMPLETE KIT. As Kit "A" but including 10 B.T.S. One-Shot Inductors, Station-name dial and full constructional details less valves. 75/6 cash or C.O.D. (You save 7/-) or 6/- down and 12 monthly payments of 6/8. If specified valves required, add 30/3 to cash price, or add 2/9 to deposit and to each monthly payment.

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Four wave-bands 12 to 2,000 metres. World-wide reception. Bandspread tuning. Automatic volume control. Brilliant reproduction. Elliptical moving-coil speaker. 5 watts output. Handsome hand-polished walnut cabinet. In sealed carton. With 6 valves. For A.C. Mains. 200-250 volts, 50-60 cycles. Maker's guarantee. Or 10/- down and 18 monthly payments of 11/-.
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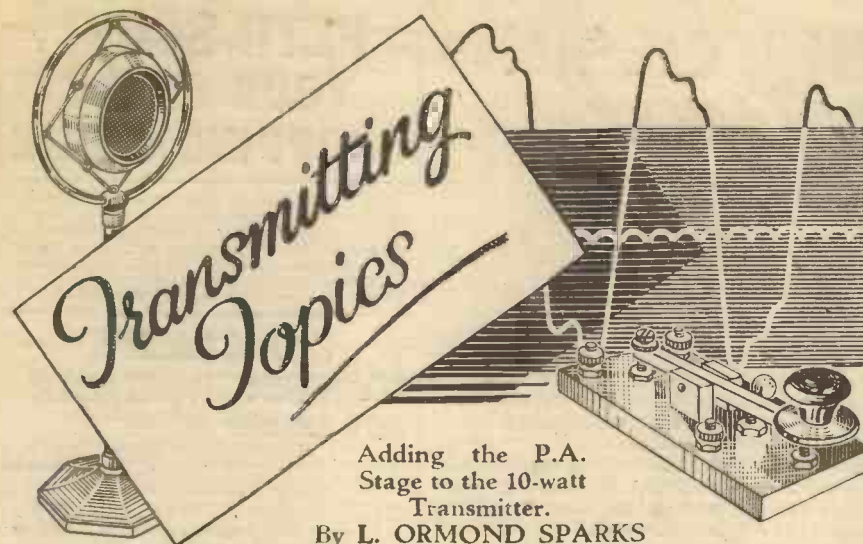


Convert your existing Battery or A.C. set for operation on the short waves with this up-to-the-minute unit. No alterations to your set whatsoever.

- No coil changing.
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MODEL 90
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List Value 42/-.
Cash or C.O.D. 25/- Carriage Paid, or 2/6 down and 10 monthly payments of 3/-.
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Adding the P.A. Stage to the 10-watt Transmitter.

By L. ORMOND SPARKS

THE top shelf of the rack is still vacant, so in view of the number of requests received for details of a P.A. stage to complete the 10-watt Transmitter, the circuit and layout is given below. The theoretical part of the arrangement is shown below. It will be seen that I have selected a pentode valve, but, provided the necessary modifications are made, a triode can be substituted.

For the beginner, however, it would be advisable to keep to the pentode, as awkward complications are likely to arise unless perfect neutralisation is obtained with a triode. It must not be overlooked that the P.A. stage has its anode and grid circuits tuned to the same frequency, and if the slightest trace of feed-back is allowed to exist, oscillations will be generated. With a pentode valve, the inter-electrode capacities are reduced considerably, and it is not usually necessary to provide any neutralising arrangements. It is essential, however, to see that the layout is such that external coupling between the circuits and between the oscillator and the P.A. is not present to provide the same effect.

Bearing this in mind, it is advisable to cover the baseboard of this section with thin sheet aluminium or zinc thus screening it from the oscillator.

Coupling

The most simple form of coupling between the output of the 6L6 and the input of the P.A. has been chosen partly because of cost and partly because of the beginner, it always being possible to experiment with other forms and add additional components as and when required.

As capacity coupling is employed, the need for a grid coil and tuning condenser is eliminated and thus the operation is simplified and the problem of screening reduced considerably. In place of the above, a reliable make of H.F. choke in series with R is connected between the grid of the P.A. and a source of negative bias, which, in this case, is provided by a small H.T. battery. The coupling condenser C_p must be of the mica dielectric type, whilst its value can be between 50 and 100 mfd. If so desired, a variable condenser can be employed, providing it is of the S.W. type with good insulation.

Auxiliary and Suppressor Grids

The auxiliary grid is supplied with a positive H.T. potential in the normal manner, the resistance R1 and the condenser C1 forming adequate decoupling arrangements.

The suppressor grid is used for the purpose of modulating the amplified radio-frequency oscillations, so it is brought out via an H.F. choke to one side of the output transformer of the modulator section or amplifier. The condenser C2, which forms a by-pass for this electrode, should also be of the mica type and connected between the actual terminals of the suppressor grid and the cathode.

Anode

The anode circuit calls for special attention. It is very desirable to see that the tuning condenser has perfect insulation

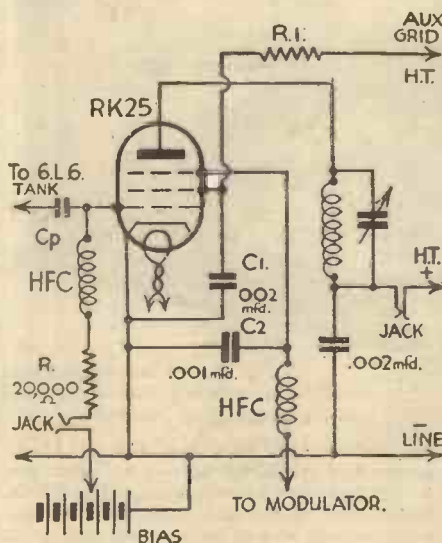


Fig. 1.—The circuit employed in the P.A. stage for use with the 10-watt Transmitter.

and, as one increases the power, suitably spaced vanes. Similarly, the coil must either be of the air-core self-supporting type or wound on a former whose insulation is unquestionable. Up to 10 watts, formers can be employed, though many favour using rigid self-supporting coils of the tube or large gauge wire type. With a P.A. stage, it is essential in the interests of efficiency to use a tuning combination which will give as high an L/C ratio as possible, while the anode H.T. should always be as near to the safe working maximum for the valve concerned as conditions will permit.

With a tank condenser of 100 mfd., the coil can be wound on a standard 1½ inch former of good make with 18 S.W.G. tinned or enamelled wire. For the 7 mc/s band

20 turns over a distance of 1½ inches will be required, while for the 14 mc/s band, 12 turns over the same distance will be suitable.

The H.T. feed end of the tank coil is by-passed to earth via a mica condenser of .002 mfd.

Layout

The valvoholder should be mounted just to the right of the centre line and towards the rear of the baseboard. On the extreme right can be mounted the coil holder, while the tuning condenser should be located on the panel midway between the valve and coil.

The object of keeping these components over to one side of the baseboard is to allow space for any future modifications such as link coupling which would necessitate a grid coil and tuning condenser. Jack sockets are provided in the bias and anode H.T. circuits so that a suitable milliammeter can be plugged in to check up on operating conditions. A very essential feature.

The valve most suited for this stage, bearing in mind the preceding arrangements, is the RK25, which requires a heater supply of 6.3 volts at .8 amps. and will stand 500 volts on the anode if so desired. This does not mean that this value of H.T. must be applied, as quite satisfactory results can be obtained with 350 volts providing other factors are adjusted accordingly.

Operation

The operation of a P.A. stage has been dealt with previously, so it will suffice if a few reminders are given here.

The grid of the valve must be well over-biased. By this it is meant that bias should be applied until no anode current is registered by the meter. The bias voltage necessary to produce this state should be noted, then its value increased to twice or even three times that value, the actual voltage depending on the drive available from the preceding stage.

Before applying the anode voltage an indication should be obtained of the input or drive, and one of the easiest ways of obtaining this is by plugging in the milliammeter in the bias circuit and after tuning the preceding stage apply the drive and note the readings obtained on the meter. The greater the current reading the higher the value of input. When this has been done experiments should be made to determine the best positions of the coupling on the tank coil of the 6L6, bearing in mind that the tank circuit will have to be tuned each time any adjustment is made.

When these items have been settled the H.T. can be applied to the anode of the P.A. stage and, with the meter plugged in that circuit, the circuit should be tuned to resonance—which will be indicated in the usual manner by a sudden dip of the meter needle. As it is possible to damage the valve if the anode circuit is not correctly tuned, it is advisable to commence this operation with low H.T. voltages, increasing in value when resonance is reached. If operating conditions are satisfactory, the drop in anode current when the circuit is tuned will be approximately 15 to 20 per cent. of the rated current consumption of the valve.

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Edited by F. J. Camm.

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Noise Suppression and A.V.E.

Some Further Details of Circuit Refinements which are Worth Trying Out.

By W. J. DELANEY

A REFINEMENT which has not met with approval in this country is the automatic volume expander. A description of this was given in our issue dated November 28th, 1936, together with a proposed circuit, and since that date a number of experiments have been carried out by the author with this type of circuit. In general, the decision which I have come to is that the circuit is not worth while. There are several reasons for this. Firstly, in this country it would appear that the B.B.C. control engineers do not exercise the same control over the outgoing broadcast as is adopted in the U.S.A., and thus although a circuit may work in that country it does not prove satisfactory over here. It

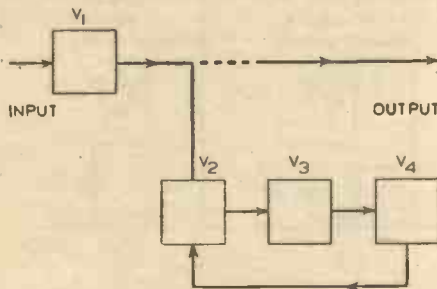


Fig. 1.—Schematic diagram showing the arrangement used in Fig. 2.

is quite true that it works, and, in fact, it is because it works in the manner designed that it proves of little value. For the benefit of new readers it may briefly be stated that the idea underlying the arrangement is to restore to the broadcast some of the balance which is claimed to be lost in the broadcast. Theoretically, when a loud passage is reached in a symphony broadcast, in order to avoid overloading the transmitter the signal is reduced in intensity, and when a very quiet passage is reached the control engineer turns up the volume control to enable the signal to provide sufficient modulation to render the passage audible above the carrier and other noise background. The result when an expander is in use is very good on some items, but when the announcer speaks one has to rush to the volume control to avoid being deafened, and if the normal speaking voice is turned to a suitable level the contrasts in the music are altogether unnatural.

Noise Suppression

On gramophone records it is possible to arrive at values which will give a much better balance of contrast than are obtainable with ordinary reproducing means, probably because the records are more consistently recorded, and a circuit has been adopted which is good with such reproduction. There is, however, another use for this type of circuit and that is in the suppression of noise due to atmospherics and similar electrical disturbances which may be met with in receiving weak telephony stations, and the normal A.V.E. circuit can be modified for use in such arrangements. The experimenter may, therefore, desire to carry out a few tests with this type of arrangement and the following notes will

prove interesting. In principle the circuit operates by taking the L.F. signal at some point in the L.F. circuits and rectifying it. The rectified circuit is applied to a variable-mu valve which acts purely as a volume control and thus regulates the outgoing signal. A schematic diagram is given in Fig. 1, where V1 is the L.F. stage. A portion of the signal is taken to the output and a portion is tapped off and fed to V2, which acts merely as an amplifier to provide sufficient signal impulse to be further dealt with. This is rectified in V3, amplified again at V4 and fed back to the variable-mu valve V2, which thus adds to the signal passing out of V1. It will be seen from this that it will be possible to introduce a delay to the signal in its passage through these three stages so that various interesting effects may be introduced.

Time Filters

A simple time filter will enable the necessary delay to be introduced and by so choosing the coupling components it will be possible to delay background noises due to atmospherics so that they are more or less inaudible

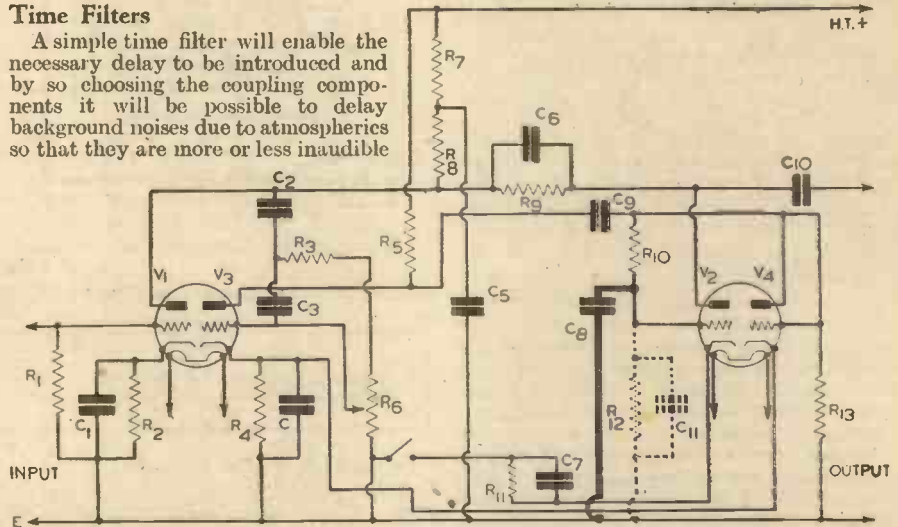


Fig. 2.—Experimental circuit for use in A.V.E. and noise suppression. Values are as follows:

R.1	5 to 1 megohm	R.9	300,000 ohms	C.4	25 mfd. elect.
R.2	2,500 ohms	R.10	500,000 ohms	C.5	.1 mfd.
R.3	300,000 ohms	R.11	2,000 ohms	C.6	.0005 mfd.
R.4	5,000 ohms	R.12	(See Text)	C.7	.25 mfd.
R.5	30,000 ohms	R.13	100,000 ohms	C.8	(See Text)
R.6	1 megohm	C.1	5 mfd. elect.	C.9	.1 mfd.
R.7	15,000 ohms	C.2	.1 mfd.	C.10	.1 mfd.
R.8	30,000 ohms	C.3	.0001 mfd.	C.11	(See Text)

against a strong signal. It is, of course, only necessary to suppress the noises when the signal fades or on weak passages as it is then that the noises are most apparent. A very interesting circuit which may appeal to the keen experimenter is given in Fig. 2, and this was developed by the chief engineer of the McMurdo Silver Corporation of America. It makes use of two dual valves, although separate valves

could be employed for the purpose. The actual types specified are two 6F8G's. The order in which these separate valve sections operate should be particularly noted, the first dual acting as V1 and V3 and the second as V2 and V4. The essential time delaying condenser is shown in heavy lines, and the designer also recommends that a resistor shunted by a condenser may also be included as shown in broken lines. Values for the time control condenser are from .001 up to .5 mfd. and for the resistance-capacity shunt from 1,000 to 3,000 ohms and .001 up to .5 mfd. may also be tried.

On some broadcasts some interesting effects may be produced by the interchange of component values, but tests show that on B.B.C. broadcasting the effects are totally different from those experienced on certain Continental broadcasts. On records the

effects are very marked and very pleasing, but at times it becomes difficult to discern whether the circuit is actually functioning. The additional gain which the circuit gives may result in a slight difficulty from overloading, and it is therefore recommended that the circuit be included in such a position that a normal L.F. volume control can be employed before the output stage, and this will enable the volume level to be kept within bounds. The degree of expansion or contrast is, of course, controlled by the potentiometer, but if separate valves are employed quite a wide range of effects may be obtained merely by exchanging the types of valve used in position V2.

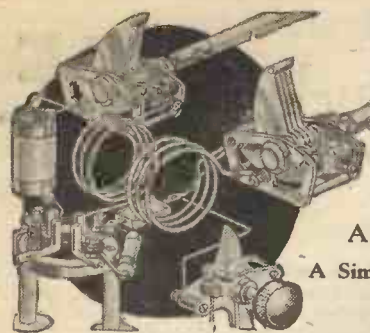
We shall be interested to hear from any readers who experiment with this type of circuit and to receive reports of the results experienced, especially with regard to its desirability in ordinary broadcast reception from the B.B.C. stations on "quality" receivers.

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Short Wave Section

AN EXPERIMENTAL 5-METRE SET

A Simple Super-regenerative Circuit Which Will Prove Interesting to Short-wave Experimenters

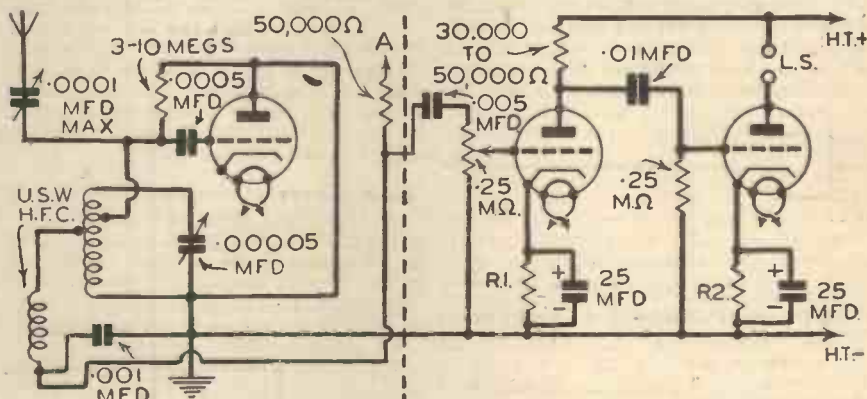
As we have before pointed out, the choice of circuits for 5-metre work is not very wide. The superhet can be made to give good results, but it is tricky to set up, sometimes noisy in operation, and is expensive on account of the number of stages which have to be employed. The majority of short-wave workers prefer the super-regenerative circuit, and this offers many attractions from an experimental point of view. The signal, when properly tuned in has a remarkably silent background and for this reason it is generally adopted for police and similar work, especially in apparatus which has to be used in traffic. It will also be found that it does not pick up so much normal electrical interference, but whether this is due to the circuit design or to the lower sensitivity of the detector stage is a moot point. It will be found that two or more L.F. stages may be used with a good super-regen. without introducing any difficulties, and in this respect the circuit has a further benefit to offer the experimenter. The detector stage may be wired up and made to work satisfactorily, irrespective of the L.F. stages, and thus an existing set may be modified to enable the super-regenerative detector to be incorporated.

The Circuit

It will be seen from the accompanying circuit, which shows a three-stage set, that the coil has to be tapped, and for this purpose it is preferable to wind it with bare wire, self-supporting, and to use tapping clips. Obviously to enable such a low wavelength to be covered the coil will have to be wound with a very small diameter, and about half-an-inch will be found most satisfactory. Approximately 10 turns will be needed, and tinned copper wire will ensure low-resistance contact. The H.F. choke should be of the U.S.W. type, and should be connected to the electrical centre of the coil; the aerial tap must be varied to obtain the most satisfactory results. Point A should be connected to a tapping on the H.T. battery if battery operation is to be adopted, or to a potentiometer across the H.T. supply if the set is operated from a mains pack. Resistances R1 and R2 will have to be selected to provide the appropriate bias for the mains valves in use, and the remaining values of components should be chosen from the values given in the diagram. For the detector a medium-impedance high-amplification valve should be selected and there is quite a wide choice from modern standard valves. Some difficulty will be experienced in obtaining regeneration if a very high impedance is selected, although the values of the leak across grid and anode will, to a large extent, govern this. A potentiometer control for the detector anode will enable the critical H.T. voltage to be selected, although if the set is neatly wired and arranged it should be found possible to obtain a voltage where regeneration will take place and be maintained constant through the entire tuning

range. This is the ideal to be aimed at and will greatly simplify the handling of the set.

The components in the detector stage should be selected from those designed for use in U.S.W. circuits and should be of the best quality. A low-loss valveholder of the ceramic type is desirable, and the same type of insulation should be provided on



Circuit of an experimental 5-metre short-wave receiver. This may be used with mains or battery supplies.

Leaves from a Short-wave Log

New British India Schedule

MORE regularity now exists in the timing of the programmes from British Indian short-wave stations, of which the schedules are now as under: VUD2, Delhi, on 60.06 m. (4.99 mc/s), G.M.T. 11.30-17.30; and on 31.28 m. (9.59 mc/s) from G.M.T. 02.30-05.30 and 06.30-09.30. It is also reported that tests are being made through VUD4, 19.62 m. (15.29 mc/s). VUB2, Bombay, is working on 31.4 m. (9.55 mc/s) from G.M.T. 02.00-03.30 and from 06.00-09.30; VUC, Calcutta, on 49.1 m. (6.11 mc/s), from G.M.T. 07.06-09.36 and from 11.36-16.36. So far, VUM2, Madras, on 49.30 m. (6.085 mc/s), does not appear to be in operation.

Another Spanish War Broadcaster

JUST above DZH, Zeesen, namely, on 20.77 m. (34.445 mc/s) you may hear a Spanish Nationalist station relaying war news bulletins from Malaga between G.M.T. 22.00-23.00 and again from 23.30-00.30. These are destined to the South American Latin States; on some mornings an English translation is also given. It is an easy matter to set the receiver for this channel inasmuch as without any difficulty you should pick up on any Wednesday evening at G.M.T. 21.45, WMF, Lawrenceville (N.J.), U.S.A., a 20-kilowatt taking the weekly New York talk in French to pass it on to Paris P.T.T., on 20.73 m. (14.47 mc/s).

the main tuning condenser. A ceramic base for the coil may be used, or the coil wired direct on to the tuning condenser. On the L.F. side standard components are permissible.

Layout

As the receiver is to be used for 5-metre work, the incidental wiring must be kept to a minimum. The detector stage should preferably be wired direct to the valveholder, so that barely any additional circuit wiring is introduced to modify the tuning circuit. Rigidity of wiring is also important so that tuning shift will not take place due to vibration of the connecting wires or coil. Beyond these points there is very little more to be said. Remember, however, that maximum results will only be obtained when the components have been correctly chosen and connected, and the circuit should not be condemned if it does not give maximum performance when first tested out.

Radio and the Wood Industry

IN German laboratories experiments have proved that it is possible to dry and season timber rapidly by exposing it to the influence of short-wave transmissions. The new method not only accelerates the process and thus shows great economy in cost, but wood so treated has been found to be more ductile and easier to work.

Sound versus Radio

ON the occasion of the Mass Display of the Czechoslovakian Sokols in the Masaryk Stadium at Prague, measures are to be specially taken to ensure that all physical exercises will be carried out by the competitors with mathematical precision. In previous years it had been established that orders for certain movements broadcast through loudspeakers erected at the control point, in view of the time lag before they reached the executives in the more distant files, prevented simultaneity. Although the actual difference was only one-third of a second it was considered that more precision should be obtained. To obviate this time lag loudspeakers spaced at a distance of 130ft. are to be buried flush with the ground and distributed all over the arena. The usual public-address system will be used for spectators. It is expected that all Czech stations will broadcast this annual event.

(Continued on facing page)

LEAVES FROM A SHORT-WAVE LOG

(Continued from facing page)

W2XE'S Summer Schedule of Broadcasts

NOT only has the Columbia Broadcasting System's Wayne (N.Y.) station made certain alterations in its transmission times, but it has also reverted in some instances to an old channel. The programme of short-wave broadcasts beamed on Europe is now as follows:

From Monday to Friday inclusive: G.M.T. 12.30-15.00, on 16.89 m. (17.76 mc/s); 18.00-23.00 on 19.646' m. (15.27 mc/s); on Saturdays, from 13.00-18.00, on 17.76 mc/s and from 19.30-23.00 on 15.2 mc/s. On Sundays a transmission is carried out from 13.00-18.00 on 13.94 m. (21.52 mc/s) and from 19.30-23.00 on 15.27 mc/s.

Test Broadcasts from Cuba

OVERSEAS listeners report that experimental transmissions have been heard emanating from a station giving the call letters CMA5, on 17.38 m. (17.26 mc/s). This would seem to be one of the transmitters owned and operated by the Cuba Transatlantic Radio Corporation of Havana. Other channels allotted to the stations are: 19.35 m. (15.505 mc/s); 25.95 m. (11.56 mc/s); 34.76 m. (8.63 mc/s.); 44.18 m. (6.79 mc/s), and 51.9 m. (5.78 mc/s.). Although no definite programme is advertised, it is understood that the transmitters are to be used for broadcast relays to the U.S.A. The power is 1 kilowatt.

High-power Stations for Venezuela

THE Government of the Republic of Venezuela is extending its broadcasting network by the addition of the following transmitters: YVKB and YVSC, Caracas, 30 kilowatts on respectively 48.61 m. (6.172 mc/s) and 31.12 m. (9.64 mc/s); YVOR and YVPX, Caracas, 15 kilowatts on 25.59 m. (11.725 mc/s) and 19.59 m. (15.315 mc/s) respectively. It is not yet clear when these will be brought into operation but in the meantime the relay of programmes of international interest has been occasionally made by YVQ, Maracay, a Government commercial station working on 46.55 m. (6.445 mc/s), 20 kilowatts.

RADIO CLUBS & SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

SLOUGH AND DISTRICT SHORT-WAVE CLUB

AT the last meeting of this club a very good display of members' gear was on show, this time consisting of receivers. It was interesting to note that most of them were of a very simple type, and also that the greatest care had been taken to get the last ounce of efficiency from them. All the sets were demonstrated one after the other on a rather poor aerial, which was the only one available, and an interesting comparison was made. There were also many friendly discussions and arguments on the merits of various circuits. Several photographs were taken of the apparatus with the aid of members' apparatus.

It was also decided to hold a contest in connection with National Field Day, and the details were arranged.

For the next meeting a junk sale was arranged, and a lecture on the Hartley Oscillator, which had to be postponed, will also be given then.

At the previous meeting Mr. K. Sly concluded his lectures on "Fundamentals" and he was warmly thanked and applauded. We must congratulate Mr. Sly on obtaining his AA licence under the call 2FAU. Secretary: Mr. J. H. White, 20, Chalvey Road, Slough, Bucks.

DOLLIS HILL RADIO COMMUNICATION SOCIETY

ON May 22nd a party under the leadership of Mr. P. C. Bradley took part in the 40-metre D.F. meeting held by the Golders Green Radio Society, and much valuable experience was gained. At the following meeting of the society a talk was given on the results obtained.

The experimental laboratory is now past the talking stage, and a large section of the membership is now actively engaged on portable apparatus.

Owing to holiday arrangements, Mr. Ash has been obliged to postpone his series of talks on "From Microphone to Loudspeaker," but these will be commenced on his return.

All visitors will be welcome at any of our meetings, which are held at Brentcroft School, Warren Road, Cricklewood, N.W.2, and the secretary will be pleased to reply to any query. Hon. secretary: Mr. Eldridge, 79, Oxgate Gardens, Cricklewood, N.W.2.

WORTHING AND DISTRICT SHORT-WAVE CLUB

THE Worthing and District Short-wave Club held another of their outdoor listening tests on the Downs near Worthing on Sunday, June 12th. Three listening posts were established (one at the top of the hill, one half-way down, and the third at the base), and contrary to expectations the receiver at the bottom of the hill logged most stations.

Owing to the amazing growth of the club, new headquarters have become necessary, and it has been decided that we shall meet fortnightly at the Literary Institute Committee Rooms, Montague Street, Worthing. The first meeting at the new headquarters will be on July 7th at 7 p.m.

The club has now been fortunate in finding a new Morse instructor, and a Morse class will be held every Monday at the present H.Q., Alpine Nurseries, Durrington Lane, Worthing, at 7 p.m.

All radio enthusiasts are welcome at our meetings, and all interested are invited to communicate with the hon. secretary, Mr. G. Lambourne, 2DQJ, 16, Angola Road, Worthing.

EDGWARE SHORT-WAVE SOCIETY

ON Wednesday, June 8th, Mr. Lawton, of Messrs. Ferranti, gave a lecture on meters. A series of lectures on transmitting apparatus and recent aerial developments will be given by the club's president, Mr. Leslie Gregory, G2A1, and parts of his transmitter will be examined and discussed.

The club is now affiliated to the Radio Society of Great Britain and a party visited the Divisional Field Day Camp, G2A1P, at the top of Mote Mount, Barnet By-pass, on the afternoon of Sunday, June 12th.

Since its inception in January of this year, the club has attained a membership of thirty and it has been decided by vote to continue the meetings during the summer, providing 50 per cent. of the members attend. Over 20 members attend regularly. Mr. F. Harris has now obtained his full licence, G3LT. Secretary: F. Bell, 118, Colin Crescent, Colindale.

PAISLEY SHORT-WAVE CLUB

FOUNDED in the autumn of last year, with a handful of members, the club has made remarkable progress. Club headquarters have been secured and equipped, and the membership is steadily growing. Many of the members are learning the Morse Code in preparation for the day when they will own a transmitter, and a Novice Section is under way. Weekly meetings are held, and a visit was recently paid to the B.E.C. transmitting station at Falkirk, and further outings are under consideration.

New members are welcome, and application should be made to the secretary, Mr. P. K. O. Oakley, 40, Collinslee Drive, Paisley. The entry fee is 2s., and the subscription rates are: Senior members, 6d. weekly; unemployed, 6d. weekly for first six weeks, thereafter 3d. weekly; junior members (under 18), 3d. weekly.

BOLTON AND DISTRICT CHAPTER OF THE RADIO SIGNAL SURVEY LEAGUE

THE Bolton and District Chapter of the R.S.S.L. now comprises seven members, and of these five have "calls." They are G6PO, 2ABF, 2DVQ, 2CKC, and 2ABT. Meetings are held fortnightly on Tuesdays, and are held in rotation at different members' QRA's. A full attendance of members is usual and all are very keen. About one hour's Morse practice is done at each meeting and two or three of the AA's are hoping to get their full calls before very long.

The secretary will be pleased to hear from local readers really interested and visitors will be welcome if they will drop him a card to enable him to let them know the date and place of the next meeting.—Chapter secretary: Norman Moorcroft (2ABT), 218, Deane Road, Bolton.

The "Little Princess" Portable

THE accompanying illustration shows the neat Portable produced by the Peto-Scott Company. Measuring only 9½ ins. by 11½ ins. by 7½ ins. deep, this set contains a full-size speaker and four valves. The output valve is a Harries tetrode made by the Hivac Company, and the rated output is of the order of 1 watt. This will, of course, only be obtained on very powerful stations, or when an external aerial is added to the receiver. The total H.T. consumption is only 6 mA, and the accumulator which is provided will enable a long period of life to be obtained without recharging. The general performance of the receiver is very good indeed, providing adequate punch on a large number of stations, and with a very good balance of reproduction. Selectivity is very good, and the frame obviously has very good properties. On several stations it was found necessary to reduce the H.F. gain in order to avoid overloading the output stage. The gain or volume control is of interesting design, consisting of a combined H.F. and L.F. control. This is a dual component

which operates on one section of the circuit for part of its travel, and on another section of the circuit for the remainder of its movement.

'Phone Connections.

On the output side a jack circuit is connected so that headphones may easily be inserted when such form of listening is desired. On the input side terminals are provided for the connection of an external aerial and earth. Thus the receiver may be regarded as a really high-class model, designed to provide maximum performance at a minimum of expense. The price is now 6 guineas cash, or by hire purchase at 7s. 6d. deposit and 12 monthly payments of 11s. 3d.



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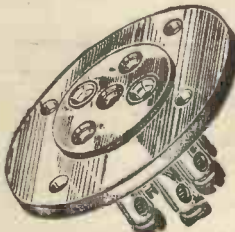
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PROGRAMME NOTES

A Country Character

WILL EVANS has for the last fifty years been a hedger and ditcher in the Clun Valley. Mr. Evans says that, although his father had done a certain amount of hedging, they never hedged together, so that he is self-taught. He will be interviewed in the Midland programme on July 4th by Edward Benbow, who helped in the preparation of and also took part in the recent feature programme entitled "Leland's Midland Tour."

A Celtic Congress in the Isle of Man

FROM June 29th to July 6th the Celtic Congress will be held in the Isle of Man, which delegates from Scotland, Ireland, Wales, Brittany and Cornwall will attend. The debates will cover matters of cultural interest in those countries, and a Celtic concert has been arranged for July 3rd, from which a broadcast will be given for Northern listeners.

An eye-witness account of the meetings of the Congress will be given in the Northern programme on July 7th.

Lancashire Transport Problems

AN important Lancashire Transport Conference will be held in Manchester on July 5th, and some of the subjects which it will consider will be dealt with in a broadcast from a Manchester studio on the same evening.

"Little Women" as a Radio Play

"LITTLE WOMEN," the novel by Louisa M. Alcott, has been adapted as a radio play in four parts by Catherine Buckle, and will be broadcast from the North in the Children's Hour for all Regions except Wales. The first part, to be heard on July 7th, will be called "Christmas Holidays." Catherine Buckle, who has written a number of stories and plays for the Children's Hour already, has taken most of the dialogue straight from the book. Each instalment of the play will also be broadcast in the evening programmes.

Hero or Traitor?

IN a programme entitled "Sant neu I Walch?" (Hero or Traitor?), to be broadcast on July 8th, Tom Hughes Jones will delve into the question whether Owain Glyn Dwr (Shakespeare's Owen Glendower) was just a bandit chieftain to whom a later century attributed its own ideals, or whether, as orators assert on national occasions, he had an impelling vision of the political and the religious unity of Wales. Whatever the verdict may be, most men will agree with the words which Shakespeare attributes to him, "I am not in the roll of common men."

"Cornwall in Canada"

CORNWALL in Canada" is the title of a talk to be broadcast in the West of England programme on July 4th, in which J. Willmar Cardell will describe some of the towns in Canada which are called after towns in Cornwall, such as Truro and Falmouth, in Nova Scotia, Penzance, in Saskatchewan, and Tintagel, in British Columbia. Mr. Willmar Cardell gave the third talk in the "Family History" series on May 18th, speaking from Treheras Farm, St. Columb Minor, Cornwall.



LETTERS FROM READERS

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Receiver Peculiarities

SIR,—I note that you have been publishing one or two letters lately regarding peculiar performances and effects. In this connection I had a peculiar fault in my set which unfortunately cleared itself up without my being any the wiser as to what caused it or what cured it. Perhaps some of your more experienced readers can solve this point. The trouble took the form of a sudden reduction in signal strength. This would occur without any introduction, and the final signal was quite free from distortion. It was just as though the aerial was taken off. I spent about a week trying all kinds of tests, from the aerial right through the set, but without success. The trouble dried up without any alteration being made, and the set has now been going for four or five months without any trouble.—R. LENCO (Balham).

Push-button Tuning

SIR,—I notice that Thermion is of the opinion that push-button is a stunt and won't last. I agree with him. Manufacturers are too keen on introducing stunts merely to sell new models. I have a seven-year-old G.E.C. set which I will back against any present-day model. It does not include any fancy gadgets and all the new sets which I inspect seem only to have slight refinements which in no way affect the performance. Surely, modern developments should take the form of improvements in performance rather than in handling or appearance? It seems that the policy is to try to render a set obsolete within six months so that the public will buy new season's sets, but from what I gather from my friends, they have now been "caught" so many times that they stick to their old sets. This will, in the end, defeat the manufacturers' objects, as when a substantial improvement does take place the public will not take any interest in it. Push-button tuning is a case in point. It has great possibilities, but the public is now apathetic and as a result push-button sets will not sell, and the manufacturers will wrongly think that the idea is no good. Thus, push-button sets will be relegated to the scrap heap by next season's show.—ARTHUR WESTLY (Nottingham).

Television Systems

SIR,—What has happened to the inventive genius of this world? I notice that the only systems now being used for television employ cathode-ray tubes with thousands of volts of high tension, rendering the apparatus a death-trap to the unwary, and resulting in a very high cost of purchase and maintenance. Surely there is sufficient inventive ability about to enable a mechanical system to be evolved which will work on television and which could be built and maintained at low cost. The old motor-driven 30-line apparatus worked, and it seems that there must be some way

of making this work on the present higher definition. I feel that television will not be popular until mechanical methods are developed and perfected. Can you not set a lead in this direction in your laboratories?—P. G. BLAND (Cardiff).

[There is at least one mechanical system which is practically ready for public use, and this has been demonstrated to the press and the trade recently. It has been developed also for large screen work, and it is anticipated that receivers embodying this system will be on view and sale at the Radio Exhibition this year.—Ed.]

Card Exchange

SIR,—I should like to pass on to all short-wave listeners particulars of the VK-NZ Card Exchange and Friendship Club. Entrance fees and membership certificates are free, the only expenditure being a few coppers for postage. Listeners may send as many of their own cards as they wish. Just place them in an envelope addressed to Cyril Alsop, Opunake Road, Stratford, N.Z., and for each one sent one will be sent in return. By swapping cards this way a large amount of postage is saved. Cyril Alsop, of New Zealand, or myself will be only too pleased to give any further information. There are no restrictions.

CUT THIS OUT EACH WEEK.

Do you know

—THAT electrolytic condensers must be connected with the correct polarity, the case generally being negative.

—THAT loss of high notes in a receiver may be due to incidental excess stray capacities in the circuit.

—THAT in general it may be taken that bass cannot be improved by tone control devices without introducing mere bass resonance.

—THAT a small spark-gap in the aerial circuit forms an ideal safety device.

—THAT hum can be introduced in a receiver by vibration of the transformer or smoothing choke acting on a microphonic valve.

—THAT when using dual speakers they must be connected so that the cones are "in phase."

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 name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL AND AMATEUR WIRELESS, George Neveles, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

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Any S.W. fan in the British Isles is at liberty to join.—J. CHRISTMAS (32, Foxcroft Road, Whitehall, Bristol, 5).

Wild-Barfield Electric Furnaces

SIR,—We have pleasure in informing you that we have appointed Dr. F. W. Haywood, Ph.D.(Lond.), B.Sc. (Hons.) Lond., A.I.C., etc., to the position of Chief Metallurgist to this company to take charge of the new research department nearing completion. Dr. Haywood, at present engaged with Messrs. I.C.I. (Fertilizer and Synthetic Products), Ltd., at Billingham, will be commencing his duties later in the year.—WILD-BARFIELD ELECTRIC FURNACES, LIMITED (N.7).

Another Grateful Reader

SIR,—Many thanks for the prize book you sent me this morning for solving Problem 299.

I have been a regular reader for some time and hope to continue being one.

The articles I am most interested in are in the Short-Wave Section. I have a home-made short-wave O-V-2. I expect that I am among your youngest readers, being only fourteen.

Wishing your paper every success and a long career.—G. LAST (Bournemouth).

Club Wanted

SIR,—I would like to know if any of your readers would like to form a Radio Club in the Clapham district. If so, will they please get in touch with me at 166, Heath Road, Clapham, S.W.8.—D. H. GARRAD (2FAB).

Station TGWA

SIR,—I have read with interest your readers' inquiries on radio station TGWA, Guatemala City. The listed wavelength is 31.75 m., 9,450 kc/s; the schedule is as follows: 1-2 a.m., 3 a.m.-7 p.m. weekdays, Sundays, 5 a.m.-11 a.m., 5 p.m.-7 p.m. G.M.T.). QSL collectors will be pleased to note that no reply coupon is necessary if a good detailed report is sent to this station. I should like to correspond with a reader of my own age, seventeen years, who is really interested in the 14 mc/s amateur band.—A. REEVES (93, Gibbins Road, Stratford, E.15).

Reader Service

SIR,—I should like to thank you very much for the excellent book you awarded me for solving Problem No. 299. The wide variety of subjects covered and the easy manner which they are thoroughly explained go to make up a book which I am sure will prove of the utmost help to me in the study of the most fascinating subject that there is, i.e., radio.

I should also like to congratulate you upon the circuit of the Cyclo Converter. I made up this set with a dual-range short-wave coil, intending to get the plug-in coils at a later date, but it goes so well that I am in two minds to leave it as it is. The reaction is silkily smooth, and as I am running it upon a mains unit the set evidently is not critical as regards voltage. I noticed also a complete absence of hand capacity. Thank you very much for such a fine circuit.

In conclusion I should like to wish PRACTICAL AND AMATEUR WIRELESS every success in the future and, if I may, to thank your Query Department for the very prompt and courteous manner in which they deal with our queries. It gives us constructors more confidence to continue constructing when we know your Query Department is ever ready to help us when things go wrong.—W. SHEPPARD (St. George, Bristol).

Practical and Amateur Wireless BLUEPRINT SERVICE

These Blueprints are drawn full size. Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, which are additional to the cost of the Blueprint. A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless .. 4d. Post Paid
Amateur Wireless .. 4d. " "
Practical Mechanics .. 7d. " "
Wireless Magazine .. 1/3 " "

The Index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus P.W. refers to Practical Wireless, A.W. to Amateur Wireless, P.M. to Practical Mechanics, W.M. to Wireless Magazine.

Send (preferably) a postal order to cover the cost of the blueprint and the issue (stamps over 6d. unacceptable) to PRACTICAL AND AMATEUR WIRELESS, Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Practical Wireless CRYSTAL SETS.	No. of Date of Issue. Blueprint.	D.C. £5 Superhet (Three-valve) ..	1.12.34	PW42
Blueprint, 6d.		Universal £5 Superhet (Three-valve)		PW44
1937 Crystal Receiver ..	0.1.37	F. J. Camm's A.C. £4 Superhet 4 ..	31.7.37	PW59
STRAIGHT SETS. Battery Operated.				
One-valve : Blueprints, 1s. each.		F. J. Camm's Universal £4 Superhet 4 ..		PW60
All-wave Unipen (Pentode) ..	—	" " Qualltone " Universal Four ..	16.1.87	PW73
Beginner's One-valve ..	19.2.38	SHORT-WAVE SETS		
Two-valve : Blueprints, 1s. each.		One-valve : Blueprint, 1s.		
Four-range Super Mag Two (D, Pen)	—	Simple S.W. One-valve ..	9.4.38	PW88
The Signet Two (D & LF)	29.8.30	Two-valve : Blueprint, 1s.		
Three-valve : Blueprints, 1s. each.		Midget Short-wave Two (D, Pen)	—	PW38A
The Long-range Express Three (SG, D, Pen)	24.4.37	Three-valve : Blueprints, 1s. each.		
Selectone Battery Three (D, 2 LF (Trans)) ..	—	Experimenter's Short-wave Three (SG, D, Pow)	—	PW30A
Sixty Shilling Three (D, 2 LF (RC & Trans)) ..	—	The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
Leader Three (SG, D, Pow) ..	22.5.37	The Band-Spread S.W. Three (HF Pen, D (Pen) Pen)	29.8.30	PW68
Summit Three (HF Pen, D, Pen)	—	PORTABLES		
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	Three-valve : Blueprints, 1s. each.		
Hall-Mark Three (SG, D, Pow)	12.6.37	F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) ..	—	PW65
Hall-Mark Cadet (D, LF, Pen (RC))	10.3.35	Parvo Flyweight Midget Portable (SG, D, Pen) ..	19.6.37	PW77
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	Four-valve : Blueprints, 1s. each.		
Genet Midget (D, 2 LF (Trans)) ..	June '35	Featherweight Portable Four (SG, D, LF, Cl. B) ..	15.5.37	PW12
Cameo Midget Three (D, 2 LF (Trans)) ..	8.6.35	"Imp" Portable 4 (D, LF, LF, Pen) ..	10.3.38	PW86
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	—	MISCELLANEOUS.		
Battery All-Wave Three (D, 2 LF (RC)) ..	—	S.W. Converter-Adapter (1 valve)	—	PW48A
The Monitor (HF Pen, D, Pen) ..	—	AMATEUR WIRELESS AND WIRELESS MAGAZINE		
The Tutor Three (HF Pen, D, Pen)	21.3.36	CRYSTAL SETS.		
The Centaur Three (SG, D, P) ..	14.8.37	Blueprints, 6d. each.		
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	Four-station Crystal Set ..	12.12.36	AW427
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	1934 Crystal Set ..	—	AW444
The "Colt" All-Wave Three (D, 2 LF (RC & Trans)) ..	5.12.36	150-mile Crystal Set ..	—	AW450
The "Rapid" Straight 3 (D, 2 LF (RC & Trans)) ..	4.12.37	STRAIGHT SETS. Battery Operated.		
F. J. Camm's Oracle All-Wave Three (HF, Det, Pen) ..	28.8.37	One-valve : Blueprints, 1s. each.		
1938 "Triband" All-Wave Three (HF Pen, D, Pen)	22.1.38	B.B.C. Special One-valve	—	AW387
F. J. Camm's "Sprite" Three (HF Pen, D, Tet)	26.3.38	Twenty - station Loudspeaker One-valve (Class B) ..	—	AW449
The "Hurricane" All-Wave Three (SG, D (Pen), Pen)	30.4.38	Two-valve : Blueprints, 1s. each.		
Four-valve : Blueprints, 1s. each.		Melody Banger Two (D, Trans) ..	—	AW388
Sonotone Four (SG, D, LF, P) ..	1.5.37	Full-volume Two (SG det., Pen) ..	—	AW392
Fury Four (2SG, D, Pen)	8.5.37	B.B.C. National Two with Lucerne Coil (D, Trans) ..	—	AW377A
Beta Universal Four (SG, D, LF, Cl. B)	—	Blg-power Melody Two with Lucerne Coil (SG, Trans) ..	—	AW338A
Nucleon Class B Four (SG, D, (SG), LF, Cl. B)	6.1.34	Lucerne Minor (D, Pen) ..	—	AW426
Fury Four Super (SG, SG, D, Pen)	—	A Modern Two-valve ..	—	WM409
Battery Hall-Mark 4 (HF, Pen, D, Push-Pull) ..	—	Three-valve : Blueprints, 1s. each.		
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) ..	26.9.36	Class B Three (D, Trans, Class B)	—	AW386
All-Wave "Corona" 4 (HF Pen, D, LF, Pow)	9.10.37	New Britain's Favourite Three (D, Trans, Class B) ..	15.7.33	AW394
"Acme" All-Wave 4 (HF Pen, D (Pen), LF, Cl. B)	12.2.38	Home-built Coil Three (SG, D, Trans) ..	—	AW404
Mains Operated.				
Two-valve : Blueprints, 1s. each.		Fan and Family Three (D, Trans, Class B) ..	25.11.33	AW410
A.C. Twin (D (Pen), Pen) ..	—	£5 5s. S.G.3 (SG, D, Trans) ..	2.12.33	AW412
A.C.-D.C. Two (SG, Pow) ..	—	1934 Ether Searcher; Baseboard Model (SG, D, Pen) ..	—	AW417
Selectone A.C. Radiogram Two (D, Pow) ..	—	1934 Ether Searcher; Chassis Model (SG, D, Pen) ..	—	AW419
Three-valve : Blueprints, 1s. each.		Lucerne Ranger (SG, D, Trans) ..	—	AW422
Double-Diode-Triode Three (HF Pen, DDT, Pen) ..	—	Cosser Melody Maker with Lucerne Coils ..	—	AW423
D.C. Ace (SG, D, Pen) ..	—	Mullard Master Three with Lucerne Coils ..	—	AW424
A.C. Three (SG, D, Pen) ..	—	£5 5s. Three; De Luxe Version (SG, D, Trans) ..	19.5.34	AW435
A.C. Leader (HF Pen, D, Pow)	—	Lucerne Straight Three (D, RC, Trans) ..	—	AW437
D.C. Premier (HF Pen, D, Pen) ..	31.3.34	All-Britain Three (HF Pen, D, Pen) "Wireless League" Three (HF Pen, D, Pen) ..	3.11.34	AW451
Ubique (HF Pen, D (Pen), Pen) ..	28.7.34	Transportable Three (SG, D, Pen) £6 6s. Radiogram (D, RC, Trans) ..	—	WM271
Armada Mains Three (HF Pen, D, Pen)	—	Simple-tune Three (SG, D, Pen) ..	June '33	WM313
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	Economy-Pentode Three (SG, D, Pen) ..	Oct. '33	WM327
"All-Wave" A.C. Three (D, 2 LF (RC)) ..	—	"W.M." 1934 Standard Three (SG, D, Pen) ..	—	WM337
A.C. 1936 Sonotone (HF Pen, HF Pen, Westector, Pen)	—	£3 3s. Three (SG, D, Trans) ..	Mar. '34	WM351
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	Iron-core Band-pass Three (SG, D, QP21) ..	—	WM354
All-World Ace (HF Pen, D, Pen) ..	28.8.37	1935 £6 6s. Battery Three (SG, D, Pen) ..	—	WM362
Four-valve : Blueprints, 1s. each.		PTP Three (Pen, D, Pen) ..	June '35	WM371
A.C. Fury Four (SG, SG, D, Pen)	—	Certainty Three (SG, D, Pen) ..	—	WM389
A.C. Bury Four Super (SG, SG, D, Pen)	—	Minitube Three (SG, D, Trans) ..	Oct. '35	WM393
A.C. Hall-Mark (HF Pen, D, Push-Pull) ..	24.7.37	All-Wave Winning Three (SG, D, Pen) ..	—	WM396
Universal Hall-Mark (HF Pen, D, Push-Pull) ..	9.2.35	Four-valve : Blueprints, 1s. 6d. each.		
A.C. All-Wave Corona Four ..	6.11.37	65s. Four (SG, D, RC, Trans) ..	—	AW370
SUPERHETS.				
Battery Sets : Blueprints, 1s. each.		"A.W." Ideal Four (2SG, D, Pen)	10.9.33	AW402
£5 Superhet (Three-valve) ..	5.6.37	2HF Four (2 SG, D, Pen)	—	AW421
F. J. Camm's 2-valve Superhet ..	13.7.35	Crusader's A.V.C. 4 (2HF, D, QP21) (Pentode and Class B Outputs for above: Blueprints 6d. each) ..	18.8.34	AW445
F. J. Camm's £4 Superhet ..	—	Self-contained Four (SG, D, LF, Class B) ..	25.8.35	AW445A
F. J. Camm's "Vitess" All-Wave (5-valver) ..	27.2.37	Lucerne Straight Four (SG, D, LF, Trans) ..	Aug. '33	WM331
Mains Sets : Blueprints, 1s. each.		£5 5s. Battery Four (HF, D, 2LF) ..	Feb. '35	WM350
A.C. £5 Superhet (Three-valve) ..	—	The H.K. Four (SG, SG, D, Pen) ..	Mar. '35	WM381
		The Auto Straight Four (HF Pen, HF Pen, DDT, Pen) ..	Apr. '36	WM384
		Five-valve : Blueprints, 1s. 6d. each.		
		Super-quality Five (2HF, D, RC, Trans) ..	May '33	WM404
		Class B Quadradyne (2 SG, D, LF, Class B) ..	Dec. '33	WM320

New Class B Five (2 SG, D, LF Class B) ..	—	Nov. '33	WM340
Mains Operated.			
Two-valve : Blueprints, 1s. each.			
Consoelectric Two (D, Pen) A.C. ..	—	—	AW403
Economy A.C. Two (D, Trans) A.C. ..	—	—	WM286
Unicorn A.C.-D.C. Two (D, Pen) ..	—	—	WM394
Three-valve : Blueprints, 1s. each.			
Home Lover's New All-electric Three (SG, D, Trans) A.C. ..	—	—	AW383
S.G. Three (SG, D, Pen) A.C. ..	—	—	AW390
A.C. Triodyne (SG, D, Pen) A.C. ..	19.8.33	—	AW399
A.C. Pentaquester (HF Pen, D, Pen) ..	—	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen) ..	—	—	WM374
£15 15s. 1936 A.C. Radiogram (HF, D, Pen) ..	—	Jan. '36	WM401
Four-valve : Blueprints, 1s. 6d. each.			
All Metal Four (2 SG, D, Pen) ..	—	July '33	WM326
Harris' Jubilee Radiogram (HF Pen, D, LF, P) ..	—	May '35	WM386
SUPERHETS.			
Battery Sets : Blueprints, 1s. 6d. each.			
Modern Super Senior ..	—	—	WM375
Varsity Four ..	—	Oct. '35	WM395
The Request All-Waver ..	—	June '36	WM407
1935 Super Five Battery (Superhet) ..	—	—	WM370
Mains Sets : Blueprints, 1s. 6d. each.			
1934 A.C. Century Super A.C. ..	—	—	AW425
Heptode Super Three A.C. ..	—	May '34	WM359
"W.M." Radiogram Super A.C. ..	—	—	WM366
1935 A.C. Stenode ..	—	Apr. '35	WM385
PORTABLES.			
Four-valve : Blueprints, 1s. 6d. each.			
Midget Class B Portable (SG, D, LF, Class B) ..	—	20.5.33	AW390
Holiday Portable (SG, D, LF, Class B) ..	—	—	AW393
Family Portable (HF, D, RC, Trans) ..	—	22.9.34	AW447
Two H.F. Portable (2 SG, D, QP21) ..	—	June '34	WM363
Tyers Portable (SG, D, 2 Trans) ..	—	—	WM367
SHORT-WAVE SETS - Battery Operated.			
One-valve : Blueprints, 1s. each.			
S.W. One-valve converter (Price 6d.) ..	—	—	AW329
S.W. One-valve for America ..	—	23.1.37	AW420
Rome Short-Waver ..	—	—	AW452
Two-valve : Blueprints, 1s. each.			
Ultra-short Battery Two (SG det., Pen) ..	—	Feb. '36	WM402
Home-made Coil Two (D, Pen) ..	—	—	AW440
Three-valve : Blueprints, 1s. each.			
World-ranger Short-wave 3 (D, RC, Trans) ..	—	—	AW355
Experimenter's 5-metre Set (D, Trans, Super-regen) ..	—	30.6.34	AW438
Experimenter's Short-waver (SG, D, Pen) ..	—	—	AW463
The Carrier Short-waver (SG, D, P) ..	—	July '35	WM390
Four-valve : Blueprints, 1s. 6d. each.			
A.W. Short-wave World-Beater (HF Pen, D, RC, Trans) ..	—	—	AW436
Empire Short Waver (SG, D, RC, Trans) ..	—	—	WM313
Standard Four-valve Short-waver (SG, D, LF, P) ..	—	Mar. '35	WM383
Superhet : Blueprint, 1s. 6d.	—	—	WM397
Simplified Short-waver Super ..	—	Nov. '35	WM397
Mains Operated.			
Two-valve : Blueprints, 1s. each.			
Two-valve Mains Short-waver (D, Pen) A.C. ..	—	—	AW453
"W.M." Band-spread Short-waver (D, Pen) A.C.-D.C. ..	—	—	WM368
"W.M." Long-wave Converter ..	—	—	WM390
Three-valve : Blueprint, 1s.			
Emigrator (SG, D, Pen) A.C. ..	—	—	WM352
Four-valve : Blueprint, 1s. 6d.			
Standard Four-valve A.C. Short-waver (SG, D, RC, Trans) ..	—	Aug. '35	WM301
MISCELLANEOUS.			
Enthusiast's Power Amplifier (1/6) ..	—	June '35	WM387
Listeners' 5-watt A.C. Amplifier (1/6) ..	—	—	WM392
Radio Unit (2v) for WM392 ..	—	Nov. '35	WM398
Harris Electrogram (battery amplifier) (1/-) ..	—	—	WM399
De-Luxe Concert A.C. Electrogram ..	—	Mar. '36	WM403
New Style Short-wave Adapter (1/-) ..	—	—	—
Trickle Charger (6d.) ..	—	June '35	WM388
Short-wave Adapter (1/-) ..	—	Jan. 5, '35	AW402
Superhet Converter (1/-) ..	—	—	AW456
B.L.D.L.C. Short-wave Converter (1/-) ..	—	—	AW457
Wilson Tone Master (1/-) ..	—	May '36	WM405
The W.M. A.C. Short-Wave Converter (1/-) ..	—	June '36	WM406



QUERIES and ENQUIRIES

Deaf Aids

"I am interested in the subject of deaf-aids and have tried one or two circuits. I am not myself deaf, but am trying to make a unit for a friend who is. So far, all the units I have built up have suffered from severe rushing background noises and I wonder if you have found any way of removing this. I do not see any circuit refinement which would do it in your design recently published. I should be glad if you could give me any advice in this connection."—F. W. (S.W.7.).

YOU have undoubtedly tried ordinary carbon microphones, and these do provide a noisy background. Our experience is, however, that this noise is only audible to those with good hearing, to whom the unit would not appeal. When used by a person whose hearing is defective the noise is not apparent and for this reason we selected the carbon mike for our unit. If you find, however, that the background is troublesome you can fit a high capacity condenser across the output or use a small transverse current mike. The latter will not be so sensitive and an additional stage of amplification may have to be fitted to make up for the loss of volume.

Special Condensers

"I wish to try out a circuit in which the designer has shown a gang condenser having the sections separated. I have looked through dozens of catalogues but cannot find a component of this type and wonder if you can put me on to the model I require."—L. E. (Bath).

YOU do not give any details of the circuit and thus we cannot make any definite decision. It is probable, however, that the condenser was made up by using two standard single components and ganging these by means of one of the special insulated connectors which are available from Bulgin, Eddystone and other firms. On the other hand, a split-stator condenser is often used in some types of circuit and in this the two rotors are mounted on a common spindle (electrically connected), but the two stator sections are insulated and screened one from the other. This particular type of condenser is obtainable from Messrs. S. Bird and Sons, Cydon Works, Cambridge Arterial Road, Enfield, Middlesex.

Mains Voltages

"I have been trying to obtain good results with a small mains unit which I have obtained in conjunction with my three-valve short-wave set. I enclose a copy of the label on the unit and wonder if this is unsuitable for use with the particular set I have got. The detector tapping I have ignored and have fed the anode from a potentiometer across the set H.T. connections. Even with the setting at minimum reaction is much too fierce and the tone is very hard."—J. T. Y. (Nelson, Lancs).

THE label which you enclose indicates that your unit is designed for use on mains inputs from 120 to 150 volts, and from a table of mains voltages it would

appear that your district is supplied with 230 volts A.C. Thus, if you connect the unit direct to your mains you are obtaining a much higher output than is intended and, furthermore, may damage the transformer or other components in the unit. If, on the other hand, the transformer has been modified or your mains are in fact between 120 and 150 volts, then the trouble is merely due to the fact that the output voltage supplies will have to be decoupled or otherwise modified to render the set stable.

Valve Types

"I have had a valve given to me by an experimenter who has been unable to find out what type it is. After carefully examining the glass beneath a bright light I detected some markings and I brought these out clear

RULES

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.
- (5) Grant interviews to querists.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

by dabbing with ordinary whiting. The numbers revealed are RB42, but no maker's name can be found. I wonder if you can tell me what this valve is and give me its characteristics."—H. N. M. (Skegness).

THE valve would appear to be the 362 Company's directly-heated full-wave rectifier. This is designed for a maximum output of 500 volts at 100 mA and has a 4-volt 2 amp heater.

Resistance Rating

"I have a number of spare resistors by me, and in making up a new circuit I find that I have not got the exact values required. I can make these up, however, by parallel and series connections, but am not certain regarding the ratings of the components when connected in this way. How will it differ from the normal rating of a single resistance?"—K. O. A. (Calais).

THE WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA

By F. J. CAMM 6th Edition 5/- net
(Editor of "Practical and Amateur Wireless")

Wireless Construction, Terms, and Definitions explained and illustrated in concise, clear language.

From all Booksellers, or by post 5/6 from George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

THE ratings of resistances are given according to the wattage dissipation across them. Consequently when connecting them in parallel the current may be reduced, and in order to arrive at the correct wattage for each separate component in a series or parallel circuit it is necessary to calculate the wattage of each separate component.

P.A. Equipment

"I have received an invitation to install an open-air public-address outfit for a local function and wonder if you can assist me in deciding upon the most suitable charge for the outfit, exclusive of gramophone records which will be used for filling in odd moments in the function."—H. R. (Hythe).

THE charge will depend, amongst other things, on the wear-and-tear of the apparatus and whether you will use any battery supplies. Most local engineers who supply equipment of this type have fixed charges and it would be advisable to make sure that you do not under-cut any local firm who specialises in the work. With regard to the use of records we would remind you of the copyright attaching to these and you should get into touch with the Performing Right Society at Copyright House, 33, Margaret Street, W.1.

Television Interference

"I have made up an experimental set for receiving the television sound broadcasts, but these are accompanied by terrific rushing and crackling noises. By substituting coils I was able to get the set to work on 30 metres and the noises are not then apparent. I therefore assume that the trouble is due to some local machinery or apparatus, but I am uncertain how to set about finding it. Would it be practicable to make a small direction-finder to take about for this purpose, and if so what are the main features of design?"—J. E. (N.1.).

A SMALL two-valve portable with a fairly large frame aerial should be quite suitable for your purpose and could be used in conjunction with earphones. No doubt the apparatus is quite close to you and will probably turn out to be a neon sign, probably of the flashing variety. If you can see such a sign near you, you could turn the set on before it comes into action and notice if the noise is then absent. The Post Office engineers may be able to assist you if you fill up the form obtainable from your local post office.

Hot Mains Leads

"Should the mains lead to a receiver get hot? I have an American receiver which recently broke down. I had it repaired and since it has been back I notice that the flex which connects it to the mains socket gets very hot."—G. P. (Cardiff).

CERTAIN American types of receiver have a special mains lead in which is incorporated a resistance in series with the valve heaters. This rises to a fair temperature on some sets, but should not get too hot to touch. If you are doubtful regarding the temperature, perhaps it would be advisable to have the set examined by a firm who are experienced in handling American sets. An undue load on the receiver arising from a faulty connection or component could cause the resistance to rise to such a temperature that there may be a risk of fire should it come in contact with some inflammable object.

The coupon on page 400 must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 5/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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ALL goods previously advertised are standard lines, still available. Post card for list free. VAUXHALL UTILITIES, 165a, Strand, W.C.2. Over Denny's the Booksellers. (Temple Bar 9338.)

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1938 RADIO SPECIAL.—ERIE 1-watt resistors, all sizes, 2/- dozen. DECCA Model 55 All-wave Transportable, £4/15/0. PHILCO 3-valve All-wave Battery, £3/15/0. PLESSEY 4-valve Battery Superhet Chassis, 8in. Speaker, £2/15/0. VALVES: 350/120 Rectifier, with Valveholder, 3/6. FERRANTI 350/100 Mains Transformer, 4v. 6-amp., 7/6. POLAR Midget 3-gang, with cover, 2/9. ROLA G. 12 1,250, 2,500 ohm, 37/6; P.M., 47/6. 14d. stamp. Lists.—COULPHONE, ORMSKIRK.

SOUTHERN RADIO'S Wireless Bargains.

SOUTHERN RADIO, 323, Euston Road, London, N.W.1, have now removed to 46, Lisie Street, London, W.C., where all bargains previously advertised can still be obtained. New list of lines will be advertised shortly.

SOUTHERN RADIO, 46, Lisie Street, London, W.C.1. Phone: Gerrard 6653.

A.C. S.T.900 Author's Kits A, £8/15/0. S.T.900 Battery Kits, complete with ten coils and valves, £4/15/0. S.T.700 Kits A, £1/16/0.—Servwell Wireless Supplies, 64, Prestbury Road, London, E.7.

BANKRUPT Bargains.—All new goods. Decca A.C./D.C. 5v. superhet all-wave transportables 90/-. Philco 3v. all-wave battery sets, £4/0/0. Philco A.C. superhet, model 444, 1933, 72/6. Brunswick 1933 11v. 5-band push-pull superhets, £10/0/0. Phillips 1933 5v. A.C. superhet chassis, complete, less only cabinets, £4/17/6. Plessey battery 4v. superhet chassis, valves and speaker, 57/6. Components and valves.—Butlin, 6, Stanford Avenue, Brighton.

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"Jubilee Works" 167, Lower Clapton Rd., London, E.5. Amherst 4723.

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can now obtain their requirements at "Jubilee Works," as well as— 165 & 165a, Fleet Street, E.C.4 Central 2833, and 50, High Street, Clapham, S.W.4. Macaulay 2381.

Premier 90 Page Giant Illustrated Catalogue, Handbook, and Valve Manual Price 6d.

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MAGNAVOX 7" P.M., with transformer, 3/11. Magnavox 8" P.M.'s—with transformers—10/6 each.

B.T.H. 10" M Coil Speakers. 1,600 ohms field. No trans., 9/11.

B.T.H., 8" 7,500 ohm field, no transformer, 2/11 each. 110 K.C. I.F. Transformers, 1/3.

LISSON Power Packs in aluminium cases, 150v., 25m.a., with C.3v. L.T., 100-250v. mains, 10/3, with Rectifier.

METAL RECTIFIERS, 250v., 60 m.a. output, 4/6 each. Telsen Slow Motion Drives, 9d. each. Telsen Twin H.F. Chokes, 6d. each. Telsen Variable Condensers, .0001 or .00075, bakelite dielectric, 6d. each.

Phillips Wet Electrolytics 4mf. or 8mf., 320v. working for universal sets, 2 for 1/6.

U.S.A. Tubular Electrolytic condensers, 8mf. 500v., 3 for 2/6; 18 + 8 mf. 450v. + 8 mf. 250 v.; 8 + 8 mf. 450 v. + 10mf. 50v., 2 for 2/6.

T.G.C. 15mf., 100v., Dry Electrolytics, 4d. each. Cossor 1 + 1 mf. Condensers, 3d. each.

2-Gang .00018 all brass short-wave steatite based Condensers, 2/11 each.

Potentiometers, 1/- each. 10,000, 20,000, 250,000, 500,000, 2 meg., with switch, 1/3 each. 10,000, 20,000, 250,000, 500,000. Special Offer, 25,000 ohm. Potentiometers, 3 for 1/6. Tubular Wire-end Condensers, .0001, .0003, .0005 and .002, 1/- dozen, your choice.

MAINS TRANSFORMERS. Primary 200-250v., Secondaries, 350-0-350v., 90 ma., 4v., 2a, 4v., 5a., 4/6. Primary 230v.-250v. only. Secondary 250-0-250v., 60 m.a., 4v., 2a., 13v., 1a., 3/6.

Mains Transformers for HT9 Rectifier, Output 300v. 60ma., 4v. 4 amp., 4/6 each. With Rectifier, 13/-.

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UNIVERSAL TYPES. 20v. 18a, S.G., Var-mu S.G., Power, H.F. Pen., Var-mu H.F. Pen, 4/6 each. 13v. 2a. Gen. Purpose Triodes, 5/6; H.F. Pens and Var-mu H.F. Pens. Double Diode Triodes, Oct. Freq. Changers, 7/6 each. Full-Wave and Half-Wave Rectifiers, 5/9 each.

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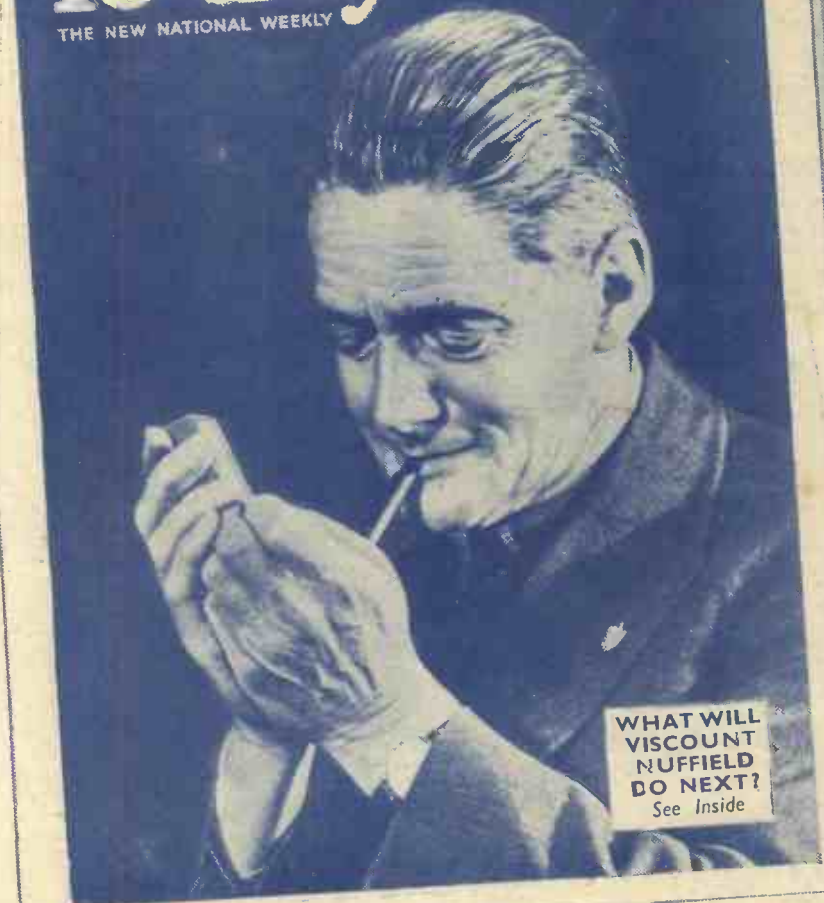
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Edited by F.J. CAMM

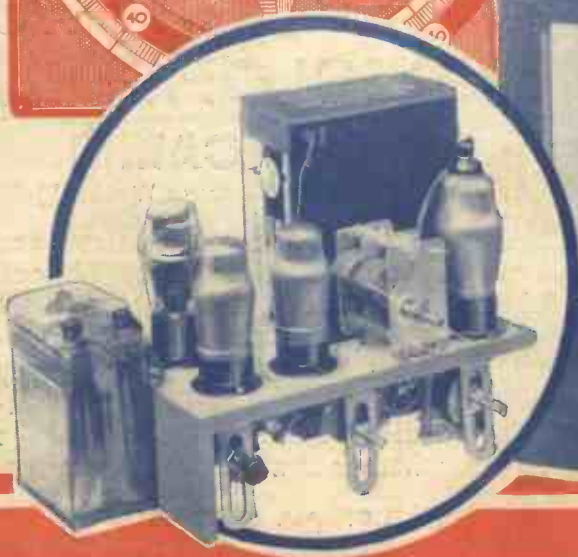
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July 9th, 1938.

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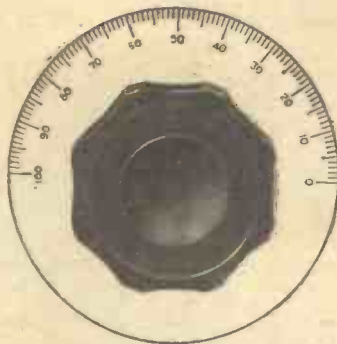
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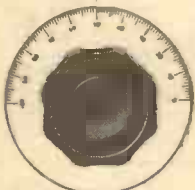
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What Is Your Ideal Circuit? — See Page 405



Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch.,
B.Sc., A.M.I.E.E., Frank Preston.

VOL. XII. No. 303. July 9th, 1938.

ROUND *the* WORLD of WIRELESS

Favourite Circuits

A QUESTION which always crops up where a number of radio amateurs are gathered together is: "What is your favourite circuit?" Each amateur has his own preference and it is very interesting to compare the points which each raises as being the most important. One will stipulate that Class B is the only worthwhile output stage, whilst another will not tolerate such a stage. One will be all for the short-waves, whilst another will endeavour to prove that short-waves are not worth while. Out of all the arguments, however, certain salient points remain, and much good can come from such interesting types of discussion. Last week we gave three circuits which the Experimenters had collected from correspondence which had reached them from readers, and in this issue we give some more similar details. Where a radio club is in existence the members will often bring along their pet receivers and endeavour to prove to other members how the set acquits itself and this is one very good way of finding out what are the merits of various circuit arrangements. Every reader cannot find time to build up each set in ideal form in order to try it for himself, but by reading the claims of others he can form a fairly good opinion regarding the type of receiver which will probably suit his requirements.

Royal Visit to France

OWING to the death of the Queen's mother, the Royal visit to Paris has been postponed and therefore the broadcasts which were previously arranged will also be put off for three weeks. The unveiling of the Australian War Memorial takes place now on Friday, July 22nd.

Radio In Taxicabs

A QUESTION was asked in the House recently regarding the permission to install radio sets in taxicabs. In a reply the Home Secretary said: "If there is a general desire for more noise in the streets of London (laughter) this matter will be considered, but at present the Commissioner of Police, who is the licensing authority for taxicabs in London, takes the view, with which I concur, that in the general public interest it is preferable that wireless sets should not be installed in taxicabs." This reply was greeted with cheers by the House.

Car Radio At Motor Show

IT is also interesting to note that for the first time car radio apparatus will be exhibited at the Motor Show in the accessories section. This means that the apparatus need not be actually installed in a car, and many well-known radio sets will thus be on view for the first time.

Reception in Falkirk

EXPERTS are at present studying conditions in Falkirk where complaints have been received regarding freak reception of the two medium-wave Scottish

The two commentators for the recorded impression to be given in the Midland programme on July 16th will be C. R. Hodgson and W. Graham Walker, each well known in the motor-cycling world, both as riders and writers.

National Diving Championship

FOR the first time a national diving championship will be held at Weston-super-Mare on July 14th, in the New Open-air Swimming Pool, and a commentary on the event—the One-metre Spring Board Championship—will be broadcast by R. G. Jordan, who is Hon. Secretary of the Western Counties A.S.A., and a member of the Executive of the Amateur Swimming Association.

A Voyage To Lilliput

LANCE SIEVEKING'S adaptation, to be heard on July 10th (National), of the story of Gulliver's famous voyage is remarkable for its boldness. As well as interpolating entirely new lyrics which Robert Chignell has set to music, he has taken the liberty of adding to the vocabulary of the Lilliputians, since in Swift's original only a very few words of their language exist.

His adaptation is radio drama in its truest form, since it could not possibly be produced in any other medium than that of broadcasting. To enable listeners to distinguish between the giant Gulliver and the tiny Lilliputians, Stuart Robertson will sing his part through a megaphone whilst the other members of the cast, whose voices will not only be artificially pitched very high but also mechanically distorted, will reply to him in the miniscule tones appropriate to people only four inches high.

New Gramophone Programmes

THREE new series of programmes of variety records have been planned by Leslie Perowne for broadcasting during the summer quarter.

The first, "What's New," a survey of new light gramophone records, will be broadcast during the early afternoon of Wednesdays. The second, "Do You Remember?" souvenirs of popular songs and singers, such as Jack Smith, Melville Gideon and Ruth Etting, will alternate with the third, "Everybody's Jazz"—records of tunes for all tastes—on Friday afternoons.

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stations. A B.B.C. official has stated that the trouble is probably due to "gratuitous rectification from metal conductors in the vicinity," and has voiced the opinion that anti-static aerials might cut out the trouble.

The King and Queen in Birmingham

THE visit of the King and Queen to open the new Birmingham Hospitals Centre will be reflected in Midland programmes on July 14th by an eye-witness account to be given that evening by Thomas Woodroffe.

Motor Cycle Trials

THE International Six Days' Motor Cycle Trials commence in Wales and finish at Donington Park, Leicestershire.

ROUND the WORLD of WIRELESS (Continued)

Sir John Reith Resigns

THE Director-General of the B.B.C., Sir John Reith, has vacated his seat to take over the duties of Chairman of Imperial Airways. Sir John has been with the B.B.C. for fifteen years and has been responsible for the great developments since Savoy Hill days. Probable candidates are stated to be Mr. C. G. Graves, the present Deputy Director-General, and Sir Stephen Tallents, Controller of Public Relations. The post carries a salary of £6,000 a year, but an extra sum is granted by way of honorarium in connection with the expenses of the office. In the case of Sir John this amounted to £1,000 per annum over a considerable period.

Australian Station VLR

WE are informed by the Australian Broadcasting Commission that from July 3rd. the Sunday hours of transmission from VLR will be as follows: 8 a.m. to 1.30 p.m.; 3 p.m. to 10.30 p.m.

Broadcasts in Esperanto

AMONG the many plays and operas broadcast in Esperanto from the Czechoslovak wireless stations, two plays, broadcast in Esperanto and Czech on different occasions, have met with particular success. They are "La Decido" and "Kara Margereto," both written in Esperanto by Mr. Douglas P. Boatman, a well-known Westcliff-on-Sea optician. After their recent broadcast in Esperanto, thousands of congratulatory letters and postcards were received by the Czechoslovak radio authorities in Prague from all over the world.

Travel Talk

A SERIES entitled "Seeing Life" is being presented by Midland to bring to the microphone Midlanders with a story to tell. In the first of these programmes on July 15th, William Potts will tell of his journey to Australia in a four-masted barque "Parma," which made a voyage of seventy-three days—a record, in spite of her nearly capsizing in the "Roaring Forties."

"The Summer Revellers"

GEORGE HAY and Gordon Lane will present another programme by "The Summer Revellers" from the Cosy Nook Theatre, Newquay, in the West of England and Regional programmes on July 14th. The Concert Party will include: Elsa Stenning (soprano), Madge Hayden (comedienne), Betty Inman (soubrette and dancer), Elisse Relnah (pianist and entertainer),

INTERESTING and TOPICAL NEWS and NOTES

Joyce Banning, Olive Bell and Betty Francis (dancers), John Lewis (tenor), Bruce Clark (baritone), Elton Hayes (light comedian and dancer) and Brian Lymbery (comedian).



Sir John Reith.

An "Eric Coates" Programme

AN "Eric Coates" programme will be broadcast on July 14th by the Clifton Light Orchestra, led by Joan Allen and conducted by Reginald Redman, with Hilda Blake (soprano) as the vocalist.

Bridlington Orchestra

LIONEL JOHNS and his Orchestra, who play at the Floral Pavilion on the Parade at Bridlington, will give a concert for Regional listeners on July 11th. Bridlington is rich in orchestral entertainment, for besides the Pavilion players, there is Darewski at Bridlington Spa.

"Small Boats"

AN interesting new series of Northern talks on "Small Boats" will start on July 6th, when Major V. Seaton Gray, of Whitby, whose pen-name is G. V. Seton, will talk about the Yorkshire cobble. There will be two further talks in this series, which is to deal with coastal and fishing craft characteristic of the North, and both the East and West Coasts will be represented. The speakers will have special qualifications, and seafaring reminiscences are likely to be part of the talks.

Pot-Pourri

"SWEET SERENADE," presented by Leslie Bridgmont, will bring for West of England listeners on July 12th another pot-pourri of romantic tunes played by the Seven Serenaders and sung by Eileen Vaughan and the Three Nomads. The last programme was broadcast on June 14th.

B.B.C. Midland Orchestra

LESLIE HEWARD has arranged three programmes of "Music at Night" for the B.B.C. Midland Orchestra and Norman Fraser (pianoforte). The first of these, on July 11th, will include Elgar's "Chanson de Nuit" and Saint-Saen's "Danse Macabre."

Out of Doors Again

JULY—and at least a promise of Summer—brings with it the revival of the feature, "The Week-End Out of Doors," this year edited and presented by Denis Ireland. It is to be broadcast every Friday night, in time to catch the week-enders and to offer them the latest authoritative information about their week-end activities. Gardening, motoring, rambling, angling, and even aviation are included in this miscellany of week-end attractions and distractions. The feature will begin in the Northern Ireland programme on July 8th.

International Motor Cycle Trials

IN conjunction with the Midland Regional station a recorded programme will be made covering the whole of the International Six Days Motor Cycle Trials in Wales, and this will be broadcast on July 16th. Last year these Trials attracted a record entry. Listeners will hear in this broadcast interviews with leading competitors, the start from Llandrindod Wells, test hills on the course, checking in, and some of the excitement en route.

SOLVE THIS!

PROBLEM No. 303

Atkins visited a market stall and saw a number of components on view which he recognised. There were several I.F. transformers by a well-known maker and upon receiving an assurance that they were in good order he purchased two. He then bought some ganged coils and a ganged condenser to match and constructed a superhet. When he came to the trimming he found himself in difficulties. He could get signals to the first I.F. stage but no further. After some trials he cut out the first I.F. stage and fed straight from the frequency changer to the second detector, using the second I.F. transformer, and then found that he could obtain signals at certain parts of the dial in this manner. What was wrong? Three books will be awarded for the first three correct solutions opened. Address your envelopes to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 303 in the top left-hand corner and must be posted to reach this office not later than July 11th, 1938.

Solution to Problem No. 302

Jackson overlooked the fact that the valves used in the Hurricane receiver are of American type, and thus the top cap is a grid connection. The following three readers successfully solved Problem No. 301 and books are accordingly being forwarded to them: D. Sefton, 49, Clifford Avenue, East Sheen, S.W.14; R. S. Bourhill, "Dykenuk," Newtowngrange, Midlothian; E. A. Valentine, 89, Dens Road, Dundee.

A Novel Pulsator

A Handy Unit for Servicing and Testing Radiograms and L.F. Amplifiers

MANY experimenters in constructing or servicing radiograms and L.F. amplifiers resort to a stand-by turntable and pick-up, but whilst it is necessary to choose a record which will give a wide range of notes for tests in quality reproduction, the occasion often arises when a continuous note facilitates stage-by-stage testing.

One of the many other advantages in the use of a small signal generator of this nature is in its portability when a turntable and pick-up is not to hand.

A rather interesting action is introduced in the design by the method of obtaining an unrestricted and direct push-pull movement to the armature of a converted pick-up unit, thus attaining fairly constant pulsations of an adjustable frequency.

It will be seen on referring to Fig. 1 that generation is derived from a "free" acting armature movement, as it was realised that a metallic coupling between the armature of the bell and the moving-iron of the pick-up would result in an untrue action with obvious "pitch" distortion. The contact to the vibrator reed of the bell armature was therefore obtained through the medium of the pick-up needle clamp, a good quality steel needle being firmly positioned and adjusted as if for ordinary record reproduction.

By soldering a fine spiralled wire (32 S.W.G. enam.) connection from the head of the needle fixing screw to one of the 3-volt battery contacts, the movement of the

Bulgin type No. I.P.7 fitted under the potentiometer instrument knob.

The potentiometer includes a switch, this being used in this instance for breaking the battery circuit to the bell movement, whilst for interrupting the pick-up output a Clix loudspeaker control panel is utilised to advantage, and proves a neat and inexpensive fitment.

It will be realised that by providing output interruption in this way radio "break-through" tests and bias variation

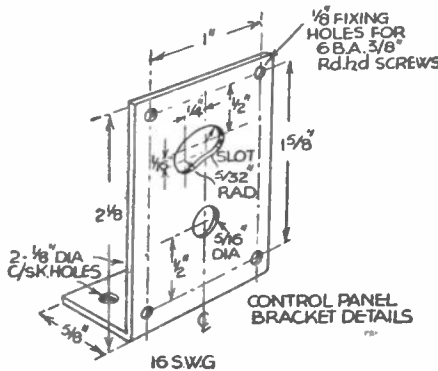


Fig. 3.—Details of the mounting bracket.

pick-up iron is in no way restricted, this remaining constant whatever the variations in the bell armature vibrations.

The Circuit

From the theoretical circuit diagram, Fig. 2, the simplicity of the wiring will be evident, whilst the only critical point in the assembly is the alignment of the needle contact to the vibrator reed on the bell armature. (See Fig. 4.)

In this particular model a 50,000-ohm potentiometer was included across the output from the pick-up, and this value will, of course, depend on the characteristics of the unit used. However, by using this "fader," intensity tests in stage gain experiments can be made, the different results being logged by taking readings from either a disc of paper or a dial of the

can be better made, and under normal conditions (excepting short- and ultra-short-wave work) interference from the bell action need not upset experiments, and some of the many tests in chassis work other than the specific purpose of the unit for amplifier testing.

Construction

Referring again to Fig. 1, it will be seen that the whole assembly is mounted in bread-board fashion, and although in this particular instance a cover was not required, any reader contemplating the construction of such a model can very

- LIST OF COMPONENTS**

 - One loudspeaker control panel No. 28, Clix (B.M.P.).
 - One potentiometer, type V 4 Radidus, Polar (N.S.F.).
 - One 3-volt battery, No. 1450, Ever-Ready.
 - One pick-up unit, Electradix Radios.
 - One small bakelite buzzer movement, Electradix Radios.
 - One switch dial No. I.P.7 (optional), Bulgin.
 - One instrument knob, K.92, Bulgin.
 - One pair Lexdix headphones, 4,000 ohm, Electradix Radios.

MISCELLANEOUS

 - 16 or 18 S.W.G. aluminium (plain or machined finish), Peto-Scott.
 - 18 S.W.G. tinned copper wire, sleeving, flex, 6BA nuts and bolts, wood screws, c'sk, rubber feet.

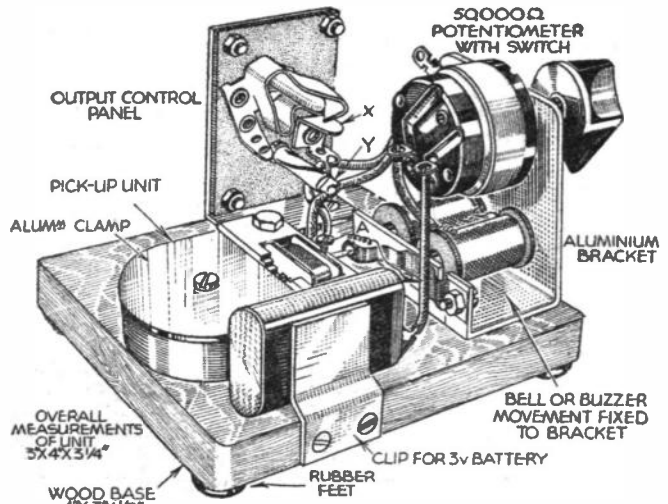


Fig. 1.—The finished unit.

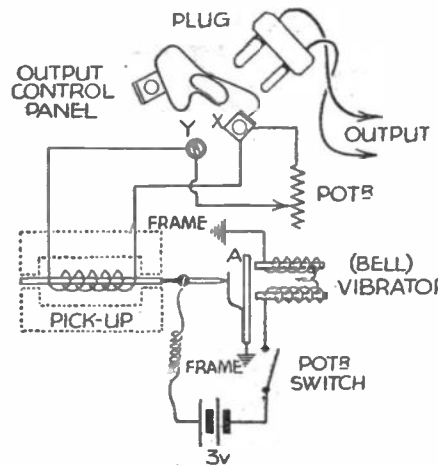


Fig. 2.—Theoretical circuit of the Pulsator.

easily make a simple cover out of either tin or aluminium, and with a little adjustment it should be possible to make this serve the purpose of a silence shroud whilst at the same time, by earthing the cover, efficiently screening the radiations from the bell movement.

The unit will serve admirably for continuity and low-resistance tests up to about the value of the potentiometer, and all that is required to make these tests is the inclusion of a pair of headphones in circuit with two test prods, connected as usual through the control panel switch plug.

Before dealing with the points to be watched in the construction and final adjustments, a word of advice to the beginner. A high voltage should never be applied across the output plug as the pick-up winding may get irreparably damaged.

It is immaterial whether a bell or a buzzer movement is used as the vibrator, but if it is necessary to purchase one, should the junk box offer no assistance, then it should be of the type having the coil pole pieces fixed to the bell chassis by screws, not by being burred over or riveted, to

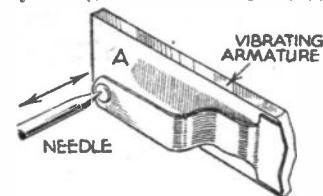


Fig. 4.—Showing how the needle acts on the armature.

facilitate removal if desired and as illustrated.

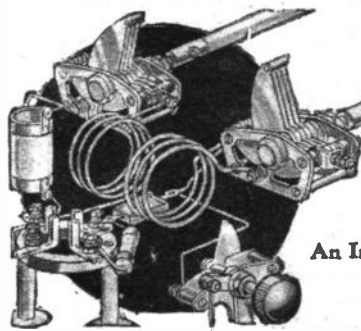
The vibrator contact reed should preferably be of either copper or phosphor bronze, but this is not vitally important, and cheaper bells and buzzers employing soft-iron contacts will serve quite well although a pitch variation in the note must be expected more frequently.

The question of pick-up will, of course, have to be left to the discretion of the constructor, and (as in the model being described) the pick-up cover may have to be removed to facilitate mounting and wiring, together with the alignment of the needle.

Sufficient distance should be allowed between the vibrator reed and the pick-up so that the movements will not be impeded through insufficient resilience in the bell armature.

When satisfied that all the components are rigidly fixed down and the small battery

(Continued on page 421)



Short Wave Section

AN S.G. DETECTOR TWO

An Interesting Experimental Set for the Short-wave Listener

By A. W. MANN.

THE most desirable features in receiver design are average selectivity and sensitivity within the defined limits of the circuit's high signal-to-noise ratio, ease of tuning, dependability, and flexibility, and smooth regeneration, if regeneration or reaction is used.

The triple input arrangement enables the experimenter to overcome these troubles effectively. For example, series condenser C is perhaps most effective from 10 metres to 65 metres. Between 65 metres and 90 metres output B, using the .0001 mfd. as against .00005 mfd. of output C, will

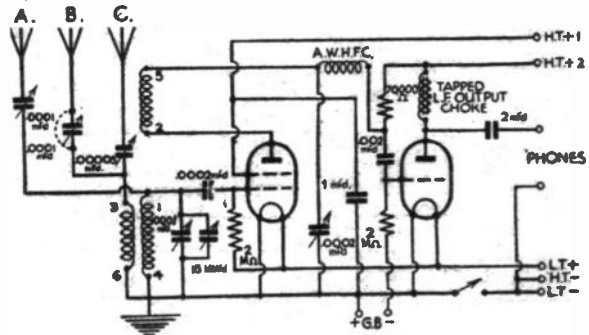


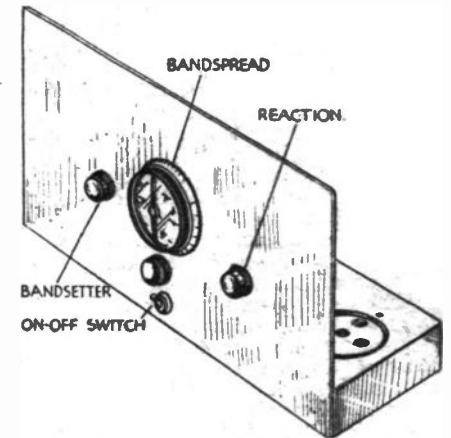
Fig. 1. (left).—Theoretical circuit diagram of the S.G. detector two.

Fig. 2 (right).—Chassis and panel assembly.

on crowded bands would otherwise be missed, and in addition makes for non-critical operation, together with the possibilities of accurate calibration.

The High-frequency Choke

With regard to the H.F. choke it will be appreciated that by the inclusion of the all-way type resonance peaks will be avoided over the full range of 10 metres to 170 metres, and in addition the tuning range can be extended above 170 metres if desired, provided suitable coils are available, no modification of choking arrangements being necessary.



Choice of circuit is the first consideration. We may choose a circuit in which a triode detector is used, a screen-grid detector or an H.F. pentode detector or again a combined triode detector and L.F., as for a Class B stage. As the writer dealt with a triode detector transformer-coupled L.F. circuit in a previous article, the present discussion is devoted to the design and constructional considerations as associated with a screen-grid detector type receiver.

Refer to the theoretical diagrams shown at Fig. 1, which consists of a screen-grid detector, resistance-coupled low-frequency combination.

Many experimenters have at some-time or other tried out a triode detector and resistance-coupled low-frequency combination and whilst satisfied with the signal-to-noise ratio felt that additional gain provided by transformer or resistance-feed coupling was most desirable, even though the background ratio, as might be expected, would be higher.

I would point out, therefore, that when using an S.G. R.C.C. combination, as shown at Fig. 1, a higher signal gain is obtainable than with the triode detector, and the noise ratio is exceptionally low.

Let us revert to the theoretical circuit at Fig. 1 and examine it in detail. Three separate aerial inputs, bandspread tuning, an all-wave type H.F. choke, resistance coupling, and tapped L.F. choke output are specified. Some explanation concerning the incorporation of the features outlined apart from the R.C.C. stage will clarify matters.

Aerial Input Considerations

Aerial characteristics differ. In one instance it may be possible to use aperiodic or inductive coupling on all bands. In another instance, on a few bands, whilst in the third instance, apart possibly from 90 metres to 170 metres, damping of the grid circuit causes a complete failure to obtain oscillation or causes dead spots in tuning over various wavebands.

provide better results especially on the amateur phone band and result in increased volume.

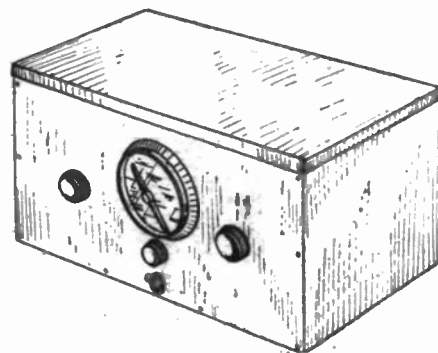


Fig. 3.—A metal cabinet showing the controls and dial.

When, however, 90 to 170 metres reception is desired, it will usually be found that aperiodic coupling is the most satisfactory; therefore, all that is necessary is to short-circuit condenser B with a short piece of wire or by means of an on/off switch. The dotted line at B shows this condenser short-circuited.

Aerial input A provides capacity coupling, cutting out the aperiodic winding entirely. Thus the triple aerial input provides a most flexible means of adapting the grid circuit to the aerial in use. Bandspread tuning is incorporated not as refinement but as an essential because its use will enable the DX enthusiast to tune in with case transmissions which

L.F. Choke Output

A tapped L.F. output choke as specified will, amongst other things, safeguard against headphone lead capacity and instability. Those who have previously regarded an L.F. output choke as unnecessary will find its inclusion to be a revelation, and whilst it is not suggested as a means of making a bad receiver good, it will undoubtedly make a good receiver better.

Whilst a tapped choke is unnecessary when a power valve is to be used, the future possibilities of changing over to pentode output should be kept in mind. Should this not be contemplated and a standard L.F. choke of suitable type is to hand, there is no reason why it should not be used.

The method of construction is a matter of individual choice. Fig. 2 shows a suitable form of chassis panel assembly. A metal panel or plywood metal back panel with a foil-lined plywood or metal chassis may be used.

In order to avoid stray pick-up by coils and wiring, efficient screening is recommended. Fig. 3 shows a metal cabinet or (Continued on page 415)

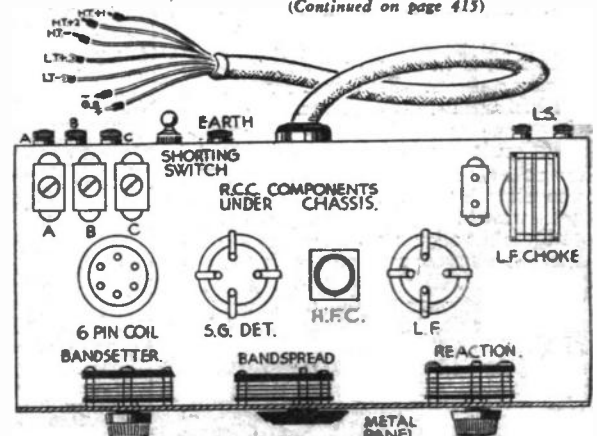


Fig. 4.—Suggested layout of components.

What is Your Ideal Circuit?—2

The "Experimenters" Continue the Discussion which they Started Last Week, and Give Some Further Interesting Circuits

LAST week we told you of our "interviews" with a few different classes of constructor in our efforts to discover what circuits are most popular. The most surprising thing we have found is that almost everyone to whom we put the question forming the title of this chat gave a different answer; in most cases the differences were strikingly wide.

Our fourth "subject" is a traveller and spends only a very small amount of his time at home. His work takes him all over the British Isles, and he likes to keep in touch with affairs by listening regularly to the news bulletins. Additionally, of course, entertainment is desired, and in many places in the country radio provides practically the only source. Car-radio he has fitted in his car, but he confesses that he rarely uses it, due to the fact that during most of the time that he is driving, his mind is occupied with his business. The set that he wants is one for use in the evenings after he has settled in a convenient hotel. You might say that every good hotel these days has its own receiver—but in that case the choice of programme rests with somebody else.

Battery Q.P.P. Portable

However, he described his ideal circuit as that of a good battery portable, working from its own frame aerial and capable of providing at least three alternative programmes in any part of the country. Due to slight deafness, a fair volume is required, and quality of reproduction should be of a fairly high standard, for "who can enjoy regular listening to distorted music?" The gentleman in question is by no means an expert and cannot draw up his own circuit diagram, although he can follow one when it is put before him. That is why we drew out for him a diagram similar to that shown in Fig. 1.

As can be seen, it is for a three-stage, four-valve portable with Q.P.P. output. We have shown two separate pentodes in the output stage, but these could well be replaced by a couple of tetrodes or by a 9-pin Q.P.P. valve. Starting from the input end there is a frame aerial with long- and medium-wave windings, also a separate three-turn winding to which an external aerial (a short throw-out one will serve) can be attached when conditions permit, and when additional sensitivity is required.

Manual Trimmer Control

This feeds into an H.F. pentode, tuned-grid coupled to a triode detector. A double-pole on-off switch is connected to serve for wave-changing on both the frame and tuned-grid coil. Reaction is applied

to the detector, which is connected to the Q.P.P. stage through a parallel-fed Q.P.P. transformer. Note the tuning arrangement. A two-gang .0005 mfd. condenser is used, but a .00005-mfd. trimmer is wired in parallel with the section used with the

by The Experimenters

intervalve coil. This is to permit of easy and accurate matching of the two tuned circuits. We appreciate that the "professional" method of doing the job is to use padding condensers which can be pre-set to ensure that the two circuits

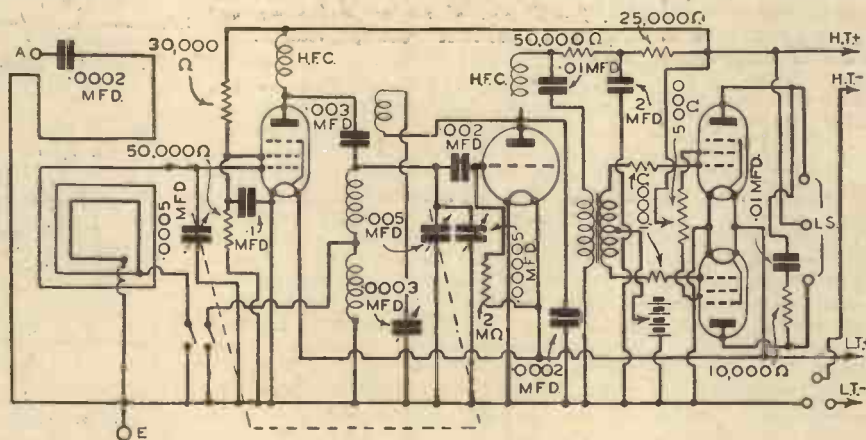


Fig. 1.—Circuit for a powerful battery portable.

remain in step over both wave ranges, but this is by no means easy to arrange without laboratory test equipment. To ensure that the trimmer, which is controlled from a knob on the front of the set, shall give a fair variation in tuning it would be desirable to remove the trimming pre-set component generally fitted to the gang condenser. Alternatively, the adjusting screw could be removed and the top plate bent well away from the other plate and the mica dielectric.

You will notice that there is a 1,000-ohm stopper resistor in each control-grid lead to the Q.P.P. stage and that a rather unusual method of "balancing" the auxiliary-grid voltage is adopted. A 5,000-ohm potentiometer (not of the graded type, for preference) is connected between the two auxiliary grids, the slider being joined to H.T. positive. Thus, the two valves can be matched accurately "by ear" simply by turning the knob of the potentiometer. Incidentally, this might well be a pre-set, baseboard-mounting type, since once it has been set alteration is not required until a new valve is fitted. Although not shown, it might be desirable to connect a 1-mfd. tubular condenser between each auxiliary grid and earth to act as by-passes.

A simple tone-compensator is joined between the two anodes in the Q.P.P. stage, and three L.S. terminals are shown;

these would be connected to the appropriate terminals on the speaker transformer which should, of course, be of a pattern suitable for use with Q.P.P. The set would not be particularly light, especially since it is wise to have a fair-sized H.T. battery and an accumulator with an a.h. capacity rating of not less than 20. This does not matter when it is usually to be carried about in a car.

H.F.-Det.-P. for "Quality"

The next person we approached happened to be an experimenter of some standing, and his ideas of the "ideal" circuit were somewhat different from those of any of the previous persons we had questioned. He very soon roughed out a skeleton circuit on the lines of that shown in Fig. 2, saying that this was what he considered the most satisfactory kind of set for inexpensive quality reproduction. As you can see, it is a "straight" with three valves plus rectifier. The first is a variable- μ H.F. pentode, the second a double-diode-triode used as a single diode and triode intermediate L.F. amplifier, while the output valve is of the power-triode pattern, such as the P.X.4.

This experimenter is a keen believer in band-pass tuning, especially for the simpler

type of set, and would not dream of making a "quality" receiver not incorporating it. He generally uses "bottom-capacity" coupling and employs a coupling condenser of rather lower value than that normally recommended by the makers of the coils, with the object of obtaining a somewhat wider band-width. He considers it worth while to experiment with a few alternative condensers until the optimum value is found.

Diode Detector

From Fig. 2 it can be seen that a fixed potentiometer is used to supply the screening-grid voltage for the variable- μ H.F. pentode; the value of this and of the biasing resistors is dependent upon the valve used, and makers' recommendations should be followed. Tuned-anode coupling is used between the first valve and the double-diode, of which the two diode anodes are strapped together and, naturally, reaction is not used.

A 25-megohm potentiometer serves as the diode load and also as the manual L.F. volume-control, whilst the output from the triode L.F. amplifier is fed to the output valve through a resistance-capacity coupling. The output valve is of the directly-heated type and requires a separate filament winding. It will be noticed that a 100-ohm resistor is included in the anode lead to the speaker to ensure complete L.F. stability.

(Continued overleaf)

WHAT IS YOUR IDEAL CIRCUIT?

(Continued from previous page)

Power Unit

In addition to the receiver part of the set, we also show the power unit suggested. This comprises a 350-volt, 120 mA rectifier, a transformer with outputs of 350-0-350 volts, 120 mA; 4 volts, 2 amp.; and 4 volts, 2 amp. Since the total H.T. current consumption is in the region of only 60 mA when the anode voltage on the P.X.4 is 250, or about 50 mA at 200 volts, the output from the rectifier valve is roughly 400 when using a valve such as the Cossor 442 B.U. At 50 mA the voltage drop across the 2,500-ohm speaker field is 125, and the bias voltage developed across the resistor between the transformer L.T. winding and H.T. negative is about 25, the voltage actually applied to the anode is 250, less the voltage drop across the primary winding of the speaker transformer.

The final result of this is that the output valve is slightly under-run, but not to such an extent that the undistorted output is much below the maximum. It will also be seen that the energising wattage for the speaker field is round about 6½, which is just about enough for satisfactory operation. If the speaker is a sensitive one, this energising wattage is sufficient to permit of effective handling of the 2½ watts or so of undistorted output which could fairly be expected from the receiver. In our opinion, however, it would be better to use a good permanent-magnet speaker and to replace the field winding by a 500-ohm, 20-henry choke in series with a 1,500-ohm power resistor.

Receiver for Las Palmas

It was an interesting coincidence that the day after we had written our last week's article we received a long and interesting letter from Mr. F. Lawson, who is domiciled at Las Palmas, Grand Canary. He starts off by saying—very kindly, we think—"I invariably turn to your most interesting

articles first, and these I always read, mark, learn and inwardly digest—with just one exception, which is when you are dealing with anything 'superhetish.'" He adds: "For some unexplainable reason I have a profound dislike for superhets."

However, Mr. Lawson goes on to say that his real reason for writing is that he is anxious to have some details of his

especially since this might be of "doubtful efficiency down round about 10 metres." There are some other questions, but these are sufficient for the time being, and we propose to deal more fully with Mr. Lawson's requirements, and the best method of meeting them, in a later chat in this series. In the meantime, any suggestions from readers will be appreciated.

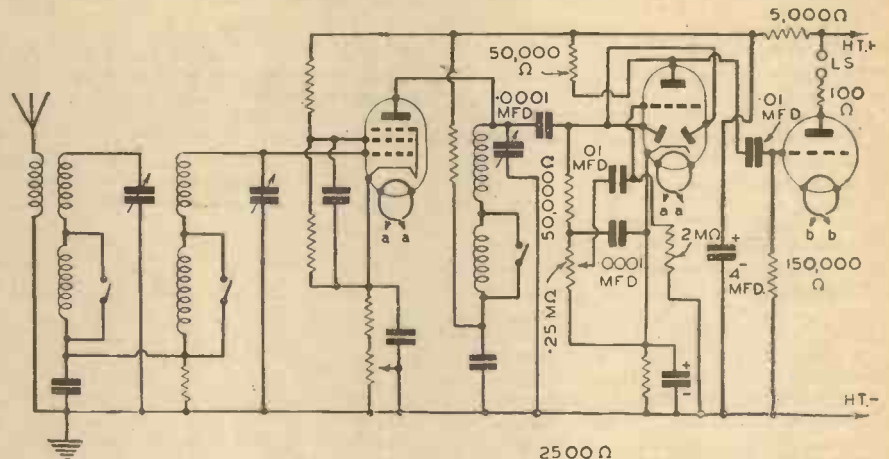
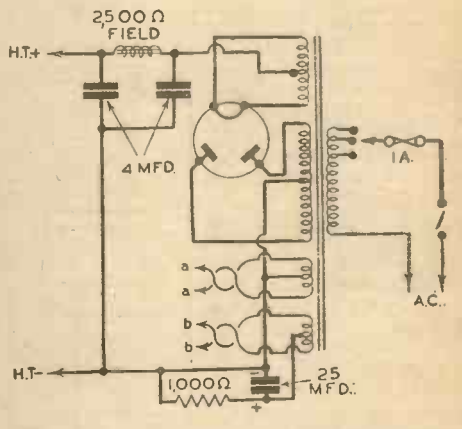


Fig. 2.—Circuits of receiver and power unit for a three-valve "quality" receiver.

"perfect" set, and hopes that we can assist. He is certainly ambitious, for he wants a set that can be built into a modern piece of furniture of the low (in height) type which runs round two sides of a room. He has in mind a five-valve "straight" to cover four wavebands, and with provision for plugging-in additional short-wave coils when necessary. The set must also have provision for pick-up connection as well as for connecting one of two separate loudspeakers and for disconnecting the filament supply to valves that are not in use. Band-spread is, considered necessary, but A.V.C. is not thought to be a practical proposition,



IMPORTANT BROADCASTS OF THE WEEK

NATIONAL (261.1 m. & 1,500 m.)
Wednesday, July 6th.—Bianca, musical comedy.

Thursday, July 7th.—Radio Road House, variety programme.

Friday, July 8th.—Variety programme from Jaywick Holiday Camp.

Saturday, July 9th.—Commentaries on the Third Test Match, England v. Australia, from Old Trafford, Manchester.

REGIONAL (342.1 m.)

Wednesday, July 6th.—Coventry Festival Serenade Concert from the precincts of Coventry Cathedral.

Thursday, July 7th.—Bianca, musical comedy.

Friday, July 8th.—Variety from the Embassy Theatre, Peterborough.

Saturday, July 9th.—Cosi Fan Tutte, act 2, from Glyndebourne.

MIDLAND (296.2 m.)

Wednesday, July 6th.—Coventry Festival from Coventry Cathedral.

Thursday, July 7th.—Shrewsbury celebrates the Tercentenary of its Charter; an eye-witness account.

Friday, July 8th.—Variety from the Embassy Theatre, Peterborough.

Saturday, July 9th.—Georges Bizet: Orchestral programme.

NORTHERN (449.1 m.)

Wednesday, July 6th.—Northern Saints—1, Paulinus; a series of plays by Bertram and Hilda Colgrave.

Thursday, July 7th.—A Lincolnshire Night's Entertainment, from the Pier Pavilion, Skegness.

Friday, July 8th.—Commentaries on the Third-Test Match, from Old Trafford, Manchester.

Saturday, July 9th.—Little Women, from the novel by Louisa M. Alcott, part 1, Christmas Holidays.

WEST OF ENGLAND (285.7 m.)

Wednesday, July 6th.—China Clay, an account of a white industry.

Thursday, July 7th.—Band concert.

Friday, July 8th.—A Concert Party programme from the Princess Pier, Torquay.

Saturday, July 9th.—The Watched Pot, presented by The Perranporth Cornish Players.

WELSH (373.1 m.)

Wednesday, July 6th.—Broadcast from the Royal Show, Sophia Gardens, Cardiff.

Thursday, July 7th.—Proclamation Ceremony of the Denbigh National Eisteddfod, 1939, from the Town Hall, Denbigh.

Friday, July 8th.—Sant neu Walch . . . ? Hero or Traitor? by Tom Hughes Jones.

Saturday, July 9th.—Dance music programme.

SCOTTISH (391.1 m.)

Wednesday, July 6th.—The Folly on Calton Hill, being the story of the National Monument on the Calton Hill in Edinburgh.

Thursday, July 7th.—Scottish Dance music.

Friday, July 8th.—Band programme.

Saturday, July 9th.—Variety programme.

NORTHERN IRELAND (307.1 m.)

Wednesday, July 6th.—Country Concert from Portrush, County Antrim.

Thursday, July 7th.—The Bann Regatta: an eye-witness account.

Friday, July 8th.—Ballad concert.

Saturday, July 9th.—Cosi Fan Tutte, act 2, from Glyndebourne.

ON YOUR WAVELENGTH



By *Thermion*

The Battery "War"

THE demand for batteries, which seems to be consistently maintained in spite of the competition of the mains set, has been responsible for two things—it has possibly cheapened the batteries, and it has attracted a number of manufacturers into the market, with the inevitable result that competition is fierce. An evening paper the other day referred to a "war" because the managing director of a chain store had stated that in future he would fix the retail price of high-tension batteries at 4s. 9d.—presumably for a 99-volt battery. You will recollect that the Association of Radio Battery Manufacturers announced a further cut in the price of their cheapest batteries from 4s. 9d. to 4s., and apparently this manager of the same store thought that the price was uneconomic, and is refusing to sell a battery for less than 4s. 9d.

Now these are matters which ought not to be aired in the public press, particularly when I read that the retailers' discount on A.R.B.M. batteries is maintained at 1s. 2d. plus a royalty bonus to retailers who are signatory to the A.R.B.M. retailers' trading agreement. This extra bonus amounts to 5 per cent.

Whilst such a war is on, the consumer will benefit. It must be admitted that it is not often that the consumer does benefit in this way, for we can all remember the very high prices they charged in the early days of wireless for valves and other components.

Radio in Taxis

I SEE that a Member of Parliament recently asked the Home Secretary if he would consider making regulations to permit the installation of radio receiving sets in taxicabs. The Home Secretary answered: "If there is a general desire for more noise in the streets of London this matter will be considered, but at present the Commissioner of Police, who is the licensing authority for taxicabs in London, takes the view, with which I concur, that in the general public interest it is preferable that wireless sets should not be installed in taxicabs." It would, of course, be much better to install

wireless sets in the Houses of Parliament to keep the members awake. On the occasions when I have been there I have noticed many of them snoring, and they only awake when someone shakes them by the shoulder and tells them to vote, and how to vote.

Back Issues

MR. A. M. HAWKINS, of 11, Claverdale Road, Upper Tulse Hill, Brixton, S.W.2, kindly offers to supply to the first applicant some back issues of wireless periodicals which he has. He undertakes to send them carriage forward.

Second-hand Sets Again

A LETTER which points its own moral is reproduced herewith. "With reference to your article on dealers and second-hand sets, in a recent issue of PRACTICAL AND AMATEUR WIRELESS, I have just had an enlightening experience as regards allowances on sets. Having made my sets for the last eighteen years I bought one of the latest all-wave models last year as the cost seemed less than I could buy the components for.

"I was unlucky in my selection as the set was unsatisfactory on the short-waves and very unselective generally; it was returned for adjustment under a guarantee, the makers reporting a faulty switch and shorted coil. Its performance on return was good on the short-waves and improved selectivity was noticeable on the other two bands.

"A month or two after I was troubled with excessive oscillation on the long and medium bands, and the makers referred me to a local service agent, who adjusted the trimmers, which partially cured the trouble on the long and medium band but worsened it on the short-wave band. Also,

the selectivity of all bands was worse.

"Being fed up I asked the makers what they would allow me on my set in exchange for the next priced set with H.F. stage (chassis price 30s. more), their reply was that if I returned my set and remitted £6, they would exchange for the one required. On my pointing out this demand was excessive they replied that old sets were a drug in the market and could not be disposed of.

"I think that some 70 per cent. depreciation on a set with under a year's use is not playing the game, and that a set should be depreciated by the life of its valves, as shown by a percentage efficiency test, providing always that good and proper material with skilled labour has been used in assembling. If a set depreciates 70 per cent. in 12 months, its value in 18 months is nil, but they do not tell you that when selling a set!

"I have a home-made superhet that has been in use for over eight years, and apart from valve renewals it is as good as ever, and much more selective than many turned out to-day.

"I wanted a set for short-wave working on D.C. mains, but manufacturers do not seem to realise that there are about 40 per cent. of D.C. systems in operation still.

"I am afraid that I have made a long rigmarole of this, but I certainly think that this question of depreciation, honest and otherwise, needs looking into."

What Does "All-mains" Mean?

A MUSICIAN brought an action against a wireless firm recently, and he raised the point as to the meaning of the term "All-mains." His claim was for the return of the price of a radiogram on the grounds that the defendants had obtained the money for a consideration which had not materialised. He stated that he entered defendants' shop and saw a radiogram advertised as "all-mains." He decided to buy it and paid cash before delivery. A little later on he was informed by the wireless firm that the set was not suitable for his mains as it was an A.C. set, whilst the electric supply in plaintiff's district was D.C. The defendants offered alternatives but he declined. He asked for his money back but the defendants refused

to return it. The defendants argued that it was a legitimate sale, and they were entitled to retain the money, and they denied that the term "all-mains" possessed the meaning the plaintiff placed upon it. A trade expert said that the meaning of the term "all-mains" was a non-battery set. The term "universal" was employed to advertise sets that could be worked on either direct or alternating current. The judge relied upon the plaintiff's evidence, and refused to accept the argument that the description applied to the set was an accurate one. This is a decision with which I concur.

Television in the U.S.A.

THE regular experimental field test from station W2XPS in New York has been terminated, and the equipment is to undergo modifications before the programmes are resumed. Members of the American Listening Club who recently bought television receivers are naturally annoyed as they are now without television programmes. The American television problem is more complex than our own, for they have a greater surface area, and the cost of erecting coaxial aerials would itself be prohibitive, as at least 90,000 miles would be required.

Automatic Tuning Sets

LEARN that numerous dealers have refused to take automatic tuning sets into stock as they have such large stocks of ordinary broadcast receivers on hand. I don't blame the dealers. Many of them have had heavy stocks pushed on to them, and the manufacturers, having unloaded their sets, perhaps at a cut price, then dive into automatic tuning, heedless of the effect it is going to have on the sale of existing receivers.

Royal Air Force Expansion

I HAVE been informed that Sir Kingsley Wood, Secretary of State for Air, recently inaugurated a new nation-wide recruiting appeal for the Royal Air Force and that this appeal is necessitated by the recently increased programme for strengthening the country's air defence. Sir Kingsley Wood stated that the vital necessity of the time required the production of many thousands of aircraft, and large quantities of equipment and air armament of all kinds, for this great expansion of the Royal Air Force. Much had been done during the past three years, and during the last few weeks the more important of the considerable additional orders for aircraft and equipment had already been placed.

"A considerable augmentation in

Notes from the Test Bench

A Fuse Point

WHEN fitting a receiver with fuses for the protection of expensive valves it should not be overlooked that the grid-bias can be a source of trouble. A receiver was recently tested in which a super-power valve was supplied with a 24-volt biasing supply provided by a group of standard G.B. batteries. The leads were so arranged that had one dropped, the filament of the output valve may have received over 20 volts, with disastrous results. A fuse in the G.B. positive lead will prevent the risk of a short-circuit of this type, it being borne in mind that the grid-bias positive connection is joined to L.T. negative.

Difficult Fault Finding

A RECEIVER which was serviced recently failed to give any results on the H.F. side. This was tested roughly and found to be in order, but no signals could be obtained in the detector stage. After a careful search the H.F. transformer was suspected, but was found to be in order. It eventually transpired that the flexible lead to the anode cap was passed through ordinary metallic braiding, but a single strand of the flex had pierced the rubber covering and was touching the metallic sleeving, which was earthed through one of the decoupling condensers.

Crackling

A PECULIAR fault was recently experienced on two occasions, the first time no cure being found as the fault cleared itself. The trouble took the form of a continual crackle, varying in intensity. After a number of chassis tests the set was turned upside down and from that moment the trouble disappeared. When a complaint was again received the receiver was carefully examined without turning over and eventually it was found that in adjusting the trimmers on the I.F. transformer a sharp screwdriver had been used and pieces of metal from the trimmer-screw heads had been chipped off. One of these had fallen between the plates of the trimmer and was jumping about with the vibration caused by the signal.

WIRELESS COILS, CHOKES AND TRANSFORMERS, AND HOW TO MAKE THEM.

Edited by F. J. CAMM.

2/6, or 2/10 by post from Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

personnel is consequently required," Sir Kingsley Wood said, "and I have no doubt that it will be forthcoming. For the current year with pilots; air observers; tradesmen and unskilled men; apprentices and boys, the number required is over 31,000. This requirement is a record number for any year in the history of the Air Force. It is about fifteen times the number entered in an average year before 1935. The country requires for this purpose some 2,100 pilots, 550 observers, nearly 26,000 tradesmen and unskilled men, and some 3,000 boys—all during the current year.

"Particulars of the terms and remuneration were now being issued, conditions have been improved considerably in many respects—better rations, higher pay, increased marriage allowances, and reduced tour of overseas duty."

Sir Kingsley Wood said that these requirements offered to large numbers an interesting career and considerable employment in the future. "During the term of service itself," he added, "provision is made for games and sport, and I know few callings which offer to a young man such an opportunity for a healthy life. Constant attention is given also to providing plenty of good and wholesome food."

P.A. Equipment in a Belfry

IT is interesting to note that Chorley Wood Parish Church has only two bells in its belfry, but on July 2nd a very interesting wedding took place, and the bride and bridegroom specially required a peal of bells at the conclusion of the ceremony. As this was not possible on the existing bells the Vicar approached Messrs. G. Jones and Son, of High Street, Rickmansworth, the local Marconiphone dealers, to ascertain what could be done with loudspeakers. A temporary installation was carried out by Messrs. Jones as a test, with the result that an order was placed on June 21st for a complete loud-speaker installation with provision for playing bell chime records.

In spite of the very short notice, the Marconiphone Company delivered the apparatus in time for Messrs. Jones to complete their contract by the date specified. The equipment consisted of one of the latest portable amplifiers, with provision for microphone, gramophone and radio input, giving an output of 10 watts, driving three of the latest type Marconiphone projector loud-speakers. These are from an entirely new range of Marconiphone equipment.



MANY letters are received from readers requesting information or details of matters relating to transmitting. It is not always possible to satisfy their requirements by a postal reply, as queries sometimes call for more explanation than can be contained in a normal letter. However, as certain readers ask about items of general interest, their questions are dealt with below.

Coupling an Artificial Aerial

There appears to be considerable doubt as to how an A.A. should be coupled to the transmitter. Actually, there are three arrangements. The simplest being inductive coupling between the coil in the A.A. and the tank coil of the transmitter; then there is "link" coupling and, finally, capacity coupling.

can be obtained by taking, say, 15 per cent. of the turns used for the tank coil, and carry out tests on either side of this figure.

It must be remembered that each wave-band will require a different value for the link coils and this, I think, forms the only snag with the method.

The sketches in Fig. 3 show the most usual methods of winding or constructing the link coils, and the experimenter must select the one which most readily lends itself to the particular layout under consideration.

Capacity Coupling

This system (Fig. 4), from the point of view of construction, is the most simple, and many will be tempted to use it for this reason. There is one snag, however, which

has been obtained, and it is not an operation which can be done in a couple of minutes, it is rather annoying if the whole procedure has to be repeated when the coupling is applied or varied. For those who wish to experiment the coupling condenser should have a value of, say, 50 mmfds., and can be of the variable type, provided that it has perfect insulation. If pentode valves are used in the output of the transmitter, the point about neutralisation will not apply, as such is very rarely necessary with valves of that type. One point in favour of capacity coupling is that the coupling holds good over a wide frequency band, therefore band changing does not involve quite so much trouble as when the link system is used.

Aerials

Requests have been received for information concerning Zeppelin and "Window" type aerial systems. The essential details are given below, but A.A. operators must note that these aerials are of the radiating type, and should not, therefore, be used unless a "full" licence is held. The "Zepp" is shown

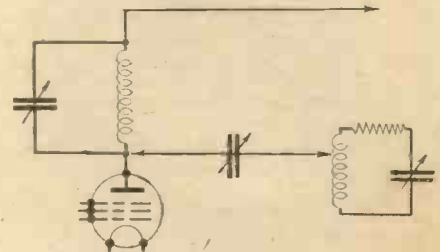


Fig. 4.—Capacity Coupling. Simple and efficient.

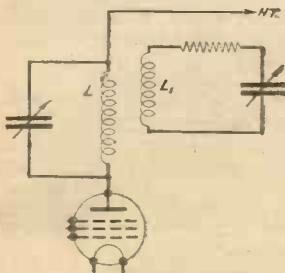


Fig. 1.—Inductive Coupling. Rather difficult to obtain owing to constructional reasons.

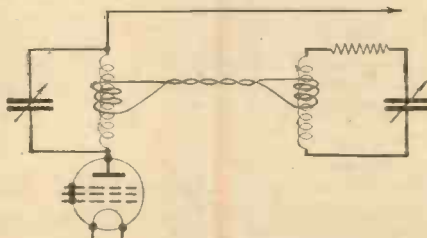


Fig. 2.—Link coupling. Ideal both from the electrical and practical point of view.

The first is shown in Fig. 1. For this it is necessary to arrange L and L1 in such a manner that the required inductive coupling is obtained. As this necessitates the coils being adjacent to each other it is not so simple from the practical point of view as the electrical; therefore, it is usually found more preferable to employ one of the other two methods.

While beginners should experiment with both of these it will be found that the "link" arrangement is the more efficient, and the most convenient, as it allows the A.A. to be widely separated from the tank coil of the transmitter.

The circuit is shown in Fig. 2. It will be seen that the link is formed by two coils connected together by means of twin flex cut to the desired length. The degree of coupling is varied by the number of turns used for the link coils, and the manner in which they are wound over the tank and A.A. inductances. There is no fixed rule governing the windings; an approximate idea

must not be overlooked. When capacity coupling is applied, it will be found that the tuning of the transmitter is affected, and if the circuit is such that neutralisation is employed, as in the case of triode valves, this will be upset also. This may not sound too serious, but once perfect neutralisation

in Fig. 6. The construction is very similar to an ordinary "inverted L" type of receiving aerial with the exception of the additional down-lead which is placed parallel to the other. The feature of the design is that the horizontal portion XY forms the radiating section; the down-leads or feeders being ineffective so far as radiation is concerned, if the design is correct.

It is essential, therefore, to see that XY is erected as high as possible and well away from all surrounding earthed objects, such as trees, buildings and overhead wires.

The length of the horizontal portion, or top, can be any number of half wavelengths, while the feeders are best if they are made odd multiples of $\frac{1}{4}$ wavelengths. For example, for the 40-metre band XY should be 66 feet, and the feeders 33 feet, series tuning being employed. It will be noted that the feeder line is not connected electrically to the remainder of the assembly. It terminates at an insulator fixed 6 inches away from one end of the top, and is held parallel to the other feeder by means of insulating spacers placed, say,

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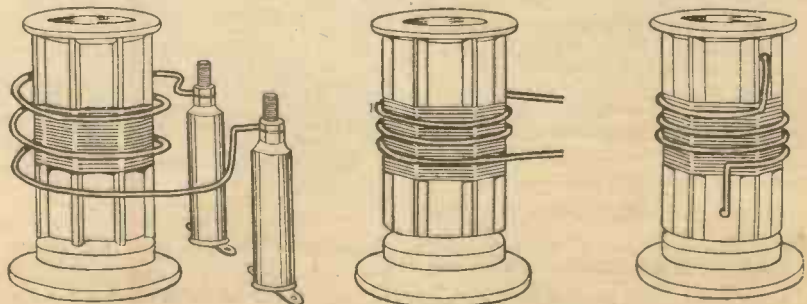


Fig. 3.—Various ways of winding the link coupling coils. The centre arrangement is most handy for the experimenter.

TRANSMITTING TOPICS

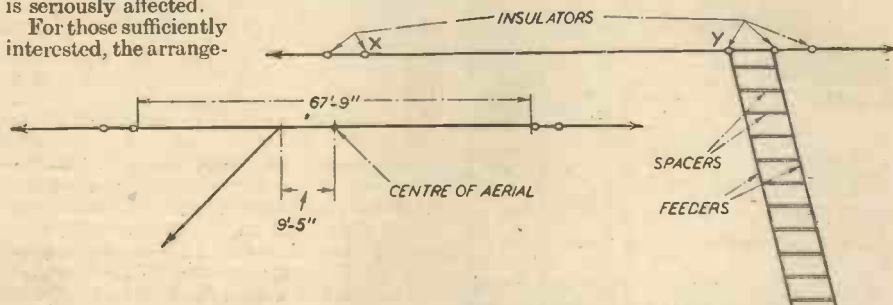
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every 18 inches along their length. The spacers can be made out of 3/4 in. dowelling, the desired lengths being boiled in wax when they have been cut.

The "Windom" Aerial

While this system is very efficient, it is hardly suitable for the beginner. The calculations involved are rather difficult, and unless these are correct in all details, even to the gauge of wire employed, the efficiency is seriously affected.

For those sufficiently interested, the arrange-

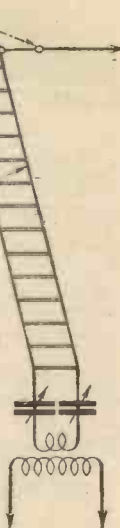


Morse Practice

Quite a number of A.A. holders, anxious to perfect their Morse reading, request details of Morse transmissions at practice speeds. As it is impossible to give a list in these pages, owing to the variation in times of transmissions, I would suggest that application be made to the Radio Society of Great Britain for details of the Morse transmissions undertaken by their members in practically every area. A

Fig. 5.—(left) The "Windom" aerial. Hardly suitable for the beginner.

Fig. 6.—"Zepp" arrangement showing how the feeders are constructed and connected.



sharp watch should be kept on the 40 metre band after, say, seven o'clock most evenings, as it is usually possible to pick up slow Morse transmissions in most areas. Apart from this, I can only advise two or three, or more, enthusiasts getting together in some quiet spot, and taking it in turns to wield the key while the others concentrate on receiving. Most clubs cater for such requirements, and it should be remembered that it is not necessary, during the summer months, to carry out the practice indoors. A secluded spot can usually be found in the open air.

Transmitting Circuits

Circuits are often sent in for inspection, and suggestions for oscillators which do not employ any form of reliable or accurate frequency control. It cannot be emphasised too strongly that such circuits should not be used. Apart from the fact that they do not conform with the P.M.G.'s regulations, they are likely to cause severe interference to nearby listeners on the broadcast wavelengths; therefore, no enthusiast who has the interests of amateur transmitting at heart should dream of using such hook-ups. It must never be overlooked that the privileges granted by the P.M.G. to amateur transmitters are too valuable to be abused, so it is up to everyone who wishes to construct any of the apparatus which has been described in these pages to see that he has his A.A. or full permit before doing so.

PICK-UP TESTS BY MICROSCOPE

Interesting Details of a Scheme for Testing Pick-ups of High Quality

THE current number of *Brush Strokes* contains some interesting details of Microscope Tests for Pick-ups, amongst which the following details, supplied by the Brush Development Company, will no doubt interest many readers.

This particular application of the microscope is in the measurement of the natural period and the amount of damping of the pick-up. In this case the microscope is adjusted to a vertical position and glass particles are attached to the sapphire point. The magnification is increased to as high a value as convenient. It is not necessary to use a calibrated micrometer eyepiece scale for this measurement as all values are relative, but it is usually done as a matter of interest. The microscope tube length may be much increased if desired without deleterious effects with most objectives. From a variable frequency oscillator a potential of a few volts is applied to the terminals of the pick-up. Under the influence of this potential the stylus vibrates and a point of light from the sapphire point will be seen as a straight line, the length of which is proportional to the angular deflection of the stylus. The voltage is kept constant and the frequency of the oscillator varied until the deflection is a maximum. This frequency is noted and is the natural period of the pick-up.

The frequency is then raised above the natural period until the deflection has a value of half what it was at the natural period. This frequency is noted and will be designated as f_1 . The frequency is then lowered until the deflection is half what it was at the natural period. This value will

be designated as f_2 . The reason for using the half-frequency value is that greater accuracy can be obtained in estimating half the deflection than if other values were used.

We can now substitute in the equation :

$$Q = \frac{f_0}{f_2 - f_1} \sqrt{\frac{D_0^2 - D_1^2}{D_1^2}}$$

and obtain the mechanical Q of the system. In this equation f_0 = the frequency of the natural period and f_1 and f_2 = the frequencies above and below synchronism respectively for half deflection. D_0 and D_1 are the mechanical deflection, and since in this case $D_0 = 2D_1$, the value of the radical term reduces to 1.732, and we can write :—

$$Q = 1.732 \frac{f_0}{f_2 - f_1}$$

Interpreted mechanically, $Q = \frac{2 \pi f I}{F}$

where I = the moment of inertia of the vibrating stylus assembly, f = the frequency and F = the magnitude of the frictional couple opposing motion.

The actual value of Q in the Brush PL-12 high-fidelity pick-up is so small that quite large percentage variations have no appreciable effect on the output characteristics, but its determination provides additional check on the accuracy of the manufacturing processes.

A LENS IMPROVEMENT

AN important part of the cathode-ray tube television theatre equipment is the projection lens used for focusing the very brilliant detailed picture reproduced on the fluorescent screen of the tube on to the remote viewing screen. On the optical characteristics of the lens used will depend the distance separating the screen from the projector proper, coupled with the size and clarity of the picture itself. Continued research and improvements are now being made, and at the C.E.A. exhibition at Folkestone a lens was shown on one stand which has been designed specifically for television projection. Displayed in conjunction with the Baird projector unit of the complete theatre equipment, this lens had an aperture of f/1.8, and a focal length of 14 inches. With the smaller type lens used at the Tatler Theatre the picture was front projected, a distance of approximately 15 feet separating the lens face from the screen. With this new lens the projector can be positioned about 60 feet from the screen, while the picture size can be increased from 8ft. by 6ft. to 13ft. by 10ft. This is a substantial step forward towards the time when the cathode-ray tube projector unit will be placed direct into the film operating box itself, to be used in conjunction with the film apparatus as and when required. Naturally, the type of lenses employed for projection work in cinemas or theatres must be of the highest quality, and are consequently somewhat expensive, but when they form part of an installation of this nature the question of cost is often of secondary consideration to the primary important object of providing the best quality picture which the apparatus can produce.

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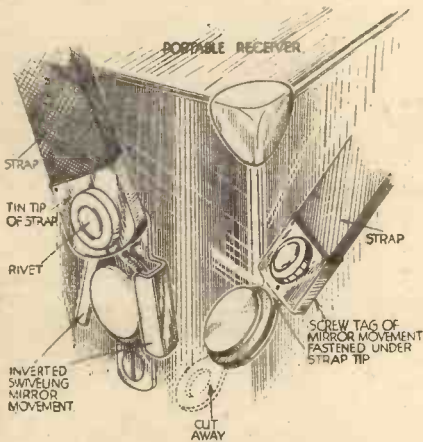
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Carrying Strap

LEATHER straps have a tendency to break at the most awkward moments. This I have prevented to a great degree by attaching to either side of my portable receiver a small mirror movement of the swivelling type, these being made in two pieces make a nice neat job. After cutting away the screw tag on one end of the strap the other is pushed up between the pivot the other is pushed up between the strap and the tin tip. A rivet is then pushed through the whole and fastened. The strap slips down and out when not in use.—G. BONSOR (Bolton).



A neat idea for a portable carrying handle.

Adjustable Workshop Light

THIS device consists of a piece of piano wire stretched between the walls of the shed, and this supports a metal fitting which carries a lamp in such a way that the lamp may be raised or lowered, and by manipulation of a screw it can be clamped to the wire, or moved along it. The lamp is fed by a length of flex, and the slack in this flex which is produced by the movement of the lamp is taken up by a simple system of pulleys and a weight so that there is a constant tension on the flex which is just sufficient to take up the slack.

The sketch is self-explanatory, but one or two points may be detailed. The flex must be of the round braided type; if ordinary twisted flex is used, the insulation will wear off at the corners and give rise to trouble. There is, actually, very little wear on the round flex. I have had a length in use with this system of pulleys, etc., for two years, and the flex is only just beginning to wear, but will last for another year yet.

The lead weight can be cast by pushing a broom-handle into clay for about 9in. depth and pouring molten lead in, while the lead is still liquid the end of the pulley with the hole in it can be pushed in, and when the whole is cool, the pulley will be found to be firmly fixed in the lead. A turnbuckle or wire-strainer is essential,

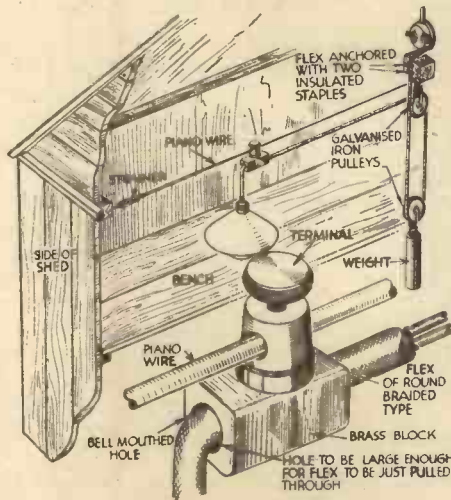
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SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page 424.

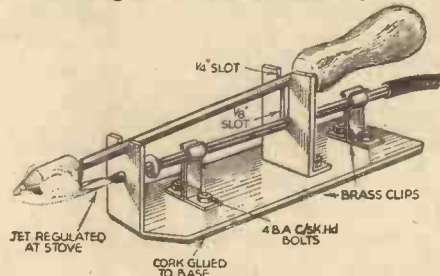
as the piano wire must be kept very taut.—K. S. FITCH (Leigh-on-Sea).



How to arrange a neat workshop light.

A Novel Soldering-iron Jet Heater

AS I do a great deal of constructional work in radio and use an ordinary soldering iron, the use of the kitchen gas ring proves too expensive, and the illustration depicts the method I have adopted for introducing the element of economy.



A gas-cooker lighter is incorporated in this soldering-iron stand.

The mounting base is made of 14 gauge aluminium, being fashioned at the jet end, although this is not absolutely essential. The jet is provided by clipping the pilot flint jet normally supplied with a certain type of popular gas stove into small brass spring clips, as shown; then, by regulation at the stove, any heat intensity can be obtained, preventing the iron from either cooling off or over-heating.

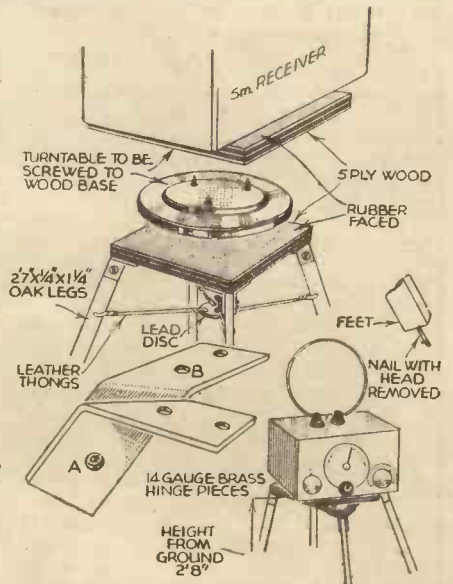
The iron supports are provided by turning up one end of the aluminium, whilst fashioning one other bracket piece which is screwed to the base with 4BA bolts as for the spring clips.—E.L. RADCLIF (Romford).

A Novel Turntable Stand for Field-Day Reception

I HAVE recently been carrying out some useful tests on a small 5-metre set, and until I constructed the turntable stand illustrated in the accompanying sketches, difficulty was experienced in overcoming ground absorption; however, the facility with which I can fit this into my car and rig up at a moment's notice certainly made it worth while designing.

The illustrations are self-explanatory, but concerning the drillings "A" and "B" these in my case were for simple wood-screw fitment to the stand's 5-ply base, with a 3-16in. drilling "B" for a Whitworth wing bolt and nut for each leg hinge movement.

I have found the most satisfactory height from the ground for the type of circuit in use to be 2ft. 5in., but other readers will



A suggested turntable stand for field-day use.

no doubt be able to modify the design to their own requirements should they follow the arrangement.—G. S. BARLETT (Reading).

As mentioned in last week's article the parasitic oscillation stoppers will not always be required. However, in accordance with our policy, several models were constructed to endeavour to simulate the types of apparatus which might be built up by various types of reader, and it was found that when the layout was not rigidly followed, or when the wiring was roughly carried out, instability occurred on the long waveband—and a slight trace was also

tion is given, and on page 414 dimensions of the cabinet are also given, so that this may be constructed at home if so desired. The frame aerial support consists of thin plywood cut to provide inside dimensions of $13\frac{1}{2}$ in. by $8\frac{1}{8}$ in., and this will just clear the batteries, chassis and speaker. To the outside edges of the frame thin strips of ply may be glued to provide a recess in which the aerial windings may be placed to prevent them from being damaged when the frame is inserted or withdrawn from the carrying case. This is not essential, however, and is merely a refinement. The medium-wave winding is wound with $27/42$ Litz wire and consists of 12 turns spaced to occupy 1 inch. To retain the wire in position the wood may be grooved slightly at the corners or a touch of shellac

The "COMPASS"

Instructions for Winding the Frame Aerial Notes for this New Part

ends of both windings should be twisted together, properly cleaned and joined to one contact on the

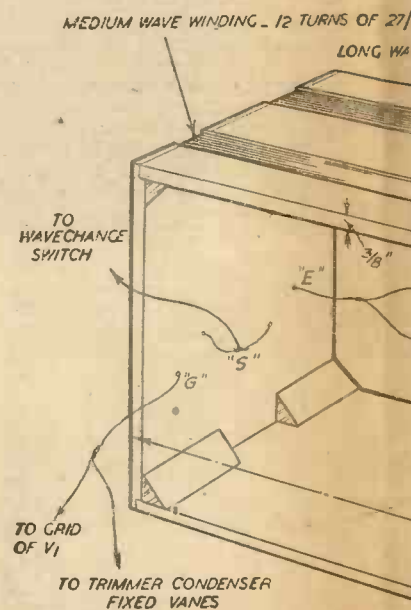


The finished receiver and cabinet.

noticeable on the medium waveband in one model. The introduction of these two stopping resistances cures the trouble and thus we have specified them but not shown them in the practical wiring plan. Their position is clearly indicated in the theoretical circuit on page 388 of last week's issue.

For the benefit of those who wish to wind their own frame aerial (although this may be obtained ready wound from Messrs. Peto-Scott), the accompanying illustra-

tion may be placed at odd intervals. The long-wave winding, separated from the medium wave by a space of about $1\frac{1}{2}$ ins., consists of 52 turns of $9/42$ stranded wire and these turns should be placed side by side. The inner



Full details of the frame aerial

switch (marked S in the wiring plan given last week).

Completing the Wiring

The commencement of the medium-wave winding is joined to the first grid, trimming condenser and gang condenser, whilst the end of the long-wave winding is joined to the common battery negative line. The illustration on this page should make all of these details quite clear. The front of the cabinet should be cut to the dimensions given on the following page, and there is one point which may be left to the discretion of the constructor. This concerns the loud-speaker opening. A large rectangle may be cut if desired, and the speaker then attached to a thin



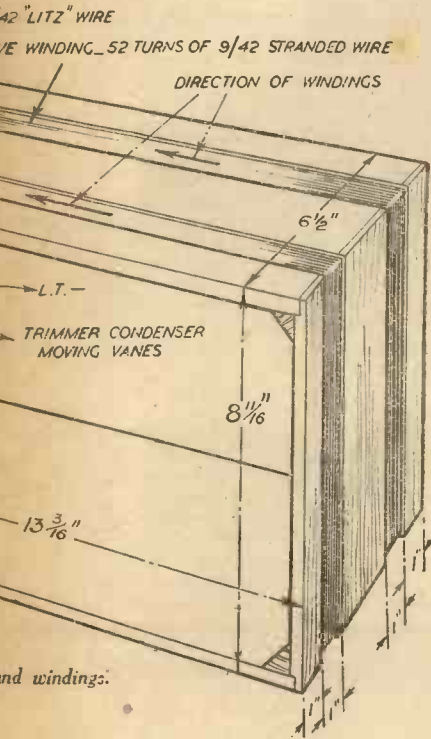
Front view of the chassis showing the positions of the two batteries.

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5" PORTABLE 4

Frame Aerial and Operating Portable Battery Receiver

plywood baffle covered with silk or other material and mounted behind the cabinet front. The dimensions



given were adopted in our experimental model and simplify the attach-

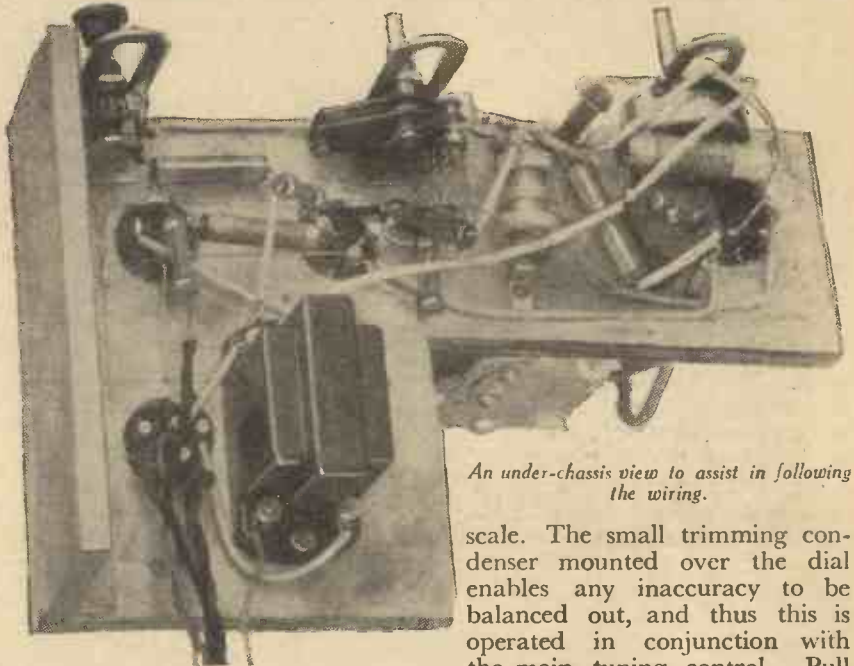
and the transformer should be on the right, viewing the speaker from the rear, so that the valves will clear the speaker chassis. The receiver chassis should then be placed inside the

ment of the speaker. This should be placed in the cabinet first,

the illustration on this page and the two output leads attached to the speaker terminals. The receiver is now ready for test.

Operating Notes

The gang condenser tunes both frame aerial and the tuning coil, and it is unlikely that these will match accurately throughout the

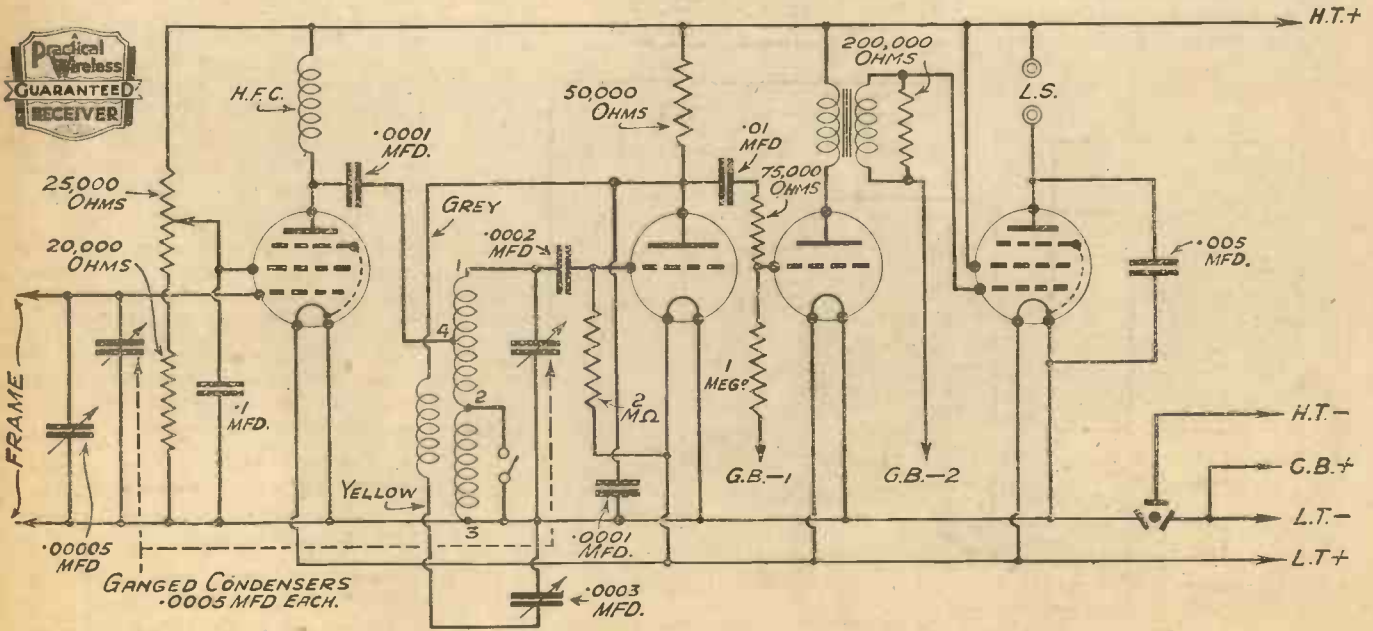


An under-chassis view to assist in following the wiring.

frame aerial and the aerial connections made to the receiver with the shortest possible leads. The combined chassis and frame may then be slid into the cabinet and the controls attached. The batteries are placed behind in the positions indicated in

scale. The small trimming condenser mounted over the dial enables any inaccuracy to be balanced out, and thus this is operated in conjunction with the main tuning control. Pull out the left-hand switch, and the receiver is set to the medium-wave band. Rotate the right-hand control in a clockwise direction until a "click" is heard; the receiver is then switched on and the volume

(Continued overleaf)



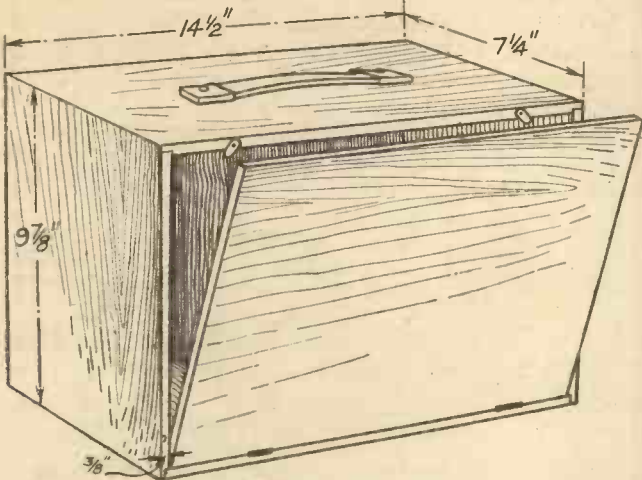
Theoretical circuit of the "Compass" Portable 4.

(Continued from previous page.)

control is in the minimum position. The centre knob should be turned to its maximum anti-clockwise position in order that reaction shall be at a

slowly and should not be turned to the oscillating position. It will be found that this control acts quite smoothly on both the medium and long-wave band and a substantial increase in volume is obtainable, without the set bursting into oscillation. Should this latter trouble be experienced, it will indicate some instability in the receiver and the wiring should be carefully inspected for an error or an unduly long lead. In all cases wires should run by the most direct route to the points to which they are joined, and in a small receiver of

this type it is unlikely that any ill-effects will be experienced from long leads unless the receiver is carelessly constructed. Remember that the frame aerial is directional, and thus, to obtain maximum volume, the receiver has to be turned so that it points towards the station being received. This property may also be utilised to aid in cutting out interference when two stations are received, provided that they are not too closely related in a directional manner. Sockets for the use of an external aerial and earth may be added to the receiver if desired and should be joined to the "G" connection and to the common battery negative line.



Constructional details of the carrying case.

TELEVISION INTERFERENCE

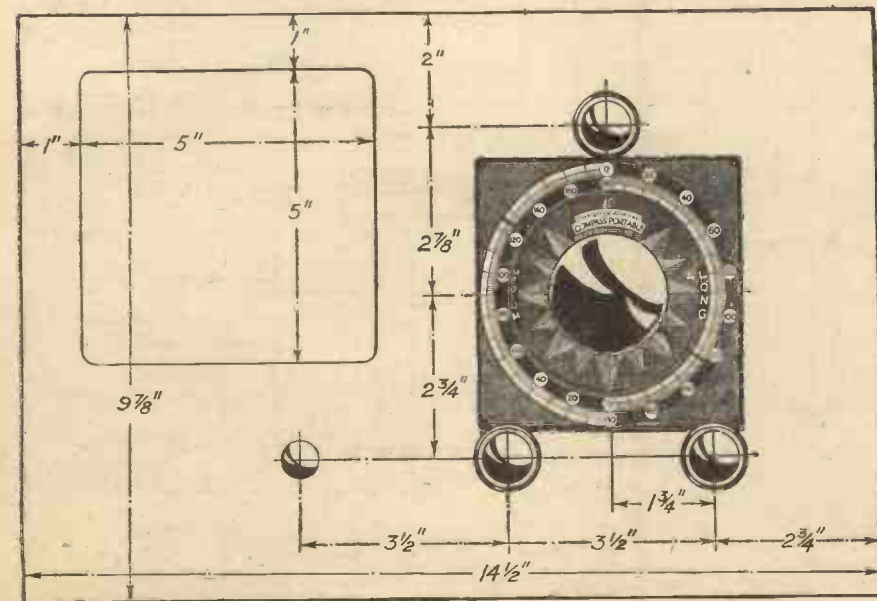
DURING the course of the Oxford and Cambridge sports, which formed the subject of an outside broadcast some time ago, a peculiar form of interference was noticed with the transmission. The pictures observed on receivers showed violent changes in the overall brightness level, becoming so intense at times that it seemed as if the cathode-ray tube picture reproducer was being grossly overmodulated. The real reason for this trouble was never found, although several tentative theories were advanced to account for the phenomenon. Some regular viewers have now noticed a similar kind of trouble occurring with their sets; the picture brilliance changing at a varying frequency without the controls being touched in any way. This has now been found to synchronise with the appearance of one or more aeroplanes flying in the vicinity of the house in which reception is being undertaken. The nearer the aeroplane the higher the frequency of the brightness changes, and these slowed down as the machine flew farther away. The theory advanced for this seems quite reasonable, it being to the effect that the metal fuselage of the plane is causing a reflection of the ultra-short waves which are normally passing into the sky. These arrive with various phase differences in relation to the ground wave which normally is instrumental in providing the vision signal to the television receiver. When the signals are additive, brightness increases, and when in opposite phase the picture intensity drops to a degree depending on the signal reduction. The results would seem to warrant a careful investigation, for it is also likely to have some bearing on the directional radio link which is employed so frequently by the B.B.C. for their outside broadcasts. Perhaps a form of A.V.C. could counteract the trouble in the same way as investigations are now being made to overcome peculiar forms of fading, noticed when pictures are obtained on the fringe of the service area.

LIST OF COMPONENTS FOR THE "COMPASS" PORTABLE 4

- One J.B. 2-gang variable condenser, type 3235 No. 4 S./M.
- One Polar mica dielectric variable condenser, .0003 mfd.
- One Polar mica dielectric variable condenser, .00005 mfd.
- One B.T.S. L.F. transformer 3.5-1 ratio.
- One B.T.S. unscreened H.F. choke.
- One Erie potentiometer with switch, 25,000 ohms.
- One B.T.S. Midget coil.
- Three component-mounting brackets, Peto-Scott.
- Four Clix chassis type valveholders: one 7-pin, two 4-pin, one 5-pin.
- Six fixed condensers: one .01 mfd; two .0001 mfd; one .0002 mfd; one .005 mfd; one .1 mfd.; all type 451, T.C.C.
- Six resistances, Erie: one 50,000 ohms 1/2 watt; one 2 meg. 1/2 watt; one 20,000 ohms 1/2 watt; one 1 meg. 1/2 watt; one .2 meg. 1/2 watt; one 75,000 ohms 1/2 watt.
- Chassis, frame and cabinet. Peto-Scott.
- One accumulator, Exide, type P.Y.4.
- One H.T. battery, Exide, type H.1146.
- One moving-coil speaker, W.B. Midget type.
- One 3-point switch, Wearite.
- Valves: Tungram H.P.210; H.R.210; L.D.210; P.P.222.

minimum. Now turn the large control knob slowly until the local station is heard—and this may not be very loud at the first trial. If nothing can be obtained advance the volume control slowly and proceed in this way until the local is heard as weak as possible. Now, by adjusting the top control, it should be possible to obtain a good increase in volume as the two circuits are brought into line—unless, of course, by a coincidence the top condenser should be at the correct setting for the station in question.

When a distant or weak station is required, the volume control will have to be set at maximum (in a clockwise direction) and use will have to be made of the reaction control. This should be advanced



Use this diagram for marking out and drilling the front of the cabinet.

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Leaves from a Short-wave Log

Curaçao Calling

THE new 150-watt radio transmitter (PJCI) installed at Willemstad on the island of Curaçao (Netherlands West Indies), operating on 31.67 m. (9.473 mc/s), now broadcasts daily from G.M.T. 23.30-01.30. All announcements are made in the Dutch language only. The transmission closes down with the playing of the National Anthem, *Wilhelmus van Nassau*, as heard through the Hilversum (Holland) medium-wave stations. PJCI also uses, during the day, 50.6 m. (5.929 mc/s) for local broadcasts. Address: Curaçoesche Radio Vereeniging, Willemstad, Curaçao.

International Broadcasting Union

CONFERENCES on various subjects connected with radio broadcasts were held at Ouchy-lez-Lausanne (Switzerland) during the period June 30th-July 2nd. In regard to the establishment of the new short-wave plan based on the proposals put forward at the Cairo Convention, as full details are required by the respective Governments by next November, a special meeting of the U.I.R. will be held during October. Although no decision has yet been taken it is expected that it will take place at Brussels (Belgium).

La Voz de la Hispaniola

ON 46.73 m. (6.42 mc/s) the above slogan coupled to the call HIIS was recently picked up between G.M.T. 01.00-01.30. According to official lists this transmitter is only rated at 20 watts and is now located at Puerto Plata (Dominican Republic) and not at Santiago de los Caballeros, as often stated. Occasionally, announcements are made in English as well as in Spanish and French, and an interval signal of three chimes is broadcast every fifteen minutes. Address: Radio-emisora HIIS, La Voz de la Hispaniola, Puerto Plata, Dominican Republic.

Another French Harmonic

IMMEDIATELY below the 40-metre amateur band, listeners may hear the 6th harmonic of Radio Méditerranée (Nice-Juan-les-Pins) coinciding with 39.18 m. (7.656 mc/s).

SHORT-WAVE SECTION

(Continued from page 404)

box which can be purchased from commercial firms or made at home from stout-gauge sheet-iron or aluminium. A well-fitting lid, however, is essential.

The layout of components is a matter of vital importance and deserves careful study. A suggested layout, and a very good one, is shown at Fig. 4. Chassis-type valveholders may be used, or as an alternative baseboard ceramic types, and R.C.C. components can be fitted underneath the chassis. If baseboard type valveholders and coil base are used it is advisable to mount them on small insulated ebonite or ceramic pillars above the chassis, and thus avoid damping.

Chassis and panel dimensions, etc., are not given, because the physical dimensions of individual components will govern the size of both panel and chassis. By following the principles outlined, however, an efficient two-valve receiver can be designed and

High-power Station for Greece

THE Hellenic Government has decided to erect as soon as possible in the vicinity of the capital a 10-kilowatt short-wave radio transmitter. A recent Royal decree has changed the names of certain Greek towns, and the capital itself is now to be known as ATHINAI.

This appellation is now given in the call used by the medium-wave broadcasting station.

Turkey's Short-wave Stations

IT is reported that tests are to be carried out shortly with the two new short-wave transmitters which the Ottoman Government is installing at Ankara. The call-signs and wavelengths adopted are: TAQ, 19.74 m. (15.195 mc/s), 2.6 kilowatts, and TAP, 31.7 m (9.465 mc/s), 20 kilowatts.

New Station at Panama City

CORRESPONDENTS report the reception of a broadcast from a station announced as working on 25.47 m. (11.78 mc/s) with a power of 750 watts. Although the call-letters have been logged alternately as HP5B and HP5P, this would appear to be a new transmitter officially given as HP5G, operated by Señor José Antonio Sosa, to whom all reception reports should be addressed. According to other reports, HP5B, Radio Miramar, Panama City, is still working on 49.75 m. (6.03 mc/s).

A Bugle Call from Haiti

ALTHOUGH rated as a mere 100-watt, HH3W, Port-au-Prince (Haiti), provides a very strong signal after midnight, usually closing down towards G.M.T. 02.00. Announcements in French, Spanish, and English; interval signal: four chimes. The station regularly comes on the air with a prolonged bugle call. Wavelength: 31.1 m. (9.645 mc/s). Address: M. Ricardo Widmaier, fils, Boite Postale A/117, Port-au-Prince, Haiti. HH3W, on 48.9 m. (6.135 mc/s), but of a power of 30 watts, is operated occasionally by the same owner.

built, provided components of sound electrical and mechanical design are used.

To assure accuracy of calibration the pre-set condensers A, B and C respectively should be adjusted and permanently set for optimum results before calibration.

The relation between screen and plate voltages is of vital importance and a matter for experiment. Voltages from 25 to 30 applied to the screen should be tried at the start and the plate voltage varied.

THAT DEATH RAY AGAIN!

FROM the Continent comes the news that German military aircraft are fitted with ultra-short-wave apparatus which can transmit a ray capable of stopping all petrol-driven engines either on land or in the air. As, however, it is admitted that the range is comparatively short, in order to protect the frontiers captive balloons possessing a similar equipment will be used against enemy aircraft. *Se non è vero è ben trovato!*

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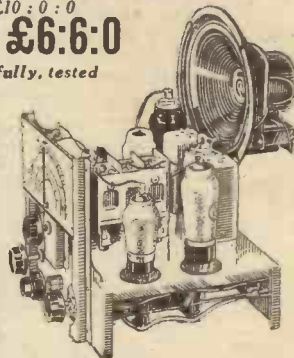
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PROBLEMS OF THE COMMUNICATIONS RECEIVER

A Discussion of Some of the Features of Design which may be Incorporated in Experimental Short-wave Receivers - - - By W. J. DELANEY

A TYPE of receiver which is gaining in popularity in this country is that known as a Communications set, and this term covers generally a de-luxe short-wave apparatus. Certain commercial receivers of this type do, it is true, incorporate coils for broadcast reception, but they are usually employed by amateurs for use with transmitters, the reliability of the circuits and operation rendering them admirable for the reception of amateurs with whom they may be working. The main essentials of this type of equipment are, therefore, circuit design and ease of handling, and there are some very interesting problems involved in the design of such receivers. The first point is in the tuning arrangements, and it is possible to use either plug-in coils or a multi-wave tuner with wave-change switching. If the broadcast band is to be covered, a large tuning condenser capacity will be needed, and it may be taken as a general rule that this will reduce efficiency on the short-waves, or at least lead to complications in the tuning. Plug-in coils, on the other hand, will enable maximum performance to be obtained on each band, provided that the coils are well made and that the turns are so fixed that they cannot move.

are readily obtainable and are so designed that inaccuracies of mounting are overcome.

for instance, may be provided with an individual gain control in preference to an automatic-volume-control arrangement, and the I.F. stages may be similarly controlled. The oscillator in the frequency-changing stage may also be provided with a separate regeneration control so that by a judicious adjustment of these controls, individually or collectively, the signal may be read through any type of background noise. A simple L.F. volume control could be added to reduce the output when the receiver is used late at night, and if it is necessary to keep down the volume to avoid disturbing other people in the house. If used with a transmitter, then a silencing switch may be worth while so that the receiver may be silenced whilst stations are being called, and thus to avoid having to wait for the valves to heat up; only the H.T. negative lead will be broken by this type of switch. If the receiver is being used in an area in which excess electrical interference is experienced the aerial input circuit may be specially designed to cut out such troubles, the simplest way of doing this being by means of a Faraday shield.

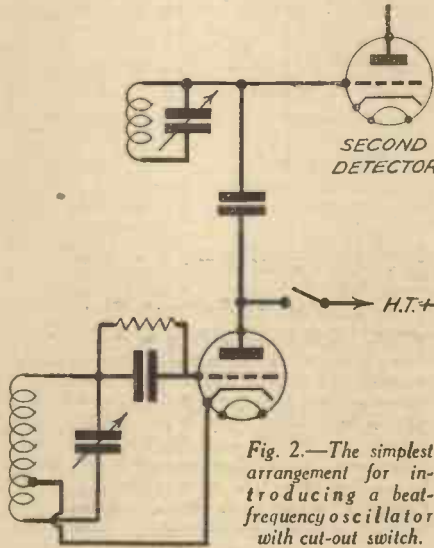


Fig. 2.—The simplest arrangement for introducing a beat-frequency oscillator with cut-out switch.

Stability

It is obvious that when a receiver has to be built to incorporate all the above features

How Many Stages?

The number of valves to be employed will depend upon the reliability which is to be attached to the receiver. A superhet, as has already been mentioned, is the only useful circuit, and for good signal to noise ratio at least one H.F. stage should precede the frequency-changer. Where expense is no object, or greater reliability is required, two such stages may be used. This will, of course, render necessary a further tuning coil and condenser, with greater difficulty in the initial setting up. With regard to the I.F. stages, two may be regarded as the minimum, and certain commercial models of the de-luxe class use three—with iron-core transformers to give high selectivity. A very good compromise in this connection is to use two such stages and employ for one of them a transformer of the variable-selectivity type so that by the turn of a switch the selectivity may be modified when desired.

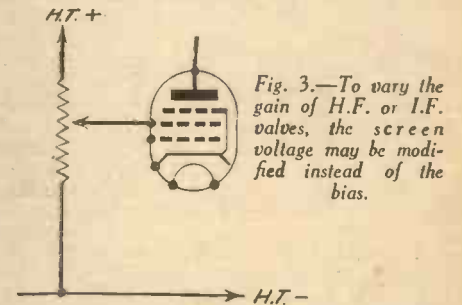


Fig. 3.—To vary the gain of H.F. or I.F. valves, the screen voltage may be modified instead of the bias.

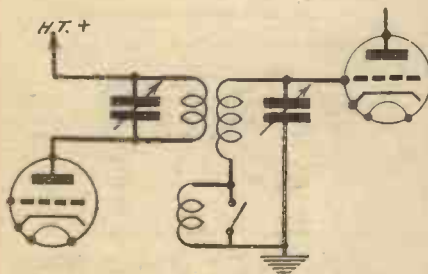


Fig. 1.—A useful method of incorporating variable selectivity.

Tuning Circuits

To simplify tuning a ganged control will be needed, assuming, of course, that a superhet circuit arrangement is employed. This is no doubt the ideal arrangement as it permits of high sensitivity and enables arrangements to be made for a reduction of noises, or, in other words, a high signal to noise ratio. In order to ensure accuracy with ganged tuning certain of the coils should be provided with small trimming capacities, mounted on the coil holders, and each set of coils may then be accurately matched and calibrated with a given condenser and scale. Bandspreading is also a most important feature, and may be incorporated on each waveband. This will necessitate the use of two tuning controls, and both may be of the large slow-motion type with open scales to enable accurate settings to be instantly reproduced when needed. In the absence of ganged condensers of small capacity, separate components will have to be linked together, but commercial accessories for this purpose

it is important that it shall be perfectly stable under all conditions, and this means that the general design must be very carefully worked out. All risk of interaction between successive stages must be removed,

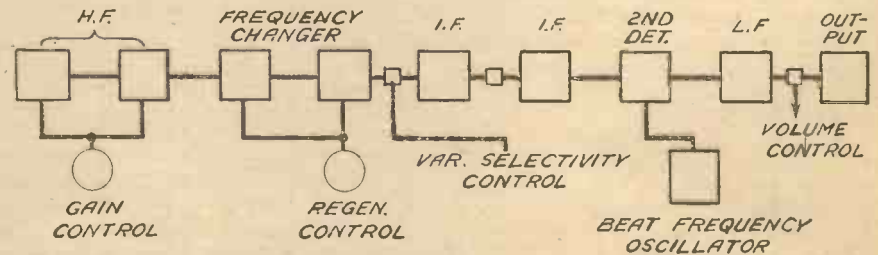


Fig. 4.—The main features of a good communications receiver are shown in diagrammatic form in this illustration.

tivity type so that by the turn of a switch the selectivity may be modified when desired. On the L.F. side a single L.F. stage feeding a pentode or a push-pull stage will give the necessary output volume.

Refinements

To the above essentials may be added numerous refinements. The H.F. stages,

and in general this will mean that each stage must be enclosed in a metal box or provided with extensive screening. The position of controls and inter-connecting leads will have to be worked out very carefully, and to enable such a receiver to be placed on a table near a transmitter, a completely self-contained unit (that is, with power pack

(Continued on page 420)



Practical Television

July 9th, 1938. Vol. 3. No. 108.

TELEVISION RECEIVERS FOR THEATRES AND CINEMAS.

Rapid Progress has been made in the Design and Equipment Suitable for Receiving and Reproducing Television Pictures on Large Screens, and this Article Deals briefly with One Form of Apparatus Now in Use.

SHOWING large-size television pictures to an audience of a few hundred people falls into an entirely different category from the better-known television reception in the home. Many factors contribute to this, not the least of which is the skill of the person responsible for operating the set. From time to time different forms of large-screen television pictures have been shown, among which can be mentioned the multiple lamp system; direct modulation of an arc lamp; Kerr cell modulation of an arc lamp beam; intermediate film recording and projection, and so on. One of the latest forms, however, is the use of the Baird projection type cathode-ray tube, this being the one employed for the Derby race demonstration, details of which were furnished in PRACTICAL AND AMATEUR WIRELESS dated June 18th. Whereas one of the principal difficulties encountered with the majority of the earlier big-screen television attempts was that of obtaining adequate light which could be modulated efficiently over the range of picture frequencies required, this seems to have been overcome with modern apparatus.

The Important Section

There is no doubt that the most important item of the whole equipment is the cathode-ray tube itself, and this has actually been developed from the standard forms used now in every commercial television receiver available for home use. The tube employed has the familiar cylindrical glass neck in which is accommodated the electrode system, and about which is mounted externally the line and frame deflecting coils, together with the solenoidal focusing coil. The neck then diverges in a funnel form to terminate in a flat, optically ground glass face approximately 6ins. in diameter. On this is sprayed internally the screen material which naturally has to be of a special composition to secure the additional light intensity, and also stand up to the increase in electronic bombardment which occurs in these tubes.

The degree of vacuum must be the best possible to prevent the possibility of ionisation, while the insulation has to be capable of withstanding the increased anode voltages employed, when compared with that necessary for a home receiver. The intrinsic brightness of the small but

detailed picture built up on the fluorescent screen of a tube of this character is such that it can be focused on to a remote viewing screen with the aid of a first-class projection lens. As far as the Baird apparatus which has been exhibited and demonstrated is concerned it is completely electro-optical in



Fig. 1.—The projector unit which houses the C.R. tube, time-base and amplifier equipment,

operation, the absence of moving parts preventing the possibility of mechanical breakdown risks. Furthermore, it gives a perfectly steady synchronised picture, and is both portable and compact.

Three Main Units

The actual apparatus is split up into three main units, namely, the projector, receiver and power supply rack, and the extra high-tension rectifier unit. The projector unit itself is seen in Fig. 1; a double-shelved four-legged stand accommodating the two parts. In the top section is the projection cathode-ray tube, lens, deflecting coils and time-base generator, focusing chassis, and final stage vision amplifier, the output signal from which passes directly to the tube's modulator electrode. Inspection ports and covers are provided, while at the back are three controls for picture bright-

ness, picture contrast, and filament current.

The metal box beneath the projector contains an intermediate vision-frequency amplifier, together with both the vision gain control and the main sound control. In the case of the sound, the output is fed to amplifiers accommodated at the base of each loudspeaker. These in turn operate their respective speakers, and in this way it is possible for the projectionist to have full control of both the picture and sound. Furthermore, immediately behind the operator is a unit through which there is control of the anode voltage to the tube via a tapped transformer. In the case of the Tatler Theatre installation this represents the equipment accommodated in the centre of the first half a dozen rows of the stalls, and the associated apparatus is housed in a room away from the audience; cable connections linking the sections together.

Receivers and Power Supply

The standard form of rack supplies the projector unit with vision, synchronising and sound signals, together with power supplies, except for the anode voltage. From top to bottom the rack comprises:

- (a) Sound radio receiver.
- (b) Vision radio receiver.
- (c) Power supply unit.
- (d) Power supply unit.
- (e) Power supply unit.
- (f) Main contactor panel.

Signals from a dipole television aerial erected on the theatre roof are fed to both the sound and vision receivers, and after amplification are fed to the main distribution panel contained in the vision rack, and finally to the main vision and sound controls shown below the projector head in Fig. 1.

Apart from having different output ratings

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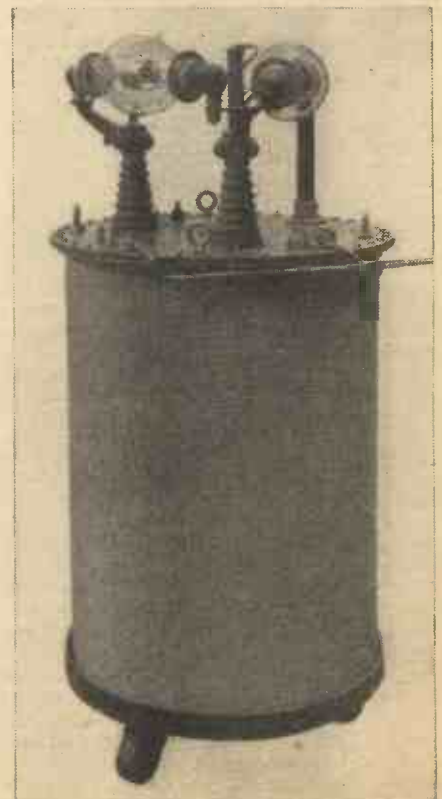


Fig. 2.—The specially developed E.H.T. unit which furnishes the anode volts essential for the proper operation of the C.R. tube.

PRACTICAL TELEVISION

(Continued from previous page)

the power supply units are almost identical in design. The first of these furnishes the H.T. and heater current to the vision and sound receiver chassis; the next supplies H.T. to the vision amplifier of the projector unit, while the last supplies H.T. to the time-base generator and the necessary current to the electromagnetic focusing coil of the tube.

Anode Voltage

For large-screen television projection work it is absolutely essential to have sufficient high-tension voltage to give a really bright picture on the tube screen. To meet this condition, therefore, a special high-tension rectifier unit embodying a voltage doubling circuit employing two valves has been designed, and this is shown clearly in Fig. 2.

Immersed in one common tank filled with insulating oil, to avoid any brush dis-

charges, are the separate transformers for heating each of the valve filaments, together with the main E.H.T. transformer and the smoothing equipment. As can be seen, the pair of rectifying valves are supported on special insulators at the top of the tank; this top section being dismantled for transport purposes. Safety resistances protect the E.H.T. transformer winding, and the final output voltage passes to the C.R. tube anode via the small control unit within reach of the operator, as mentioned earlier. For complete safety, and to comply with any local council conditions that may be imposed, this E.H.T. unit when installed in a theatre is housed in a safety cage, it being arranged that when the door of the cage is open the supply is switched off automatically, the positive E.H.T. terminal being earthed at the same time. Similarly it is impossible for anyone to start up the equipment unless the door is properly shut. Designed to work off A.C.

50 cycle mains, 200-250 volts, the whole equipment is very economical to run, the total consumption being only 2 kilowatts.

As used at the Tatler Theatre, London, the picture size on the tube's fluorescent screen is about 4ins. by 3ins., but this is projected on to a viewing screen to give a picture 8ft. by 6ft. Furthermore, the degree of brilliance is such that there is no eye strain to an observer during the periods that the pictures are shown. From the brief description just furnished it will be apparent that the equipment in its present commercial form represents a very distinct step forward in theatre television work. The results so far achieved and witnessed by a large number of people justify the claims of those responsible for its development, and now that the cinema industry realise exactly what is involved in an installation of this character, it is anticipated that they will give the fullest co-operation.

A New Form of Scanner

A PATENT has been granted to a Canadian inventor for a form of scanner which combines mechanical and electronic principles. A photo-electric mosaic has the scene to be synthesised focused on to it optically, and in the usual manner the individual cell elements lose electrons in proportion to the degree of light or shade to which they are subjected. A cathode-ray tube furnishes the electron stream used to neutralise the required picture element charge and so generate the vision signal, but the beam is swept across the mosaic by a revolving member having sectors of holes punched through its face. It is claimed that in this way a picture of much finer detail is secured, while the system lends itself more readily to the provision of secret methods of scanning. This may prove advantageous for military or commercial purposes but built up in this way the unit is complicated. Furthermore, a similar device has to be used at the receiving end, while the important question of synchronising is not dealt with at all except to say that the revolving mechanical element can be driven by a motor fed by pulses transmitted from the remote station.

The Paris Service

ACCORDING to the reports of those who have had an opportunity of witnessing the 455-line definition pictures radiated by the new Paris television station, the results are most promising. On many occasions the form of spot lighting used so freely in the Alexandra Palace studios has not given the best pictorial value to the pictures transmitted. In France, however, they seem to favour a more general lighting with "spots" used sparingly, and this has softened the picture slightly, especially when there is a tendency amongst viewers to advance both the brightness and contrast controls on the receiver beyond the optimum position. A lot also depends on the form of make-up employed and emphasis of the eyes, nose and mouth invariably gives a better picture on those occasions when the set is not operating at 100 per cent. efficiency. Detail tends to be emphasised in this way, although of course no one is anticipating a return to the rather grotesque make-up which had to be employed in the earlier days of the service. It will be interesting to make comparisons with the London and Paris television results after the latter station has had its service in operation for another month or two.

TELEVISIONS

C.R. Tube Modifications

THE normal cathode-ray tube which one layman was heard to refer to as a glass vessel full of emptiness has proved most versatile in nature, in so far as it can be applied to the reproduction of television pictures. With a view to improving its performance many suggested modifications have been tried with varying degrees of success, and it is, as yet, too early to say whether these alterations will prove both valuable and commercially practicable. In one case an effort was made to reduce the complexity of the auxiliary equipment by furnishing the voltage required for the first accelerating anode from a modified internal electrode construction. In simple words the idea was to have an auxiliary stream of electrons emitted from the cathode, quite distinct from and in no way interfering with the main stream which "paints" the television picture on the front fluorescent screen. This second stream of electrons was amplified according to ordinary valve technique, and the resulting fall of potential across a small resistance served to furnish the required volts for the initial anode. Relatively simple in conception, it must increase the initial cost of the C.R. tube as well as making subsequent replacement charges higher. In another case the fluorescent screen was replaced by an incandescent one. This gives a much brighter picture, but suffers from the defect of having a thermal lag in its response to the modulation action of the electron beam. To counteract this it was proposed to subject the screen to a form of electron bombardment during the vision signal intervals between frames, when only the synchronising signal is operative. The object of this bombardment, supplied internally from an auxiliary source, is to raise the normal working temperature of the screen so that it is just remote from the glowing condition. The claim is that not only is lag reduced, but also the amount of power required to produce the measure of incandescence corresponding to the intensity of the electron stream. Another proposal is to incorporate two fairly open mesh grids in close proximity to the front screen of the tube, and normal to the tube's axis. One of these is furnished with a voltage in

excess of the anode, while the other is fed with high-frequency oscillations, the positive pulses of which serve to increase the measure of electron impact on the screen. The valve supplying these oscillations is fed with the television signal modulation, and it is claimed that by this means the actual tube operating voltages are much lower than those required normally.

Scanning Films

WHEN it is desired to televise standard talking films which move through the gate of the projector at a pre-determined rate some allowance has to be made for the film picture movement from frame to frame, as distinct from those periods of time when the film frame is stationary. Several solutions have been advanced and tried to meet this condition. In one case, where a projection type cathode-ray tube functioned as the scanner, and the variations of light passing right through the film were made to activate the cathode surface of a multiplier photo-electric cell, the interlace scanning was so arranged that it "chased" the film section at the beginning and end of each movement, and in this way compensated for rapid changes of position. Again, in the standard form of Iconoscope camera advantage is taken of the storage principle possessed by the mosaic plate. Scanning by the electron beam is still undertaken, even when the light from the projector lamp is cut off, and no picture is focused on to the signal plate. This is because the mosaic is capable of electrically memorising the picture to which it has been exposed earlier, and in consequence the beam of electrons completes the scan, while the shutter is operative to allow the next film frame to come into the gate. Another scheme has been proposed for a camera in which the film picture is focused optically on to a mosaic screen, the resultant electron image being then focused electrically on to a fluorescent screen. Picture synthesis is undertaken by a beam of electrons scanning the fluorescent screen. When the picture on the mosaic screen begins to move as a result of the frame change in the gate, the electron image on the fluorescent screen is kept stationary by applying an opposing electrical field to the electron image stream, in its passage from one type of screen to the other. When the new film frame is in the gate the immobilising electrical field collapses, and scanning begins on the new picture now focused on to the fluorescent screen.

RADIO CLUBS & SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

DOLLIS HILL RADIO COMMUNICATION SOCIETY

On June 19th a 5-metre direction-finding contest by members took place in the neighbourhood of Hatfield. The hidden transmitter, G6SKP, was located by all but one party, solely by bearings taken, before the end of transmissions. Receivers and aerials of all types were used, and much valuable data was gained. Fine weather marked the event, and members and visitors spent an interesting time. The society caters for all interested amateurs, and a cordial invitation is extended to visitors at any of our meetings which take place fortnightly at 8.15 p.m. in Braintcroft Schools, Warren Road, Cricklewood, N.W.2. Hon. sec.: Mr. E. Eldridge, 70, Oxgate Gardens, Cricklewood, N.W.2.

EASTBOURNE AND DISTRICT RADIO SOCIETY

At the meeting of this society, held in the Science Room at the Cavendish Senior School at 7.30 p.m. on June 13th, 1938, a wireless junk sale was held. Mr. G. Bayley proposed that 25 per cent. of the money raised should go to the society's funds. Mr. J. P. Glickman seconded it. Mr. T. G. R. Dowsett presented some books and magazines to the society, and it was decided that they should start a library. Full information for joining can be had from the hon. secretary, T. G. R. Dowsett, 48, Grove Road, Eastbourne.

SLOUGH AND DISTRICT SHORT-WAVE CLUB

At the meeting held on June 21st the following important decision were made:
(a) That to all those applying for membership before July 21st a reduction in subscription to 2s. 6d. per half year should be made.
(b) That in future, in order to reduce expenses, notices of meetings will be sent to members in the form of a list containing the agenda of the meetings, once every three months. Will all members please note. The notices will also appear in this journal as usual.

After these decisions had been made the secretary handed in his notice, but expressed his willingness to carry on until a substitute be found. We were pleased to welcome a new member, Mr. Froude. Morse practice was carried out as usual, after which Mr. White (2DAJ) spoke on the Hartley Oscillator.

Agenda for the meetings for the next three months were discussed, and were finally arranged as follows:
July 19th—"The Superheterodyne Receiver," by Mr. R. Sly.

August 2nd.—Demonstration of 7 mc/s CO-PA by 2DDG.

August 16th—"Simple receivers," by 2DAJ.

August 30th.—Mr. Tuckfield's receiver on view.

September 13th.—Demonstration of 3-watt battery amplifier by 2BML.

September 27th.—Demonstration of TX by 2FAU.

Further details may be obtained from the secretary, J. H. White, 20, Chalvey Road, East Slough.

THE EAST SURREY SHORT-WAVE CLUB

A VERY successful junk sale was held on June 23rd, with G5LA acting as a very competent auctioneer. Afterwards the unsold junk was raffled as one lot, and was won by Mr. R. M. Jeremy. Morse practice is progressing favourably, and is held at 7.30 p.m.—8 p.m. every other Thursday. Hon. sec., Leslie Knight (G5LK), 13a, Hatchlands Road, Redhill, Surrey.

CREWE AMATEUR RADIO SOCIETY

A CLUB has been formed under the above name, and interested readers in the district are invited to write for particulars to W. Worthington, 10, Beech Street, Crewe, Cheshire.

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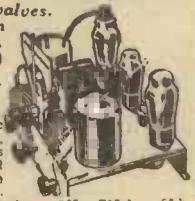
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Blank Discs 3/3 dozen. Complete Acoustic Sets de Luxe, 18/-; No. 2 10/6; Junior Type, 5/6 each, complete.

GRAMO-MOTORS—A.C. Gramo-motors and turntable. Victor, H.M.V., 230 volts, motor, 30/-.

DIX-MIPANTA VEST POCKET TESTER—A wonderfully versatile moving-coil multi-range meter for service on A.C. or D.C. jobs. No projecting terminals. THREE ranges of volts: 0-75, 0-150, 0-300. Used for MILLI-AMPS, reads: 121 m.a. and 75 m.a. In black bakelite case. Measures only 2 1/2 in. by 2 1/2 in., with pair of test leads and plugs. Leads, "N" gives full information, 10/6.

THE ROLLS-ROYCE OF RADIO TEST METERS, DIX-ONEMETER 60-range Test Set. Measures 2 millivolts to 2,000 volts, 25 microamps, to 20 amps. Price is only 55/-. Latest model. Mirror Double Scale. Moulded Base. The finest Precision Multi-Measuring instrument in the Moving Coil DIX-ONEMETER.

THE SUPREME PORTABLE A.C.-D.C. ANALYSER M.C. Meter has range switch with rectifier for A.C. All ranges. Adaptor on cable and prods. A £12 set. Bargain, at reduced price of £4 10s.

OTHER TESTERS—Silvertown Portable Test Set, Bridge type, .001 ohm to 1 meg., 57. Paul Unipivot Model U, listed £10, reads 1 microamp to 15 amps, 1/10 millivolt to 1,000 volts. Also ohms and meg. Sale £9/10/6. Cambridge Unipivot Dynamometer, Wattmeter, Model D. Reads from .01 watt, £7/10.

ROTARY CONVERTERS for A.C. Sets from D.C. 12v., 50v., 100v. or 230v. to A.C. 110 v. or 220v., 50 cycles. Various sizes in stock from 15 to 100 watts.

July Bargain List "N" Free on request.

ELECTRADIX RADIOS

218, Upper Thames Street, London, E.C.4

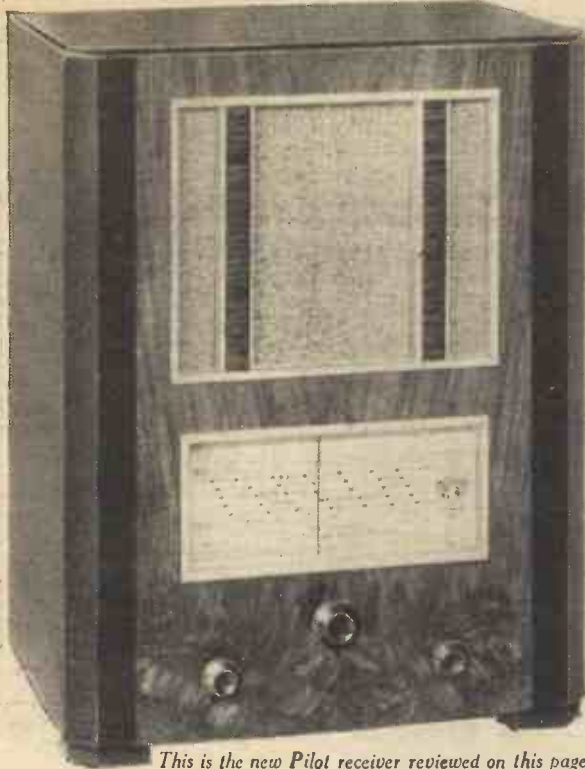
Telephone: Central 4611

TO FIND THAT FAULT!

THE WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA

5/- or 5/6 by post from

George Newnes, Ltd., Tower House, Southampton St., Strand, London, W.C.2.



This is the new Pilot receiver reviewed on this page.

NEW PILOT BATTERY RECEIVER

A Review and Test Report of the Latest Model B.43 Superhet Receiver

Controls

A very novel tuning dial is provided on this receiver, and as may be seen from the illustration, this is rectangular in shape with the long, medium and short wavebands calibrated in metres, and with station names in the centre. The wave-change switch on the right controls a sliding panel behind the dial, in which three slots are cut. The sliding panel carries three arrows and thus, as the switch is set to a special waveband, the appropriate scale is indicated by one of the arrows, the remaining two being hidden. It is thus extremely simple to see instantly to what waveband the set

is adjusted, and this will certainly prove an attractive point with this particular set. On the left of the panel is a small red pilot light which shows when the receiver is switched on. The pointer is of the vertical type travelling parallel across the scale. The remaining two controls are for tuning and for combined volume control and on/off switching. No tone control has been provided on this model in the form of a separate adjustment, but the circuit has been so designed that the general balance is suitable for all ordinary purposes. The 8-inch speaker provides good bass response without any trace of boominess due to cabinet resonance, and the high notes have not been cut by the use of excessive bypass condensers. In spite of this, however, there is no trace of excess screechiness which is sometimes found in superhets without tone controls.

Performance
On all wavebands the performance was

extremely good, and in fact it was difficult at times to realise that one was listening to a simple 4-valve battery set. Selectivity was as good as could be obtained with a superhet without an H.F. signal stage, and all the worth-while stations could be heard on medium and long wavebands. On the short waves the American stations were tuned in very easily and many other interesting short-wave stations were located at the first trial. The absence of additional controls enables the operation of the receiver to be carried out with ease and it is quite safe to say that a child could tune in any desired station. Naturally on many stations the gain is so high that the output valve is overloaded with the volume control in the maximum position, and there is adequate reserve to enable a very large number of stations to be heard at any time.

The receiver is very economical to maintain, the four valves consuming approximately $\frac{1}{2}$ amp. from the accumulator and the maximum H.T. consumption being approximately 10 mA. The price is 9 guineas, exclusive of batteries.

SPECIFICATION

RECEIVER: Model B.43 Battery-operated 4-valve superhet.

CIRCUIT: Triode-hexode frequency-changer, variable-mu H.F. pentode as I.F. amplifier, double-diode-triode 2nd detector, A.V.C. and L.F. amplifier, pentode output. Fixed tone compensation, provision for external speaker with silencing switch. Automatic grid bias for output valve. No gramophone pick-up provision.

CONTROLS: Three only—tuning, volume control, and combined on-off switch and wavechange switch.

PRICE: 9 guineas, exclusive of batteries.

MAKERS: Pilot Radio, Ltd., 87, Park Royal Road, London, N.W.10.

PROBLEMS OF THE COMMUNICATIONS RECEIVER

(Continued from page 416)

and a speaker) all in a metal cabinet which is earthed will ensure that no interaction will take place with the transmitter, and furthermore that any adjustments or modifications which may be made in the workshop or laboratory will have no effect upon the receiver. It is quite possible to build a set of this type and when it is working to find that a change of surrounding apparatus will completely upset the working conditions and thus give rise to troubles which may be hard to trace at the time.

Beat-frequency Oscillator

There is one final refinement which may be needed in a receiver of this type when used by a keen amateur. A properly adjusted superhet cannot be used for the reception of code signals sent by C.W. It is thus necessary to make some arrangement by which such signals can be made audible.

The most effective way of doing this is to fit a beat-frequency oscillator to work in conjunction with the second detector and this may be so adjusted that different notes may be obtained. A simple switch may be fitted so that the note may be changed over two or three different limits when it is found that the signal is heard with a background from another, and the note, or at least the pitch of the note, may thus be modified so that it is rendered more distinctive and thus easier to read. The main features of a receiver of this type are shown in diagrammatic form in Fig. 4, whilst the remaining illustrations show some of the essential circuit features in theoretical form for the benefit of those amateurs who may wish to design a receiver of this type.

WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA

5/- or 5/6 by post from

George Neumes, Ltd., Tower House, Southampton St., Strand, London, W.C.2.

MUSIC FROM HAWAII

TRADITIONAL Hawaiian songs by some of the most famous Hawaiian singers will be heard by British listeners on July 9th when a programme relayed from Hawaii will be broadcast on the National wavelength, through the courtesy of the National Broadcasting Company of America.

Long-distance relays of this kind provide miracles of radio engineering. From KGU, N.B.C.'s station on Hawaii, the voices of the singers will travel via R.C.A. communications to Point Reyes on the Pacific coast of America. Thence they will be fed by land-line to San Francisco and from there to the N.B.C. network of the United States. They will be picked up at the short-wave station at Bound Brook, New Jersey, and from there will travel by directional beam to England, where they will be collected at Tatsfield, passed on to Broadcasting House, and finally distributed to listeners to the National programme.



LETTERS FROM READERS

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

A Reader's Thanks

SIR,—I wish to express my thanks for your book "Sixty Tested Wireless Circuits," which was awarded to me as a prize for solving problem No. 300. It will certainly prove most useful.

I have been a reader for several years now and I should like to say how very much PRACTICAL AND AMATEUR WIRELESS has helped me. Being an active amateur transmitter I naturally enjoy the short-wave section most of all, but the paper certainly contains something for everybody.

Thanking you again for the most useful gift, and wishing PRACTICAL AND AMATEUR WIRELESS every success.—JAMES G. STONE-STREET (G2JN) (Rugby).

S.W. Logs

SIR,—I read with regret your editorial note in PRACTICAL AND AMATEUR WIRELESS of April 9th last, viz.: "Logs will not be published, unless accompanied by veris [in respect of the stations]." Having read the various issues published since the aforementioned date, it is apparent that you mean to adhere to your note.

In the past you have rendered your short-wave readers a great service in publishing these logs, for thereby comparison, skill in tuning, checking of new calls, and even new countries can be accomplished.

Logs published after the veris have been submitted to you will be of no material value to anyone, owing to the fact that arrival of a veri from a DX station takes from six weeks to twelve months.

Apart from this many short-wave enthusiasts do not collect QSLs, but, nevertheless, are able to compile logs and give news of real value.

May I suggest that you continue to publish logs if readers keep to real DX or unusual stations; state time of reception; type of receiver and aerial used; whether phone or C.W. in the case of "amateur" reception; and for broadcasting stations, details of interval signals, opening announcements, or other information which would aid fellow readers in their identification? In this way only can logs do justice to the space occupied, and at the same time be of real value, not only to the "old hand," but to the mere novice also.

As a regular reader of your excellent journal, and a keen short-wave enthusiast, I have gained considerable data from logs published in the past, and from your splendid S.W. articles.—ERNEST J. LOGAN (Hertford).

[What do other readers think about this subject?—Ed.]

High-tension Batteries

SIR,—Looking through some old numbers of PRACTICAL AND AMATEUR WIRELESS I came across an article on the above subject, which set me thinking. In that article you described the difference between three types,

according to price, giving an illustration of the increased size of the cells according to the quality of the battery. I well remember a very large 120 battery as big as two present ones and costing somewhere around a pound. This and the intermediate size seem to have disappeared, and now all types, from the latest 4s. battery, right through to the 10s. 6d. type, are of identical size. If we battery users are to believe what you wrote and advised four years or so back, what change has taken place so that standard, medium and supers contain cells of the same size? We might be pardoned for becoming sceptical. Personally I can find no difference between a 5s., 6s. or 7s. 6d. battery, and as I heard remarks by a party who knows a bit about "tricks of the trade," differently coloured and priced wrappers are put on containers of the cells of the lowest price, hoping that the higher-priced batteries will appeal to a certain class who believe that price matters much. It would be interesting to have your comments on this important matter.—AN OLD READER (Glasgow).

[This reader is not correct in stating that all batteries are of the same size. They are still made by reputable manufacturers—

CUT THIS OUT EACH WEEK

Do you know

—THAT the primary or secondary winding of an old I.F. transformer may be used as a B.F.O. coil.

—THAT several different types of variable-selectivity I.F. transformer are now readily obtainable.

—THAT when screening a short-wave receiver it often proves advantageous to insulate the screening panel from controls or components.

—THAT the principle of magnetic induction has now been demonstrated in the use of head-phone reception without wires.

—THAT television signals from Paris are now being received regularly on standard English television receivers on the South Coast.

—THAT the utility of an all-wave superhet may often be improved by arranging for a change of voltage in the frequency changer stage on each waveband.

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 name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL AND AMATEUR WIRELESS, George Avenues, Ltd., Tower House, Southampton Street, Strand, W.C.2. Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

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in various sizes according to the capacity. For instance, in the Exide list the 3s. 60-volt battery is 8½ in. by 3½ in. by 2½ in. The 5s. 6d. 60-volt battery is of the same length and width but is 3¾ in. in height, indicating that the cells are slightly larger. The cheap battery is rated for 6 mA output and the other one for emissions up to 12 mA. For sets taking up to 30 mA a 60-volt battery is available at 8s., and this is 13½ in. by 5½ in. by 3 in. in size, which is very much larger than the 3s. battery.—Ed.]

A NOVEL PULSATOR

(Continued from page 403)

held securely in position by some form of clip as the type illustrated, a headphone test can be carried out to effect the alignment of the armature movement.

Using the Pulsator

Switching on the potentiometer and the control panel switch, and increasing the potentiometer to its maximum position, it will in all probability be found that the vibrator or bell armature is not functioning, this being due either to insufficient pressure, no contact between the reed and the needle, or too much pressure. A check will therefore have to be made of the bell armature air gap between the pole pieces, which condition is effecting too little or too much magnetic flux.

Adjustment should be made carefully to the movement, but the needle need not in this particular instance be disturbed, any alteration to the pressure being carried out by varying the reed itself.

Trial and error methods will have to be adopted when endeavouring to obtain a clear note, and the higher the note the better; a low note tends to introduce a greater degree of pitch variation.

The unit should operate immediately it is switched on and until this occurs the correct adjustment will not have been obtained. Fig. 4 details the relationship of the contacts, and to attain a steady pulsation accurate centring is most important.

ANOTHER TELEVISION PROBLEM

THE B.B.C.'s attitude towards any form of advertising is well known as far as it applies to sound broadcasting, but the advent of television, especially with outside broadcasts, is presenting a new problem. Anyone watching the Derby transmission could not fail to be impressed with the large hoardings advertising different makes of spirits, which literally filled the picture screen, during the camera panning, to show the real atmosphere of the Epsom Downs. The names of pianos come out distinctly during certain pianoforte recitals in the studio; while in Picture Page on several occasions unintentional advertising has come over due to names being seen, which of course could not happen to a sound broadcast. Bearing in mind the actual wording of the Selsdon Committee report published in January, 1935, surely it is possible for the B.B.C. to accept programme material from firms whose particular products are likely to be of interest to viewers. One can immediately call to mind several "See how it works" or "See how it is made" programmes which would both interest and entertain and serve as a source of revenue to the B.B.C. On the question of accidental forms of television advertising it is difficult to see how any action can be taken, but in any case it would be interesting to know the feelings of potential advertisers, for it is certain a happy solution could be found.

Practical and Amateur Wireless BLUEPRINT SERVICE

PRACTICAL WIRELESS Date of Issue, Blueprint.	No. of Blueprint.	D.C. £5 Superhet (Three-valve) ..	1.12.34	PW42
CRYSTAL SETS.		Universal £5 Superhet (Three-valve) ..		PW44
Blueprint, 6d.		F. J. Camm's A.C. £4 Superhet 4 ..	31.7.37	PW59
1937 Crystal Receiver ..	9.1.37	F. J. Camm's Universal £4 Super-		PW60
STRAIGHT SETS, Battery Operated.		het 4 ..		PW73
One-valve: Blueprints, 1s. each.		"Qualitone" Universal Four ..	16.1.37	
All-wave Unipen (Pentode) ..		SHORT-WAVE SETS		
Beginner's One-valver ..	19.2.38	One-valve: Blueprints, 1s.		
Two-valve: Blueprints, 1s. each.		Simple S.W. One-valver ..	0.4.38	PW88
Four-range Super Mag Two (D, Pen)		Two-valve: Blueprints, 1s.		
The Signal Two (D & LF) ..	29.8.36	Midget Short-wave Two (D, Pen)		PW38A
Three-valve: Blueprints, 1s. each.		Three-valve: Blueprints, 1s. each.		
The Long-range Express Three		Experimenter's Short-wave Three		
(SG, D, Pen) ..	24.4.37	(SG, D, Pow) ..		PW30A
Selectone Battery Three (D, 2 LF		The Perfect 3 (D, 2LF (RC and		
(Trans) ..		Trans) ..	7.8.37	PW63
Sixty Shilling Three (D, 2 LF		The Band-Spread S.W. Three		
(RC & Trans) ..		(HF Pen, D (Pen) Pen) ..	20.8.36	PW68
Leader Three (SG, D, Pow) ..	22.5.37	PORTABLES		
Summit Three (HF Pen, D, Pen) ..		Three-valve: Blueprints, 1s. each.		
All Pentode Three (HF Pen, D		F. J. Camm's £1LF Three-valve		PW65
(Pen), Pen) ..	20.5.37	4 Portable (HF Pen, D, Pen) ..		PW77
Hall-Mark Three (SG, D, Pow) ..	12.6.37	Parvo Flyweight Midget Port-		
Hall-Mark Cadet (D, LF, Pen (RC		able (SG, D, Pen) ..	19.6.37	PW12
F. J. Camm's Silver Souvenir (HF		Four-valve: Blueprints, 1s. each.		
Pen, D (Pen), Pen) (All-wave		Featherweight Portable Four (SG,		PW86
Three) ..	13.4.35	D, LF, Cl. B) ..	15.5.37	
Genet Midget (D, 2 LF (Trans)) ..	June '35	"Imp" Portable 4 (D, LF, LF,		
Cameo Midget Three (D, 2 LF		Pen) ..	10.3.38	PW86
(Trans) ..	8.6.35	MISCELLANEOUS.		
1936 Sonotone Three-Four (HF		S.W. Converter-Adapter (1 valve)		PW48A
Pen, HF Pen, Westector, Pen)		AMATEUR WIRELESS AND WIRELESS MAGAZINE		
Battery All-Wave Three (D, 2 LF		CRYSTAL SETS.		
(IC) ..		Blueprints, 6d. each.		
The Monitor (HF Pen, D, Pen) ..		Four-station Crystal Set ..	12.12.36	AW427
The Tutor Three (HF Pen, D, Pen)		1934 Crystal Set ..		AW444
The Centaur Three (SG, D, P) ..	14.8.37	150-milo Crystal Set ..		AW450
The Gladiator All-Wave Three		STRAIGHT SETS, Battery Operated.		
(HF Pen, D (Pen), Pen) ..	29.8.36	One-valve: Blueprints, 1s. each.		
F. J. Camm's Record All-Wave		B.B.C. Special One-valver ..		AW387
Three (HF Pen, D, Pen) ..	31.10.36	Twenty-station Loudspeaker		
The "Colt" All-Wave Three (D,		One-valver (Class B) ..		AW449
2 LF (RC & Trans) ..	5.12.36	Two-valve: Blueprints, 1s. each.		
The "Rapido" Straight 3 (D,		Melody Ranger Two (D, Trans) ..		AW388
* 2 LF (RC & Trans) ..	4.12.37	Full-volume Two (SG det., Pen) ..		AW392
F. J. Camm's Oracle All-Wave		B.B.C. National Two with Lucerne		
Three (HF, Det., Pen) ..	28.8.37	Coil (D, Trans) ..		AW377A
1938 "Triband" All-Wave Three		Big-power Melody Two with		
(HF Pen, D, Pen) ..	22.1.38	Lucerne Coil (SG, Trans) ..		AW338A
F. J. Camm's "Sprite" Three		Lucerne Minor (D, Pen) ..		AW426
(HF Pen, D, Det) ..	26.3.38	A Modern Two-valver ..		WM409
The "Hurricane" All-Wave Three		Three-valve: Blueprints, 1s. each.		AW396
(SG, D (Pen), Pen) ..	30.4.38	Class B Three (D, Trans, Class B)		
Four-valve: Blueprints, 1s. each.		New Britain's Favourite Three		AW394
Sonotone Four (SG, D, LF, P) ..	1.5.37	(D, Trans, Class B) ..	15.7.33	AW394
Fury Four (2SG, D, Pen) ..	8.5.37	Home-built Coil Three (SG, D,		
Beta Universal Four (SG, D, LF,		Trans) ..		AW401
Cl. B) ..		Fan and Family Three (D, Trans,		
Nucleon Class B Four (SG, D,		Class B) ..	25.11.33	AW410
(SG), LF, Cl. B) ..	0.1.34	£5 6s. S.G.3 (SG, D, Trans) ..	2.12.33	AW412
Fury Four Super (SG, SG, D, Pen)		1934 Ether Searcher; Baseboard		
Battery Hall-Mark 4 (HF, Pen,		Model (SG, D, Pen) ..		AW417
D, Push-Pull) ..		1934 Ether Searcher; Chassis		
F. J. Camm's "Limit" All-Wave		Model (SG, D, Pen) ..		AW410
Four (HF Pen, D, LF, P) ..	26.0.36	Lucerne Ranger (SG, D, Trans)		AW422
All-Wave "Corona" 4 (HF Pen,		Cosser Melody Maker with Lucerne		
D, LF, Pow) ..	0.10.37	Coils ..		AW423
"Acme" All-Wave 4 (HF Pen, D		Mullard Master Three with		
(Pen), LF, Cl. B) ..	12.2.38	Lucerne Coils ..		AW424
Mains Operated.		£5 6s. Three; De Luxe Version		
Two-valve: Blueprints, 1s. each.		(SG, D, Trans) ..	10.5.34	AW435
A.C. Twin (D (Pen), Pen) ..		Lucerne Straight Three (D, RC,		
A.C.-D.C. Two (SG, Pow) ..		Trans) ..		AW437
Selectone A.C. Radiogram Two		All-Britain Three (HF Pen, D, Pen)		AW443
(D, Pow) ..		"Wireless League" Three (HF		
Three-valve: Blueprints, 1s. each.		Pen, D, Pen) ..	3.11.34	AW451
Double-Diode-Triode Three (HF		Transportable Three (SG, D, Pen)		WM271
Pen, DDT, Pen) ..		£6 6s. Radiogram (D, RC, Trans)		WM318
D.C. Ace (SG, D, Pen) ..		Simple-Tune Three (SG, D, Pen)	June '33	WM327
A.C. Three (SG, D, Pen) ..		Economy-Pentode Three (SG, D,		
A.C. Leader (HF Pen, D, Pow)		Pen) ..	Oct. '33	WM337
D.C. Premier (HF Pen, D, Pen)	31.3.34	"W.M." 1934 Standard Three		WM351
Ubique (HF Pen, D (Pen), Pen)	28.7.34	(SG, D, Pen) ..	Mar. '34	WM354
Armada Mains Three (HF Pen, D,		£3 3s. Three (SG, D, Trans)		
Pen) ..		Iron-core Band-pass Three (SG,		
F. J. Camm's A.C. All-Wave Silver		D, QP21) ..		WM362
Souvenir Three (HF Pen, D, Pen)	11.5.35	1935 £6 6s. Battery Three (SG, D,		
"All-Wave" A.C. Three (D, 2		Pen) ..		WM371
LF (RC) ..		PTP Three (Pen, D, Pen) ..	June '35	WM389
A.C. 1936 Sonotone (HF Pen, HF		Certainty Three (SG, D, Pen) ..		WM393
Pen, Westector, Pen) ..		Minutiae Three (SG, D, Trans)	Oct. '35	WM396
Mains Record All-Wave 3 (HF		All-Wave Winning Three (SG, D,		
Pen, D, Pen) ..	5.12.36	Pen) ..		WM400
All-Wave Ace (HF Pen, D, Pen) ..	23.8.37	Four-valve: Blueprints, 1s. 6d. each.		
Four-valve: Blueprints, 1s. each.		6s. Four (SG, D, RC, Trans) ..		AW370
A.O. Fury Four (SG, SG, D, Pen)		"A.W." Ideal Four (2SG, D, Pen)	16.9.33	AW402
A.C. Fury Four Super (SG, SG, D,		2HF Four (2 SG, D, Pen) ..		AW421
Pen) ..		Crusader (A.V.C. 4 (2HF, D, QP21)	18.8.34	AW446
A.C. Hall-Mark (HF Pen, D,		(Pentode and Class B Outputs for		
Push-Pull) ..	24.7.37	above: Blueprints 6d. each.) ..	25.8.35	AW445A
Universal Hall-Mark (HF Pen, D,		Self-contained Four (SG, D, LF,		
Push-Pull) ..	9.2.35	Class B) ..	Aug. '33	WM331
A.C. All-Wave Corona Four ..	0.11.37	Lucerne Straight Four (SG, D,		
SUPERHETS.		LF, Trans) ..		WM350
Battery Sets: Blueprints, 1s. each.		£5 6s. Battery Four (HF, D, 2LF)	Feb. '35	WM381
£5 Superhet (Three-valve) ..	5.6.37	The H.K. Four (SG, D, Pen)	Mar. '35	WM384
F. J. Camm's 2-valve Superhet ..	13.7.35	The Auto Straight Four (HF Pen,		
F. J. Camm's £4 Superhet ..		HF Pen, DDT, Pen) ..	Apr. '36	WM404
F. J. Camm's "Vitesse" All-		Five-valve: Blueprints, 1s. 6d. each.		
Wave (5-valver) ..	27.2.37	Super-quality Five (2HF, D, RC,		
Mains Sets: Blueprints, 1s. each.		Trans) ..	May '33	WM320
A.C. £5 Superhet (Three-valve) ..		Class B Quadradyne (2 SG, D, LF,		
		Class B) ..	Dec. '33	WM344

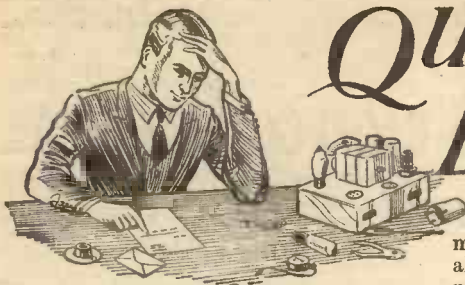
These Blueprints are drawn full size. Copies of appropriate issues containing descriptions of these sets can in some cases be supplied at the following prices, which are additional to the cost of the Blueprint. A dash before the Blueprint Number indicates that the issue is out of print.

Issues of Practical Wireless .. 4d. Post Paid.
Amateur Wireless .. 4d. ..
Practical Mechanics .. 7 1/2 ..
Wireless Magazine .. 1/3 ..

The Index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus P.W. refers to PRACTICAL WIRELESS, A.W. to Amateur Wireless, P.M. to Practical Mechanics, W.M. to Wireless Magazine.

Send (preferably) a postal order to cover the cost of the Blueprint and the issue (stamp over 6d. unacceptably) to PRACTICAL AND AMATEUR WIRELESS Blueprint Dept., George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

New Class B Five (2 SG, D, LF	Nov. '33	WM340
Mains Operated.		
Two-valve: Blueprints, 1s. each.		
Consoelectric Two (D, Pen) A.C. ..		AW403
Economy A.C. Two (D, Trans) A.C. ..		WM286
Unicorn A.C.-D.C. Two (D, Pen) ..		WM304
Three-valve: Blueprints, 1s. each.		
Home Lover's New All-electric		
Three (SG, D, Trans) A.C. ..		AW383
S.G. Three (SG, D, Pen) A.C. ..		AW390
A.C. Triodyne (SG, D, Pen) A.C. ..	19.8.33	AW399
A.C. Pentaquester (HF Pen, D,		
Pen) ..	23.6.34	AW439
Mantovani A.C. Three (HF Pen,		
D, Pen) ..		WM374
£15 15s. 1936 A.C. Radiogram		
(HF, D, Pen) ..	Jan. '36	WM401
Four-valve: Blueprints, 1s. 6d. each.		
All Metal Four (2 SG, D, Pen) ..	July '33	WM326
Harris' Jubilee Radiogram (HF		
Pen, D, LF, P) ..	May '35	WM386
SUPERHETS.		
Battery Sets: Blueprints, 1s. 6d. each.		
Modern Super Senior ..		WM375
Varsity Four ..	Oct. '35	WM395
The Request All-Waver ..	June '36	WM407
1935 Super Five Battery (Superlet) ..		WM370
Mains Sets: Blueprints, 1s. 6d. each.		
1934 A.C. Century Super A.C. ..		AW425
Heptode Super Three A.C. ..	May '34	WM359
"W.M." Radiogram Super A.C. ..		WM306
1935 A.C. Stenode ..	Apr. '35	WM385
PORTABLES.		
Four-valve: Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D,		
LF, Class B) ..	20.5.33	AW389
Holiday Portable (SG, D, LF,		
Class B) ..		AW393
Family Portable (HF, D, RC,		
Trans) ..	22.9.34	AW447
Two H.F. Portable (2 SG, D,		
QP21) ..	June '34	WM363
Tyers Portable (SG, D, 2 Trans) ..		WM367
SHORT-WAVE SETS—Battery Operated.		
One-valve: Blueprints, 1s. each.		
S.W. One-valve converter (Price 6d.) ..		AW329
S.W. One-valve for America ..	23.1.37	AW429
Rome Short-Waver ..		AW452
Two-valve: Blueprints, 1s. each.		
Ultra-short Battery Two (SG det.,		
Pen) ..	Feb. '36	WM402
Home-made Coil Two (D, Pen) ..		AW440
Three-valve: Blueprints, 1s. each.		
World-ranger Short-wave 3 (D,		
RC, Trans) ..		AW355
Experimenter's 5-metre Set (D,		
Trans, Super-regen) ..	30.6.34	AW438
Experimenter's Short-waver (SG,		
D, Pen) ..	Jan. 19, '35	AW463
The Carrier Short-waver (SG, D, P)	July '35	WM390
Four-valve: Blueprints, 1s. 6d. each.		
A.W. Short-wave World-Beater		
(HF Pen, D, RC, Trans) ..		AW436
Empire Short Waver (SG, D, RC,		
Trans) ..		WM313
Standard Four-valve Short-waver		
(SG, D, LF, P) ..	Mar. '35	WM383
Superhet: Blueprint, 1s. 6d.		
Simplified Short-waver Super ..	Nov. '35	WM397
Mains Operated.		
Two-valve: Blueprints, 1s. each.		
Two-valve Mains Short-waver (D,		
Pen) A.C. ..		AW453
"W.M." Band-spread Short-waver		
(D, Pen) A.C.-D.C. ..		WM368
"W.M." Long-wave Converter ..		WM380
Three-valve: Blueprint, 1s.		
Emigrator (SG, D, Pen) A.C. ..		WM352
Four-valve: Blueprint, 1s. 6d.		
Standard Four-valve A.C. Short-		
waver (SG, D, RC, Trans) ..	Aug. '35	WM391
MISCELLANEOUS.		
Enthusiast's Power Amplifier (1/6)	June '35	WM387
Listeners' 5-watt A.C. Amplifier		
(1/6) ..		WM392
Radio Unit (2v) for WM392 ..	Nov. '35	WM398
Harris Electrogram (battery am-		
plifier) (1/-) ..		WM399
De-Luxe Concert A.C. Electro-		
gram ..	Mar. '36	WM403
Now Style Short-wave Adapter		
(1/-) ..	June '35	WM388
Trickle Charger (6d.) ..	Jan. 5, '35	AW462
Short-wave Adapter (1/-) ..		AW456
Superhet Converter (1/-) ..		AW457
B.L.D.L.C. Short-wave Converter		
(1/-) ..	May '36	WM405
Wilson Tone Master (1/-) ..	June '36	WM406
The W.M. A.C. Short-Wave Con-		
verter (1/-) ..		WM403



QUERIES and ENQUIRIES

Screening a Receiver

"I have built a powerful superhet and to simplify matters I avoided as much as possible the sub-division of the stages. Thus, with unscreened coils I find that there is a direct pick-up from mains wiring and other outside interference. What is the best method of preventing this? I have tried lining the cabinet with foil but it was not successful."—N. H. (Palsley).

If you have lined the cabinet properly it must prevent the trouble, or else it indicates that it is not due to direct pick-up on the coils or wiring. To make a successful total screen of the type you need some care is necessary. Each side of the cabinet—including the bottom—should be covered with foil, which may be screwed or tacked in position. The lid also must be covered in the same manner. Each corner should be soldered to ensure continuity of the lining, and to make good contact with the lid lining, and thus to complete the screening, the top edges of the side linings should be permitted to project and then turned over but not fixed. Thus the weight of the lid will give sound contact.

Beam Aerials

"Whilst reading some radio literature the other day I came across a term which does not appear to have cropped up in your paper and I am thus at a loss to know what it means. The term was a 'flat-topped beam' and the claims were so wide that I should like to try one with my set. Can you give me any details even if only brief so that I could experiment in this direction?"—G. R. (Gloucester).

THE aerial referred to is chiefly of interest to the transmitter, but you may care to try it out with your apparatus if this is of the short-wave type. It consists of two closely arranged dipoles in a horizontal position, and the wires are crossed at a critical point. You may use any number of sections, but although certain improvements may be experienced when two or three are employed, for most practical purposes a single section is adequate. If the aerial is needed for more than one band you will have to use tuned feeders, although, as in all dipoles, the single arrangement operates quite well on certain harmonics.

Background Noises

"I have acquired a powerful 9-valve superhet which is stated to be fitted with A.V.C. I find, however, that when listening to American stations they still fade considerably and there is a terrific background of noise which sometimes rises above the signal. Does this indicate a fault in the receiver or is it usual on American short-wave signals?"—H. R. (Tewkesbury).

IT is difficult to make a definite statement regarding this matter without hearing the signal or the receiver in operation. We assume that you find it necessary to have the H.F. gain control in its maximum

position in order to obtain the American signals and thus the sensitivity is at maximum. This will obviously bring in all atmospheric noises and give rise to a noisy background in the absence of any special noise suppressor tone control. The A.V.C. is no doubt working, but the variation in signal strength is usually so marked that the A.V.C. cannot compensate for it, as it exceeds the voltage limits of the volume control device which is fitted. The only way to obtain the signal in a more reliable manner will be to use a more powerful set—preferably with more H.F. amplification, and to use a noise suppressor circuit.

H.T. Battery Life

"I am rather puzzled by my set which is a commercial 4-valve rated to take 12 milliamps. I have put a meter in the H.T.

RULES

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, 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.
- (5) Grant interviews to querists.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

negative circuit and the current is just over this. My H.T. batteries, however, only last two weeks and I find it expensive to run. Is there any possibility of a drain on the battery which is not shown by meter test?"—L. S. (S.W.2).

IF the meter gave a reading of 12 mA, then the total consumption was of that order. Thus there is no excessive drain whilst the set is in use. The on/off switch may, however, be faulty and when in the "off" position it may disconnect the L.T. and provide some kind of short circuit for the H.T., but this is a remote possibility, and the more likely explanation of your trouble is that you are using a small, cheap battery and this is not capable of delivering the 12 mA for the long periods during which you use the set. Put the meter in the negative lead to the battery and see if there is any reading when the set is switched off. If not, then the batteries you are using are too small and larger capacity types should be obtained.

Lucerne Coils

"Would you kindly let me know what Lucerne coils are? I see you have blueprints for the Cossor Melody Maker. Are these the same sort of coils that are supplied by

the makers when this set was issued—if not are these coils still on the market and, if so, who supplies them?"—H. J. (Dover).

THE coils in question were designed by *Amateur Wireless* in order to take full advantage of the Lucerne Plan when this was inaugurated. The blueprint referred to shows the original Melody Maker modified to enable this type of coil to be employed and thus does not utilise the coil originally specified by Messrs. Cossor. You would, therefore, be in order in rewiring the receiver in question with a Lucerne coil, and it may be obtained ready-made, or the parts for it, if you wish to wind it yourself, from Messrs. Peto-Scott.

Crystal Detector

"Could you please inform me of the address of the Jewel Pen Company and also the price of their Red-Diamond crystal detector?"—S. F. F. (Tyseley).

THE address is 21, Gt. Sutton Street, London, E.C.1, and the price of the detector is 2s. 6d.

Quality Output

"I have an M.C. speaker of good make with its own input transformer, but not being satisfied with the quality of reproduction I spoke to a friend who told me I could not expect to get quality without an output filter. I therefore bought a choke and fixed condenser, but still the quality is not improved—in fact, in my opinion it is worse. Could you help me over this difficulty?"—R. P. O. (Dewsbury).

THE statement you received was not correct. When an output transformer is used there is no need for a filter and, in fact, the inclusion of this will introduce greater risk of distortion as there will be double the amount of iron in the output stage. The choke is in parallel with the transformer primary, and thus if the transformer is correctly matched to the output valve your quality problems are bound up in the general circuit design or operating details. You should therefore look to this part of the apparatus in an endeavour to improve matters.

D.C. and 'Phones

"I should like to know whether there is any danger in using headphones with a D.C. mains set. I notice that there is a faint tingling when I touch the metal headband of my 'phone set and this leads me to suppose that there is some live current in them which might be dangerous. I should be glad if you could relieve my mind on this score."—J. B. V. (Peterborough).

IF you can feel the tingling sensation mentioned it would indicate that there is a leakage to the headphone band. This may be merely the current from your output valve, but in a properly-made pair of 'phones the band should not be in contact with the windings. You should therefore have these examined first. You can prevent the current flowing through the 'phones by using an ordinary output filter, but you should remember that a D.C. receiver should be provided with a good condenser in both aerial and earth leads in order to make certain that the set is not "live" in respect to the mains supply.

The coupon on page 424 must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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PUSHBACK Wire, Gyds., 6d., heavy 9d. Resin-cored Solder, 6ft. 6d. Screened Flex, single, 6d. yd.; twin, 9d. yd. Assorted Solder Tins, 6d. packet. Houdinners, 6d. each.
SPEAKERS.—We carry large stocks. Magnavox, 10in. energised, \$1,000 or 2,500 ohms, 15/8. Jensen, 5in., 2,500 ohms, with transformer, 7/6; energised 5in., 1,200 ohms with transformer, 6/11.
UTILITY 7/6 Famous Micro Dials, 3/9; Radiophone, 0.00015 Short-wave Condensers, 3/6. Short-wave HF Chokes, 5-100 metres, 3d. Centralab Pots, all sizes, 1/6; switched, 2/-; 20,000 ohms Pots, 1/-; Tubular Glass Fuses, 2d. Milliameters 25 m.a. upwards, 5/9; amper, 6/9.
SPECIAL OFFERS.—Class B KH, worth 30/-, comprising Driver, Transformer, Valve and Holder, 5/-. Dozen wire-ended assorted resistors, 1/8. Order 5/- post free.
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ARMSTRONG Co., 100, King's Road, Camden Town, N.W.1. Gulliver 3105.

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RECEIVERS in Makers' Sealed Cartons: PHILCO Console, list £10/19/6d., at £5. BELMONT 9-valve, list 18 gns., at 9 gns. CROSLY Push-Button Car Radio, list 10 gns., at 5/15/-. 1/4d. stamp for lists.—**COULPHONE RADIO LTD., ORMSKIRK.**

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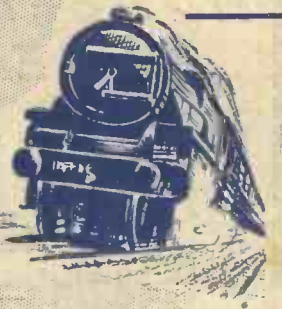
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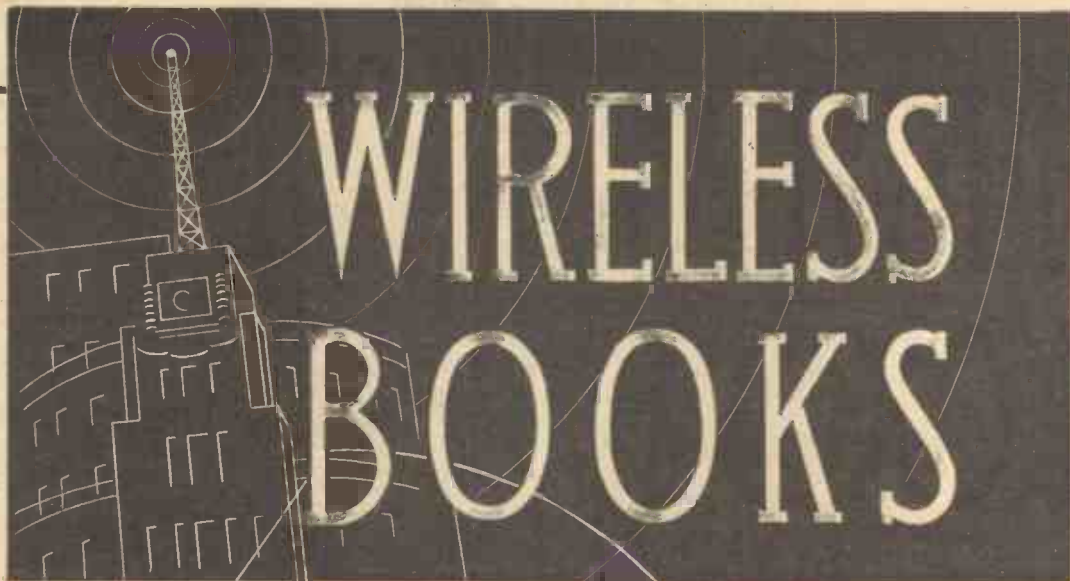
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INTERESTING POINTS IN DESIGN— See page 427



Practical and Amateur Wireless

Edited by **F. J. CAMM**

Technical Staff:
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B.Sc., A.M.I.E.E., Frank Preston.

VOL. XII. No. 304. July 16th, 1938.

ROUND *the* WORLD of WIRELESS

Test Equipment

THE keen experimenter often finds a need for reliable test equipment, but the multi instruments which are needed calls for a large outlay. Consequently, he generally manages with a good milliammeter, and by suitable shunts and other accessories makes this serve for all normal purposes. When, however, he has to test certain components, this form of test equipment is not found all-sufficient, and such items as oscillators or signal generators are often needed. We have described various equipment of this nature in previous issues, and in this number we give details of a further tester which will be found interesting, not only in design, but in the method of use. As will be seen from our cover illustration this employs a neon lamp as a source of indication, together with an earphone acting as a buzzer. The experimenter may care to design further equipment on similar lines which may have either specific or general application.

New Use for Wind-chargers

THE use of wind-driven generators for battery charging has before been explained, and now from America comes a new application of this equipment. It has been found that pipe-lines laid across open country disintegrated and it was eventually traced to the fact that the pipe became charged, and in discharging to ground the pipe disintegrated. Now, by placing a bed of iron round the pipe and charging this in a positive sense from the wind-charger, the current flows in a reverse direction to that formerly obtaining, and the disintegration is avoided.

Czech Television

THE television transmitter recently completed by the Czech Post Office has now been publicly tested. A definition of 405 lines has been adopted and thus British apparatus may be used, and if we may adopt an optimistic viewpoint, British viewers may pick up the transmissions. The wavelength is 6.1 metres, but it is unlikely in the present state of the art that the signals will be resolved in this country.

Celestion and Magnavox

THE proprietors of the well-known Celestion speakers have now taken over the plant and rights of production of the Magnavox apparatus, and in future they will all be handled by Celestion, Ltd. This is probably now the largest loudspeaker

manufactory in Europe. Mr. G. Campbell and Mr. A. Kay, of Benjamin Electric (who formerly manufactured the Magnavox products), have joined the Board of Celestion, Ltd.

is a mystery should listen to the Midland programme on July 22nd when David Gretton will explain how Birmingham Assay House supervises the fineness of all gold and silver-ware which comes to it for hall-marking, and why its anchor is to be found on nearly all the silver now being manufactured in England, as well as on much of the gold.

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The Invisible Man

REGIONAL listeners will, on July 16th, hear a play based on the story of the Invisible Man. This is a classic of its kind, being one of the earliest examples of the "impossible" type of murder, which subsequent writers have frequently imitated but never improved upon. Father Brown, a character adopted by Felix Felton, will set out to solve the mystery.

Golden Wedding Couples

THE B.B.C. wish to get into touch with all those Golden Wedding couples who, during their life together, have seen or taken part in the drama, tragedy and adventure that have gone to make English history of the last fifty years, as well as those with outstanding memories of variety and musical comedy. Their experiences are to be built into a symbolic whole in a programme entitled "Golden Wedding" which, dedicated to Golden Wedding couples everywhere, will be broadcast at the end of the summer.

Birmingham Assay House

HOW are precious metals assayed and hall-marked? Those to whom this

How to Read a Map

TO many people a map is a mystery, except for the identification of the roads. On July 20th, in the West of England programme, a new series of talks will be inaugurated, and will open with one specially designed for motorists and walkers, and O. D. Kendall, Lecturer in Geography at the University of Bristol, will explain how to look at a map.

U.S. Ambassador

MR. KENNEDY, the U.S. Ambassador, will make his first broadcast speech in this country since he was appointed to London, on July 18th. The broadcast will take place from Fyde House, Boston, an early eighteenth-century house which is the headquarters of the Boston Preservation Trust. Part of the house is now set apart for United States visitors to the Lincolnshire Boston. The Earl of Ancaster will be among those who will welcome the Ambassador at Boston, and the occasion will mark the annual visit of representatives from Boston, Massachusetts, to the "mother" town from which the early New England settlers emigrated.

"Selections From —"

FOUR popular variety series broadcast earlier in the year are to be featured in B.B.C. Summer programmes.

Phil Cardew and the Band Waggoners, appear in some of their Band Waggon "hit" numbers (August 8th and during the first week in September); Peter Yorke conducts his orchestra in selections from the "Sweet and Lovely" programmes (July 23rd, August 19th and the second week in September); Benny Frankel's arrangements of numbers featured in "Rhythm Express" will be recalled on July 27th and during the third weeks in August and September; while Jay Wilbur's "Melody from the Sky" numbers will be played again on August 5th and in the last week of September.

ROUND the WORLD of WIRELESS (Continued)

New Polish Station

THE new broadcasting station erected at Baranowicze is to serve the eastern part of Poland. The transmitter will have an output power of 50 kW. Like the station in Torun, on the Vistula, the Baranowicze broadcasting house is a complete unit. The station has begun testing on 578 m. (520 kc/s).

French Cycling National

IT is reported that France's greatest sporting broadcast, the *Tour de France*, will take place from July 15th to 31st. State and private stations will follow this cycling race round France with special transmitting cars and teams of commen-

INTERESTING and TOPICAL NEWS and NOTES

same author, was broadcast in the West of England programme on May 26th.

Variety from Coventry

A PROGRAMME of variety will be broadcast from the New Hippodrome Theatre, Coventry, on July 21st, and among the artists listeners may hear in this broadcast are Sam Browne and Elsie Carlisle, and Albert Whelan.



Mrs. Don Bradman, wife of the Australian Test captain, listening in to the broadcast of the first Test Match at Nottingham. She was the guest of Mr. H. W. Hodgetts, a South Australian member of the Australian Cricket Board of Control, at Adelaide. On the second day of the Test Match Mrs. Bradman celebrated her birthday, as also did Mr. Hodgett.

tators. There are usually eight or ten different commentaries each day.

Speedway

A COMMENTARY on part of the Speedway match between Bristol and Harringay will be given by Frank Buckland from Knowle Stadium, Bristol, on July 22nd.

Light Music from Bournemouth

LEONARDI and his Wiener Orchestra, with Renee Barr (soprano), Robert Keyes (pianoforte), Emilio (accordion), and Eric Shrimpton (electric guitar), will give a programme of light music on July 22nd. Until quite recently Jack Leonardi was closely associated with Alfredo's Orchestra, and was heard many times in the National programme as its leader. He first broadcast with his own Orchestra in the West of England programme in July, 1937.

Short Story

"A FRIGHTFUL FIX," a short story by Frank Baker, will be read on July 18th. "High Tension," a story by the

it is featured at the Winter Gardens Pavilion, where entertainments varying between light music and symphony concerts are frequent.

Travel Talk

WILLIAM H. POTTS, of Birmingham, will come to the microphone on July 18th to tell the story of his journey through Tibet in the series entitled "Seeing Life." Mr. Potts left Shanghai just before the outbreak of the present war and was the last European to cross China from east to west before hostilities made this impossible. In Tibet he travelled with a long straggling Tibetan tea caravan and visited the King of Muli, a little lamas-kingdom about the area of Wales, hidden in the mountains at the eastern extremity of the Himalayas, on the borders of Tibet. He learned to speak Chinese and he reached the frontier of Burma six months after leaving Shanghai.

Northern Concert Party

TWO Blackpool shows will be broadcast on July 21st, when the microphone will visit the Arcadian Follies, presented by Ernest Binns, at the South Pier, and the Royal Follies, the Tom Vernon show, at the Central Pier.

Fleetwood Follies

A POPULAR concert party broadcast is featured in the Northern programme on July 22nd, when listeners will hear an excerpt from the Marine Follies, an Ernest Binns show, at the Marine Hall, Fleetwood, Lancashire.

International Water Polo

ON July 23 John Hodgson will give a running commentary on part of the International Water Polo Match between England and Scotland, which is to be played at the Roundhay, Leeds, open-air swimming pool.

SOLVE THIS!

PROBLEM No. 304

Jonson's three-valve set utilised an H.F. transformer (without reaction) between the H.G. and detector stages, and he decided that reaction would be an improvement. He accordingly disconnected the transformer primary from the anode circuit and connected this between earth and the anode of the detector, with a suitable reaction condenser in series. In place of the primary in the anode circuit of the H.F. valve he fitted a high-inductance H.F. choke and joined the anode to the "top" end of the grid or secondary winding. He failed to obtain results with this arrangement. Why? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 304 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, July 18th, 1938.

Solution to Problem No. 303

When Atkins purchased his I.F. transformers he forgot to check the frequencies for which they were designed and he obtained one for 110 kc/s and one for 465 kc/s. The following three readers successfully solved Problem No. 302 and books are accordingly being forwarded to them: C. J. Whitehead, Latchmoor Cottage, Brockenhurst, Hants. S. Davey, Tregullov Cottages, Scorrier, Redruth, Cornwall. C. J. Taylor, 68, Twickenham Road, Erdington, Birmingham 21.

"Glamour of 1938"

"GLAMOUR of 1938," a Super Seaside Revue presented by Harry Benet from the Alexandra Gardens, Weymouth, on July 19th, will include: Fred Walker (comedian), Muriel Cronshaw (soprano), Freddie and Peggy Payne (light comedians), Betty Ray (entertainer), Gerald Osborne (baritone), Mollie Dean (soubrette), and Dawnya and Petrov (speciality dancers).

Cabaret from Torquay

DANCE Cabaret will be broadcast from the Grand Hotel, Torquay, on July 13th. There will be dancing to Harry Evans and his Dance Band, with Reg. Mitchess and Freddy Noakes.

Weston Municipal Orchestra

THE Weston Municipal Orchestra, conducted by H. C. Burgess, will broadcast from the Rozel Bandstand, Weston-super-Mare, on July 20th. The orchestra is well known to listeners, and for more than seventeen years has been playing at the Rozel Bandstand in Madeira Cove during the summer. In the winter months

INTERESTING POINTS IN DESIGN

YOU will remember that last week we concluded our chat on ideal circuits by referring to a letter received from a reader in Las Palmas who was interested in details of a rather elaborate battery receiver. Among other things, he wanted a five-valve "straight" circuit with two H.F. stages, two L.F. stages, detector and various refinements. One important requirement was that the set should cover four wavebands, while there should be provision for bringing into circuit an extra coil holder into which any desired coil could be plugged. Our correspondent pointed out that he did not propose to use A.V.C., because he was not sure that it offered many advantages on short waves.

As a receiver of this general type is often asked for by Empire readers we have given a good deal of thought to the question of its design. And since several of the rather interesting refinements that were suggested can conveniently be added to most types of receiver we felt that we should be justified in devoting this week's space to the many problems involved.

"Straight" or Superhet?

We should make it perfectly clear at the

The "Experimenters" Discuss a Number of Receiver Refinements that are Applicable to Many Types of Set, and Also the Question of Designing a "Super" Set for Empire Readers

reception below 10 metres. Who is going to be the first to dispute this?

Five-valve Battery Set

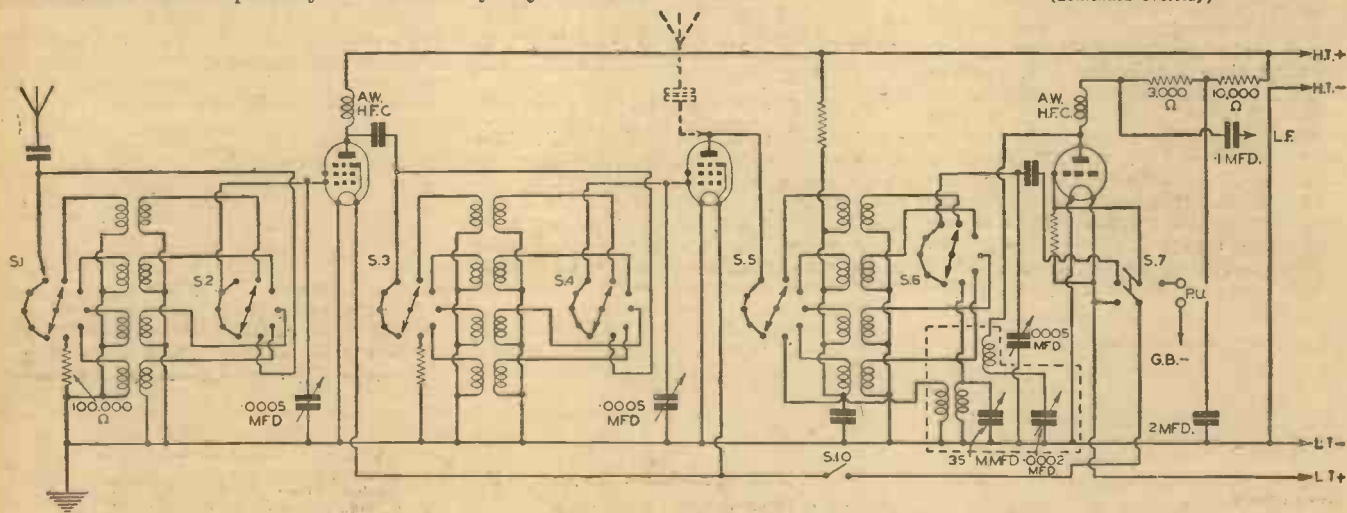
For the moment, however, let us turn to the requirements of Mr. Lawson, for he set out these quite clearly and without equivocation. We have "interpreted" his needs in the skeleton circuit shown in Fig. 1. There are five valves—two H.F. pentodes, a triode detector, and a push-pull output stage in which a pair of tetrodes is employed. Unless an eliminator, Milnes unit or H.T. accumulator, is available it would be better to replace the two tetrodes by a Q.P.P. valve.

In one small respect we have diverted from our correspondent's specification. He stated that band-pass should be incorporated. This would lead to unnecessary complications with trimming and would not, we think, be very satisfactory on short waves. In any case, the use of three double-wound tuners should ensure ample selectivity and introduce quite enough "fun" when trimming the gang condenser. In fact, it would almost certainly be desirable to fit additional low-capacity padding condensers across the short-wave windings to ensure accurate alignment.

Wave-change Switching

There are six five-way rotary switches marked S.1 to S.6, and these would be ganged on a common operating shaft. They bring into use the appropriate windings of the coils. Frankly, we do not know of any ready-made coils that are exactly suitable for use in the circuit given, although there is not a shortage of three-range coils with these connections. One solution would be to build up the coil unit from separate coils such as those made

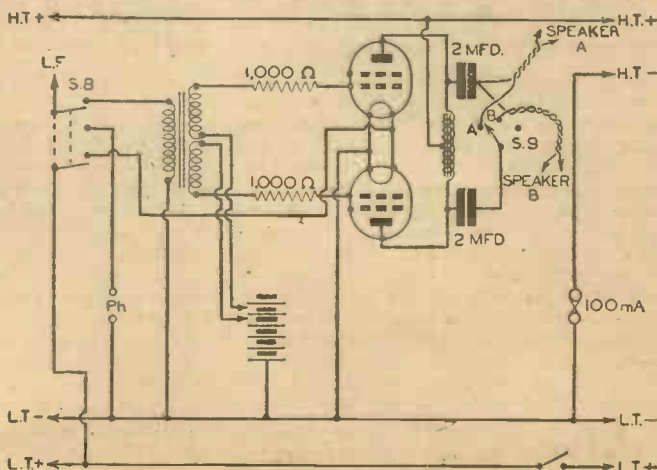
(Continued overleaf)



outset that we do not consider that a "straight" circuit is particularly satisfactory in a case such as this, and that we have replied by post to Mr. Lawson pointing out this fact. At the same time there are so many points of interest in the scheme that many of our readers will find ample food for thought in the suggestions that we shall put forward. If we were designing what would, in our opinion, be the ideal receiver to meet with the requirements set out, we should go for a four- or five-valve superhet using five-range coils similar to the Bulgun C.64 (aerial) and C.66 (oscillator) tuners. These cover ranges from about 5 to 2,100 metres in five steps and are made for ganging.

Our reason for favouring the superhet is that it can be made stable far more easily than can a "straight." In addition, our experience shows that a "straight" with a couple of H.F. stages is unsuitable for

Fig. 1.—The combined circuit shown above and to the right is an "interpretation" of the requirements of a Las Palmas reader. It incorporates a number of refinements and switching systems, but might be considered as unnecessarily complicated.



INTERESTING POINTS IN DESIGN

(Continued from previous page)

by Wearite, and which have previously been mentioned in these pages. Alternatively, three-range coils could well be used in conjunction with additional short-wave coils. This is a matter which the individual constructor would have to decide.

We gathered that the idea of using additional plug-in coils was to permit of ultra-short-wave reception, so we have provided only one such coil, this being in the detector circuit. When this is brought into circuit by the wave-change switch assembly a 100,000-ohm fixed resistor is used to provide aperiodic coupling for the aerial and inter-H.F. circuits. The reason for this [is] that we doubt whether three circuits could be properly aligned for this wave-range without the use of elaborate laboratory equipment.

As Det.-L.F.

A separate aerial connection, shown in broken lines, can be made to the ultra-short-wave coil, eliminating the two H.F. valves, the filaments of which can be disconnected by means of switch S.10. With these connections the receiver would act as a Det.-L.F. one. Even when used in this way we do not consider that the circuit is by any means ideal, and it is far too complicated for our liking, for simplicity should be the keynote when dealing with below-10-metre reception. Still, we make the suggestion for what it is worth and leave it to the experienced experimenter to draw his own conclusions.

From the detector stage onward we feel more happy with the circuit. There is provision for including a pick-up (with its own built-in volume-control) in the detector grid circuit, and a two-way change-over switch brings this into action, and at the same time breaks the L.T. positive lead to the two H.F. valves. That prevents possible "radio" break-through besides economising in L.T. current when only the detector (used as L.F.) and output stages are in use. A two-pole Q.M.B. switch could be used, but it would be far better to use an anti-capacity switch or one of any other type designed for use in radio-frequency circuits. In any case, it should be mounted close to the grid terminal of the detector valve.

'Phone Connections

A parallel-fed double centre-tapped push-pull transformer is used between the detector and push-pull output stages; the separate secondary windings permit of the

G.B. voltage for each valve being chosen more accurately than is the case when both valves receive their bias from a common tapping.

There is provision for connecting ear-phones after the detector valve, and terminals for these are shown. They are connected to a two-pole change-over switch of the Q.M.B. type, which disconnects the L.T. supply to the output valves when 'phones are in use. This effects an economy in L.T. current. Instead of using a double-pole switch it might be found better to use a pair of single-pole switches which can be ganged by means of a long spindle. The switches could then be mounted close to the points which they control.

Speaker Switching

In the output circuit there is a centre-tapped push-pull output choke and a rotary switch (S.9) for bringing into circuit either or both of two speakers. When the contact arm is at A one speaker is connected; when it is at B the other is in circuit; by allowing it to bridge both contacts both speakers can be used at the same time. The speakers are fed through a pair of 2-mfd. fixed condensers so that they

not supply such a plan. And, as mentioned in our opening remarks, we are of the opinion that the circuit is of very limited application.

Superhet Preferred

To fulfil the main requirements of Mr. Lawson we should adopt a circuit on the lines of that shown in skeleton form in Fig. 2. This is a five-valve superhet using the Bulgin five-range coils mentioned above. These have built-in trimmers and switches so that the circuits can be aligned without great difficulty, whilst the superhet circuit is far more reliable for all-wave working.

There is a pentagrid frequency-changer, followed by an H.F. pentode, triode detector, and (although not shown) a push-pull or Q.P.P. output circuit similar to that in Fig. 1. This should provide very satisfactory results on wavelengths between about 5 and 2,000 metres. We have omitted the various switching refinements for the sake of simplicity, but these could be adapted to suit the new arrangement. As with the first circuit, we have not shown variable-mu volume-control or A.V.C., although one of these would be included.

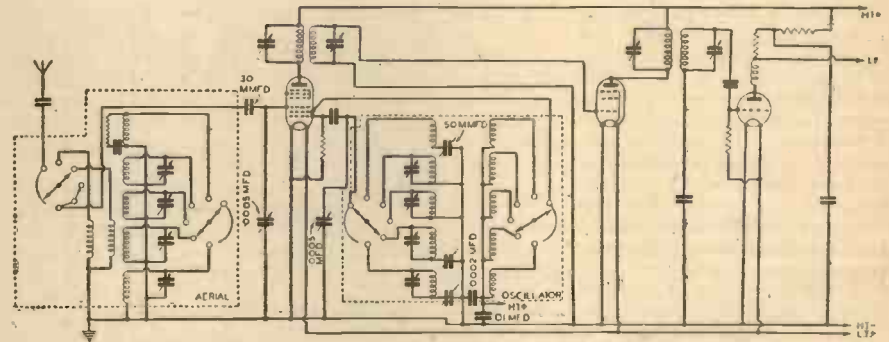


Fig. 2.—Frequency-changer, I.F. and triode second-detector portion of a set using five-range tuners.

are isolated from the H.T. circuit. The condensers are not essential, but they are at least desirable.

Well, that is our "prescription," whether you like it or not. It does, at any rate, embody the suggested requirements, and many of the details are suitable for general application. We give only a skeleton diagram, because there are many practical details that must be settled as a result of experiment. For that reason we ask readers to refrain from writing for a complete wiring plan or anything of that sort. Without a considerable amount of experiment, and short of building the receiver, we could

There is a considerable amount of interest in these "super" circuits among our Empire readers, and we should be very glad if some of them would let us have details of their own DX outfits so that we can pass them along to others. By the way, perhaps some of you in the "far-flung posts of Empire" would tell us if there is very much to be heard below 10 metres. We cannot imagine that there is, since the practical range of these ultra-short-wave transmissions is still limited to the "optical" distance between transmitter and receiver. Or are we too old-fashioned in this respect?

LINE DEFINITION

ON several occasions the French television transmissions from Paris have been received with varying degrees of success at favourable high locations on the south coast of England. This has served to bring to the fore once more the all-important question of the adoption of a universal standard of line definition for the radiated pictures. Only under expert supervision should an attempt be made to alter the electrical constants of the time-base generator in order to receive television transmissions other than those emanating from the Alexandra Palace, and for which all British sets have been designed. Even assuming that designers of sets make provision for one or more picture standards in order to meet the possibility of alternative

programmes, there are other important items to consider, quite apart from the number of lines into which a picture is dissected. Interlacing seems to be generally adopted, but there is more than one method by which this can be undertaken, so that presents its own problem right at the outset. Then comes the type of modulation, that is whether positive or negative, together with the scheme used for injecting the line and frame synchronising impulses into the vision carrier wave. All these have a definite bearing on the designs of the vision receiver, methods of selecting synchronising pulses, number of stages, etc., and the whole arrangement becomes hedged with difficulties which would inevitably increase the price of television

receivers out of all proportion to the spasmodic possibility of tuning in any alternative programme. Picture ratio, direction of scan, ratio between vision and synchronising modulation represent additional factors, so that when the non-technical press glibly talks of the French television pictures giving an added service to that provided by the B.B.C., readers should remember that there are many factors to be considered, besides picture definition, before such a happy situation materialises. In conclusion, it is as well to stress that very unpleasant interference can be secured unless the separate television transmitting stations have their vision and sound carrier frequencies well apart. Patterns will appear on the picture screen, and a mixture of whistles will be heard on the sound, unless this is the case, and this has already made itself felt on those few occasions when the Paris station has been received in this country.

The H.F. Stage

A Practical Article Dealing with the Construction of High-Frequency Stages, and Describing a Typical Two-H.F. Receiver

THE advent of the superhet receiver heralded a change in radio reception. In the early stages of its existence it was the subject of much discussion, and many readers may remember the controversy which sprang up respecting the merits of this type of receiver compared with the already-established "straight" set.

Wireless experts were not slow in realising the possibilities which the superhet presented, and it was not long before it rivalled the T.R.F. set in popularity. To-day it is undoubtedly the more popular of the two, but even so it has by no means superseded its old rival.

The popularity of the superhet is mainly due to its high efficiency: high sensitivity and selectivity are obtained with a minimum number of valves. For a T.R.F. receiver at least four tuned circuits must be employed if high selectivity is desired, but two H.F. stages will provide more than sufficient sensitivity. A two-H.F. receiver with a band-pass filter in the aerial circuit provides an excellent alternative to a superhet, and this type is preferred by many amateurs who would rather possess a sensitive T.R.F. receiver than a large superhet with bad image response and poor reproduction.

A typical two-H.F. receiver is described in this article, and many purely practical points are raised in order to show the reader some of the pitfalls which may crop up in the construction of H.F. stages.

The diagram includes the first and second H.F. stages working into a diode detector, but no L.F. stages have been shown. This leaves the audio-frequency equipment to the discretion of the reader, but as the circuit is quite conventional, an ordinary pentode or triode output valve will suffice.

The Aerial Circuit

A capacity-coupled band-pass filter, with a loosely coupled aerial coil, constitutes the H.F. input circuit. Two sections of a four-gang condenser are employed to tune the band-pass coils, and the rotors of these sections are earthed at the point X in the diagram. Actually, the rotors could be connected to any convenient earthed point, but the stability of the first stage is mainly dependent on correct earthing, and, since the cathode of the valve in question is the natural terminus for H.F. currents, better stability may be expected if it is used as an earthing point. The cathode proper cannot be used because it has a positive potential with respect to earth, but since it is by-passed to earth, the earthed end of the by-pass condenser provides an excellent juncture.

A bus-bar is taken from this juncture to the earth terminal, and a second bus-bar is connected directly from the point X in the second H.F. stage. The separate bus-bars are a precautionary measure to ensure that no stray H.F. currents flow from one H.F. stage to the other. This statement may at first sight appear contradictory, and one may be tempted to ask how H.F. currents can flow from one stage to another via the earthing. Actually

this frequently occurs in sets in which the earthed wiring runs haphazardly through the chassis, but instability is only likely to occur in a sensitive receiver; in a simple receiver this fact provides the illusion that earthing is of little importance.

Too much attention cannot be paid to the earthing system, and it is advisable to earth a metal chassis at the earth terminal only unless the design of some components—notably the gang condenser—is such that they are automatically earthed by virtue of their chassis fixtures. If the chassis can be completely isolated, the danger of H.F. currents flowing through it and coupling one stage to another, can be avoided.

The Band-pass Filter

Capacity coupling between the two sections of the band-pass filter allows the condenser C1 to serve the dual purpose of coupling element and decoupler for the A.V.C. line. A value of .01 microfarads has been chosen for this condenser. A higher value would decouple the A.V.C. line more efficiently, but would provide too tight a coupling for the filter sections. The

Local/Distant Switching

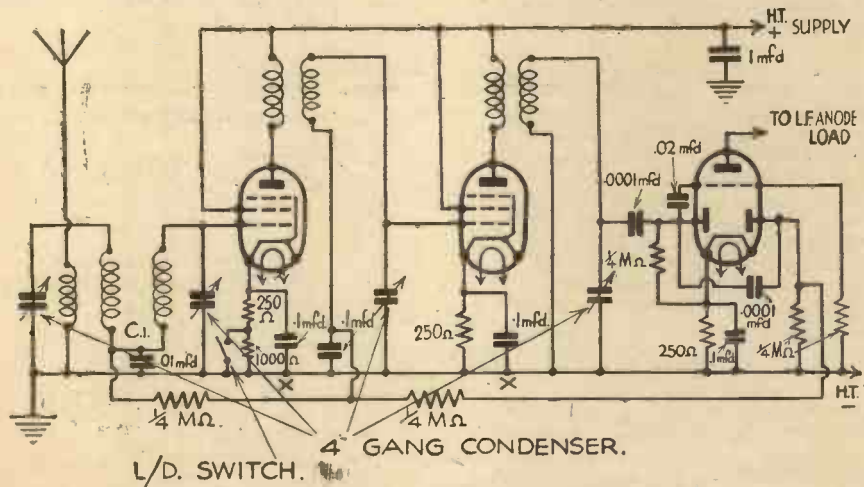
The sensitivity of a well-designed two-H.F. receiver is high enough to make some form of local/distant switching desirable, and this is provided for by the special cathode circuit of the first valve. The complete cathode resistance has a value of 1,250 ohms, of which 250 ohms is the standard value suited to the valve and 1,000 ohms for cutting down the gain for local reception. As shown in the diagram, a switch is connected across the larger resistance. When this switch is closed there is only 250 ohms in the cathode of the 1st H.F. valve, which obtains its normal bias. A much higher bias is developed when the switch is opened, thus connecting both resistances in series. The large bias reduces the gain of the stage, and, therefore, the receiver is more suited to local reception with the switch in the "open" position.

The cathode by-pass condenser has a value of .1 microfarad, and is of the paper variety. A larger value may be used, but there is no point in using more than .25 microfarads.

Second H.F. Stage

An H.F. transformer couples this stage to the first. A suitable transformer can be made from a standard medium-and-long coil by winding a primary winding on top of the existing winding. This winding should consist of about a tenth of the number of turns on the secondary. A larger winding will increase the sensitivity of the receiver, but only at the expense of the selectivity.

The grid-circuit of this valve is not band-passed, neither has it a local/distant cathode circuit, but with these exceptions



Theoretical circuit diagram of a two-H.F. receiver.

opposite is true for too small a condenser, although the larger condenser will give the greater sensitivity.

As before, this condenser is earthed at point X in the diagram of the first stage. A mica condenser is recommended; but should one not be available, a paper type condenser will usually be satisfactory.

Two standard coils may be used for the band-pass circuit, providing they are accurately matched, but they must be effectively screened from each other. The screening should be good enough to ensure that the only coupling between the coils is the capacity C1. In practice, a metal can over each coil is sufficient to ensure almost perfect screening, but the distance from the inside of the can to the coil winding should not be less than 1in. A smaller can would seriously detract from the efficiency of the coil.

all the previous remarks on the first H.F. stage apply equally well.

The Detector

A double-diode-triode serves the triple purpose of detection, A.V.C. and L.F. amplification. Since the signal diode is connected to cathode, and the A.V.C. diode to earth, the A.V.C. has a delay voltage equal to the bias on the D.D.T. This delay prevents the A.V.C. from coming into action on weak stations. The A.V.C. is of material assistance in preventing instability in the H.F. stages, and should it be omitted it may be necessary to reduce the gain of the H.F. stages.

More than two H.F. stages may be employed, but the difficulty of obtaining a sufficiently large tuning gang-condenser usually sets the limit of T.R.F. set-design to two stages with one band-pass, or three stages without any band-pass.

Loudspeaker Faults, and Their Remedies

A Detailed Account of Some of the Troubles which may be found in Modern Apparatus and Some Suggested Cures = = = = By W. J. DELANEY

WHEN a receiver is being serviced it is often found that all the existing tests fail to reveal anything wrong with the circuit or components. In such a case the speaker will be at fault, and many servicemen now adopt the procedure of testing the speaker first—considering this as the weakest link in the chain. There are many obscure faults which may exist in this part of the equipment and which may fail to answer to normal tests. Such items as shorted turns on the speech coil or field, for instance,

the fracture is very large, to replace the cone.

Speech Coil and Leads

In some cases the speech coil turns may have become loose and can give rise to a similar effect, and the remedy is again to reattach them with a good adhesive. On most speakers two flexible leads are anchored to the cone and taken down to the speech coil, and these should be kept clear of the cone. If, due to mishandling, they have been pushed near to the cone they may vibrate and come into contact with the cone at certain frequencies, or at a certain volume, and thus give a periodic "paper and comb" effect. Short-circuited turns on the speech coil will upset the matching and give rise to the type of distortion which is experienced with an unmatched output stage, and only by removal of the cone will it be possible to identify this type of fault unless the resistance of the coil is known beforehand and a good ohmmeter is available to read the resistance.

be simplified by slipping strips of card or ivory at three or four points round the speech coil whilst the spider or centring bolt is locked into position. Special small wallets containing a number of strips of varying thickness are supplied by Messrs. Holliday and Hemmerdinger, and will facilitate this operation (Fig. 1).

A broken web on the spider will be obvious and the only satisfactory cure here is to replace it—preferably by a similar spider obtained from the makers of the speaker.

Energised Speakers

The field winding of an energised model is wound to a definite resistance, and if overrun the covering of the wire may char and eventually give rise to a short-circuit. If this occurs on two or more adjacent turns it will not make a great deal of difference except perhaps to result in a slight rise in temperature. Where, however, the short-circuit effectively cuts out many turns the resistance of the field will be reduced and excessive H.T. will be applied to the valves. The increased current resulting from this will cause an increase in the temperature of the field and more charring will probably take place. A new field winding is the most satisfactory solution where it is definitely traced to overheating, but where movement or some other cause has resulted in a slight wearing of the insulation the field winding may merely be impregnated with good shellac or if the coil is unwound a small piece of insulation tape may be wrapped round the defective part.

(Continued on page 441)

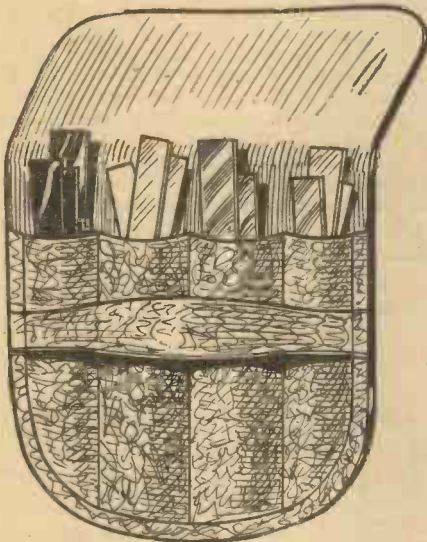


Fig. 1.—This handy wallet, containing strips of varying thicknesses for re-centring speaker cones, is supplied by Holliday and Hemmerdinger.

may be very difficult to locate. Dealing with the usual faults in a more or less sequential order, one of the commonest troubles is that which gives rise to what may only be called a "paper and comb" form of reproduction. This may be due to several things, the most usual being a torn cone. This will not be readily seen if the speaker is mounted with its dust bag intact and the speaker will therefore have to be dismantled. This should, of course, be the first step in testing the speaker. A tear or rupture in the fabric of the cone should be easily seen unless it occurs round the edge of one of the types of cone which has corrugations round the edge. A careful examination will in this case have to be made and the surrounding frame, with felt ring, must be removed. The simplest cure for this trouble is to repair the fracture, and in some cases this may be done merely by carefully coating the torn edges with a good adhesive. A patch may be used in some cases, but will interfere with reproduction. In some cases, of course, this may be tolerated, and only with a quality receiver will it be necessary, unless

Distorted Cones

When a speaker has been kept in a damp atmosphere there is a possibility of the

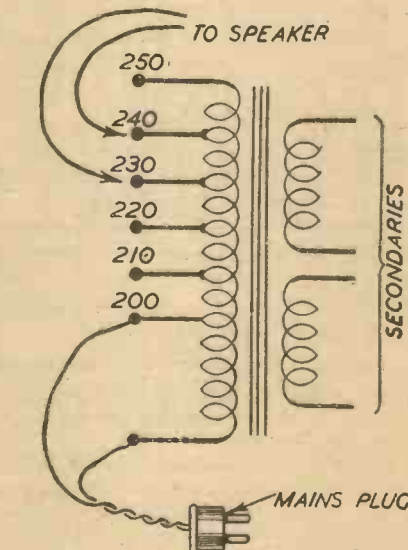


Fig. 2.—Circuit diagram of a mains transformer, showing the tappings for the speaker field winding.

cone becoming flabby and distorted, and although this can give rise to distorted reproduction, a more serious effect is that the resultant sagging of the speech coil may cause the coil former to foul the sides of the air gap. Again, this may be periodic, only occurring at certain volumes. With some cones it is possible to dry them out, but in most cases a new cone is called for. Re-centring is a difficult task, but may

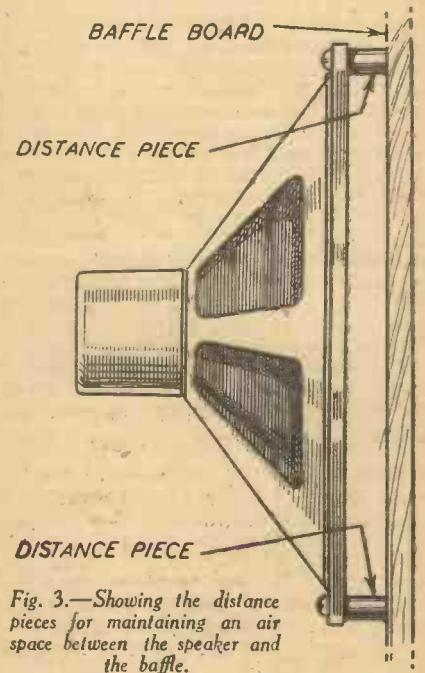


Fig. 3.—Showing the distance pieces for maintaining an air space between the speaker and the baffle.

ON YOUR WAVELENGTH

New Method of Transmission and Reception

I HAVE been interested to read an account of a new system of radio transmission and reception described in a paper read before the Convention of the Institute of Radio Engineers by Murray D. Crosby, of the R.C.A. Laboratory. The new method suggests that international broadcasts of the future will be transmitted over greater distances with four times the output of transmitters at present ratings. Application of the method, it is thought, would make possible an even closer linking of nations and Empires by voice than is now possible. Mr. Crosby describes the system as one of "phase modulation," which makes possible greatly increased power at the transmitter which results in a reduction of the annoying effect of static, man-made interference, and fading. One of the chief advantages of the new system, therefore, is an increased power output from a given power input, or reduced amount of power input for a given required amount of output. If justified, this holds promise for use in mobile craft communication, such as aeroplanes to ground transmission, where the weight and space required must be small. It is not believed that the new system will affect broadcasting on the standard frequency band because the most effective reception of phase modulated waves requires receivers specially designed for the system.

Conditions in New Zealand

MR. E. SUTHERLAND, of Cattleflat Station, Pembroke, Otago, New Zealand, says that he is perfectly satisfied with the wireless fare radiated in that country. They are, of course, afflicted with crooners, swing music and the like; they are served in that country with three classes of programme—Government owned and controlled, privately owned transmissions without advertising, and Government owned commercial stations radiating sponsored programmes. He says that the latter class are hardly worth while, as their programmes follow on the lines of the American stations. Sunday programmes in New Zealand are on the whole satisfactory, and



By *Thermion*

consist of light opera interspersed with songs by such artists as Peter Dawson and Gladys Moncrieff. A good number of church services are to be found round the dial throughout the day, although they have the choice of a good number of Australian stations which come in well after dark. The privately owned stations are numerous, but advertising matter spoils them. American sets, he says, are selling well in New Zealand. Mr. Sutherland says that he thinks he can claim to be my most distant reader, as the shortest route by which this journal can reach him is 11,755 miles. The last number he has received was dated March 12th. I am much obliged to this reader for maintaining contact with me and the old journal, and for the interesting photographs he sends.

Second-hand Sets

E. J., of Rottingdean, tells me that a short while ago he purchased a second-hand set for £2. It worked perfectly when he heard it demonstrated in the shop, but when he got it home it refused to work unless he kept his hand on the reaction control. Further investigation showed that the coils had turned green with mildew. However, he rectified matters and the set is now working well. You cannot expect a new receiver for £2, and as this one evidently required a minimum of attention, E. J. has very little about which to complain.

Scots Only

ENGLISH readers, and certainly English purchasers of batteries, will be surprised to learn that only Scots workers are employed at the Scottish Battery Co., Ltd. I am unaware that any race ban is imposed in English factories, nor can I see any particular reason for employing only Scots workers. I do not subscribe to the view that ability

and brains are indigenous only to the soil of England, of course, but if this system is carried to an extreme, eventually we shall find people living in one street refusing to employ those living in the next street. I take it that this firm, so loyal in its support of only Scots labour, will not object to Englishmen, Welshmen and Irishmen buying their batteries.

Radiolympia

I TAKE pleasure in informing readers that we shall occupy the same site at Radiolympia as in former years—Stand No. 10, Ground Floor. Our telephone number there will be Fulham 9202. When PRACTICAL AND AMATEUR WIRELESS first appeared at a Radio Show it had a vast number of competitors. Now it has only one—during the last year one of the few remaining competitors having ceased publication. Constructors are appreciative of the fact that this journal still exists to help them, and we on our part will not fail them. A cordial invitation is issued to every reader who visits the Show to call upon us at Stand No. 10. The Exhibition this year dates from August 24th to September 3rd. Make a note of these dates.

Sir John Reith—An Appreciation

THE following is an extract from the appreciation of Sir John Reith which was broadcast recently by Mr. Ronald Norman, Chairman of the Board of Governors:

"... Broadcasting owes much to his dominant personality. Let me try to bring home to you all in a few words the impression which Sir John's work has made upon the Corporation. In other hands broadcasting might so easily have become little more than a vehicle for the diffusion of popular entertainment. Of course, one of the greatest claims upon broadcasting must always be the provision of entertainment and delight. But under Sir John's guidance broadcasting has become one of the most powerful, and, I know you will agree, one of the most valuable influences on the life of the country. Sir John's width of vision embraced not only the passing desires but the permanent needs of Society as a whole. He gave to British broadcasting that character and those qualities which we now take for

granted. He saw that broadcasting might promote the religious life of the country ; that it might help to bind the peoples of the Empire together, and to bridge the gulf that separates nations from one another ; that it might assist the teacher, improve the musical taste and knowledge of the people, and provide entertainment for us all. He saw that great opportunities lay before it as a form of political discussion, and as a new agency for the diffusion of exact political information ; that it might enable a Sovereign to speak to his peoples, and the voices of the leading statesmen in the world to be heard by the quiet fireside ; that it might come as a blessing to the blind, the bedridden, the aged, and the children in the nursery. He knew also that he must study the tastes of the public, and that those tastes differ. He must find room for the bright, provocative thoughts of the young people as well as for the prudent, sober reflections of their elders. And so, despite the serious turn of his own mind and the austerity of his intellectual tastes, he made allowance for an ample supply of music and entertainment, adjusted to differing likings and degrees of education, but governed by the principle that all forms of broadcast entertainment should be wholesome and of the highest quality.

"Only a very unusual man, I know you will agree, could have built up from the beginning so unusual and vast an enterprise. High courage, wide vision, the power of rapid decisions, a broad span of knowledge and sympathy, great energy and drive, political prudence, a sound judgment of character, and exact administrative memory ; and that measure of technical and engineering knowledge which was necessary to command the respect of a great engineering staff—all these qualities were desirable, and all were found in Sir John Reith. You know that criticism of the B.B.C. is now a popular national amusement. It is quite right that the B.B.C. should be criticised ; the Corporation welcomes it. But continual criticism tries the nerves, and the man who directs the B.B.C. must be tough. Now Sir John Reith is a high mettled and a very sensitive man ; but, however conscious he may have been of the assaults of his critics, he has never allowed himself to be flustered by them, or to be deterred from any course which he thought to be right. Fearlessness is one of his most noticeable characteristics.

"Every listener will, I know, wish him good fortune and success in his

Notes from the Test Bench

Hum Troubles

AN obstinate case of hum was recently experienced in which all the usual tests failed to locate the cause. The set was a six-valve broadcast superhet with a four-gang tuning condenser and this was found eventually to be the seat of the trouble. The mains transformer was bolted to the chassis—made from fairly thin aluminium, and the vibration of the core was transmitted to the gang condenser. The trouble was overcome by loosening the bolts of the condenser, and eventually to make a reliable job it was refixed to the cabinet with rubber washers above and below so that it was "floating."

Drilling Aluminium

WHEN making an aluminium chassis, holes larger than 2in. in diameter will sometimes be found difficult to drill with ordinary twist drills. The following procedure will, however, enable a satisfactory job to be made and avoid the tendency to tear an odd-shaped hole due to the drill biting into the metal too quickly. Pressure should be avoided and the drill turned fairly fast. Plenty of lubricant should be applied, and either oil or water may be used. The chassis should be turned from time to time so that the hole is cut more or less evenly from both sides of the chassis. In this way a clean hole, without burrs, will be obtained.

The Acme Receiver

FOR those constructors who are modifying the coils in this receiver it may be mentioned that the work will be facilitated if the coil cans are first scratched so that they may be replaced afterwards in the original position, and the switch rod should also be removed. This will enable the switch assembly to be rotated slightly so that the lock-nuts for the coil may be more easily adjusted. It may be repeated that only fourteen turns should be removed from each of the two windings on each coil. Whilst carrying out this work the greatest care should be taken in handling the coils in order to avoid completely upsetting the inductance values.

new and arduous post ; but nowhere will he have more sincere well-wishers than those he leaves behind on the Board and staff of the B.B.C. To him we all say farewell."

B.B.C. Staff Representation

THE Director-General, to secure full and free discussion of the B.B.C. Staff Representation scheme, suggested in a memorandum sent to all staff with the report of Sir James Rae's Committee on March 8th that the staff should hold private meetings of their own as a preliminary to a vote by secret ballot.

The first meeting was held on April 20th, and by the middle of June 154 meetings were held throughout the Corporation varying in size from eight to fifty-five members. Reports were received from eighty-three chairmen and many of these contained questions and suggestions. Seven conferences were held at the request of chairmen and points of difficulty were discussed, after which further meetings of groups were held. The largest of these conferences consisted of fifty-three chairmen from Head Office who appointed a sub-committee for further investigation of the scheme. The meetings of this conference and its sub-committee are still in progress, and it is anticipated that when the Head Office chairmen have completed their investigations they will convene further meetings of their staff groups.

It is intended that the staff should receive every facility for considering the proposals before them and some weeks must still elapse before all meetings have been completed and final reports received. The Corporation will then consider the suggestions put forward and issue a further statement before the ballot is taken.

Another Howler!

C. G., of Bognor Regis, sends me the following :

"I work in a garage where, as a sideline, we charge wireless accumulators. One day a lady walked in to collect her accumulator, which was on charge. When she noticed the cells wired together, she remarked to me, 'Isn't it a wonder the wires do not corrode up with the acid flowing through them.'"

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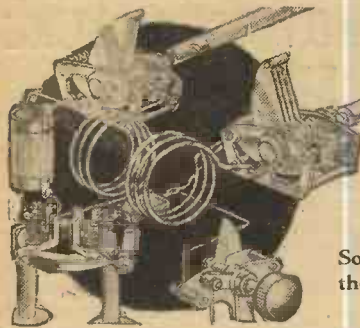
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Short Wave Section

MAKING SHORT-WAVE COILS

Some Suggestions for Various Types of Coils and the Methods to be Adopted in Winding and Mounting



THE efficiency of a short-wave set depends to a very great extent upon the coils which are used and it is here that many beginners go wrong. For broadcast reception a roughly-wound coil of wire on any type of former will give results, but the losses experienced in the short-wave circuit will often result in complete failure to obtain results on certain bands. It may be pointed out first that a solid former may be used for wavelengths down to 12 metres or so, but the windings

of the former to leave a skeleton ribbed support for the coil.

Multi-wave Coils

It is possible to incorporate the wave-switching idea in a short-wave tuner unit and this has been done on more than one occasion commercially. Unless the constructor is experienced, however, it would be unwise to attempt to make a coil of this type without taking extra precautions to remove all risks of high-frequency losses.

Self-supporting Coils

Below 12 metres a self-supporting coil is to be preferred, and below 10 metres it is practically essential to adopt this form of construction. The coil may be wound round a solid former, laying each turn side by side, and when the required number have been placed on, the end should be cut and the wire released. The turns will then open slightly and automatically space themselves, giving a fairly rigid coil if thick wire is employed. To assist in keeping the turns in position and avoiding short-circuits between adjacent turns a strip of celluloid may be cemented across the turns at one or two points with amyl acetate. If terminals are used the ends of the coils should not be taken across the former as shown in Fig. 3, as this may

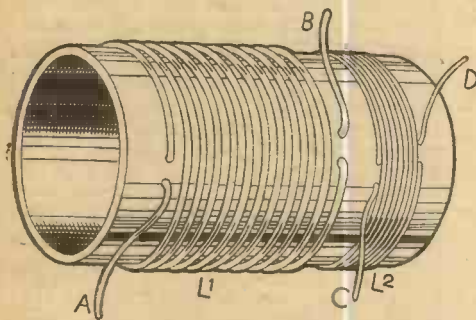


Fig. 1.—A good example of a home-made short-wave coil.

should be spaced—except for the aerial coupling coil. The wire may be held in position by a spot of adhesive at odd points, but an excess of this should be avoided. The accompanying illustration shows a good type of coil on the lines already indicated, ends A and B being joined respectively to grid and earth, and ends C and D being

lead to all kinds of troubles. Terminate the winding right up to the connecting point. Below 10 metres it will be found advisable to use tubing rather than heavy-gauge wire, and the size of the tubing will depend upon the size of the coil—number of turns, etc. If copper tubing is employed it should

Wires Running Through Interior of Coil.

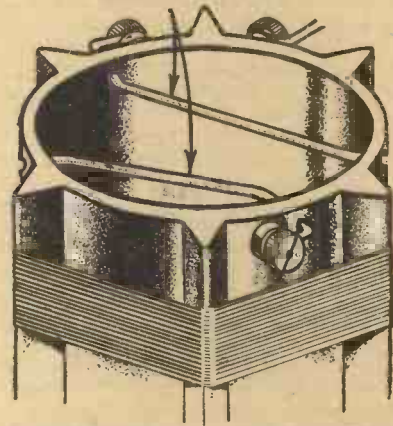


Fig. 3.—The ends of the windings should not be taken across the coil, but joined direct to the terminals.

first be well cleaned and polished, and afterwards coated with a transparent lacquer to prevent corrosion or a dirty surface which would lead to H.F. resistance.

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Leaves from a Short-wave Log

Proposed Broadcasts from Iran (Persia)

THE two 20-kilowatt radio transmitters, which the Telefunken Company (Berlin) is installing at Teheran for the Iranian Government, will bear the call-letters EQC and EQB, and will work on 30.99 m. (9.68 mc/s) and 48.74 m. (6.155 mc/s) respectively.

Night Programmes from Sweden

FROM July 1st, every Wednesday and Saturday between G.M.T. 01.00-02.00, the Swedish Broadcasting Company will transmit a special programme destined to their Nationals resident in the United States. The broadcast will be carried out through SBO, Motala, on 49.46 m. (6.065 mc/s).

Those Cuban Stations

DURING the past few months mention has frequently been made of a new transmitter, CMA5, installed at Havana (Cuba). Strictly speaking this 1-kilowatt station is not a "broadcaster," but is used by the Cuba Trans-Atlantic Radio Corporation for the relay of radio programmes to the United States of America. The frequencies are: 17.26 mc/s (17.38 m.), 15.505 mc/s (19.35 m.), 11.56 mc/s (25.95

m.), 8.63 mc/s (34.76 m.), 6.79 mc/s (44.18 m.) and 5.78 mc/s (51.9 m.).

By the same opportunity it is useful to clear up some misunderstanding regarding other calls which have also been logged as those of stations broadcasting regular radio entertainments. COBZ, Havana, 200 watts, 20.62 m. (14.55 mc/s), privately fulfils a similar purpose to that of CMA5, but for relay to other towns in Cuba; other channels adopted are 33.22 m. (9.03 mc/s), and 43.99 m. (6.82 mc/s). COCU, Havana, 200 watts, works on 30.15 m. (9.95 mc/s) and 45.52 m. (6.59 mc/s); COCW, in the same city, 100 watts, on 30.77 m. (9.75 mc/s) and 43.6 m. (6.88 mc/s). COBC, Havana, may use 25.49 m. (12.2 mc/s), 32.09 m. (9.35 mc/s) or 51.64 m. (5.81 mc/s); COCA, Havana, 46.44 m. (6.46 mc/s). COBX, Havana, may be heard occasionally on 25.82 m. (11.62 mc/s); 32.61 m. (9.2 mc/s) or 48.23 m. (6.22 mc/s). In the provinces we find COGC, Santiago, on 48.78 m. (6.15 mc/s), and COWR, Santa Clara, relaying CMHB on 47.77 m. (6.28 mc/s).

Although these should not be logged as regular broadcasting stations from time to time, there is a strong probability that the programmes they relay may be picked up by listeners.

(Continued overleaf)



Fig. 2.—A commercial multi-band short-wave coil which is not now available.

joined to earth and aerial. If desired, this latter winding could be employed for re-action, and the aerial then joined to end A via a small coupling condenser. This type of former could be employed for lower wavelengths, merely by cutting away pieces

NORMAN NEWMAN

A BRIEF BIOGRAPHY

NORMAN NEWMAN has exceptional talent. His musical education began at an early age, under the direction of Sir Granville Bantock, at the Birmingham and Midland Institute School of Music.

Nowadays he does his own special arrangements and transpositions.

Instruments of which he is master include: saxophones, clarinet, trumpet, trombones, drums and piano.

Starting at the age of 16 as drummer in a small café, he has since played for Jerry Hoey (Piccadilly Hotel), Billy Cotton, Roy Fox, Ambrose, Teddy Brown, Jack Jackson (Dorchester Hotel), Cunard White Star Line between Liverpool, Southampton and New York, over 60 times on "Berengaria" and



Norman Newman, whose popular band from the Tower Ballroom at Blackpool is heard in the North Regional programmes.

other liners, and for a World Cruise in the "Majestic."

At the age of 27 he is under contract with the Blackpool Tower Company, Ltd., and the Blackpool Winter Gardens and Pavilion Company, Ltd., as Musical Director of the Tower Band at the world-famous Tower Ballroom. He is already one of the most popular figures in the north-west of England, and there is little doubt that in the future his name will rank among internationally-renowned dance and stage band leaders.

Football, flying and swimming are Norman's hobbies.

He is Captain of the Tower Football Club, which plays other well-known stage clubs, the proceeds of the matches being devoted to charities.

Some years ago, playing "Rugger" for England's schoolboys against Ireland, Scotland and Wales (twice), he gained his caps. At the present time he plays for Fylde.

In 1930 he obtained his pilot's certificate, and is well known at Stanley Park Aerodrome, where he is also extremely popular.

An early-morning swim is his first engagement daily throughout the year.

SHORT-WAVE LOG

(Continued from previous page)

More Cuban Notes

COKG, Santiago, previously on 33.63 m. (8.92 mc/s), is now working on 48.39 m. (6.2 mc/s) with a power of 1.2 kW. The transmitter relays the radio entertainments of the CMKG studio in the same city. Call: *CMKG*, Santiago, and the experimental short-wave station *COKG*. Interval signal: 4 chimes. Announcements in Spanish and English. Address: Señor Emilio Grau Medina, Apartado Postal, 137, Santiago (Cuba).

COJK (Camaguey), of which the power has now been increased to 11 kilowatt, is now audible nightly on 34.36 m. (8.663.9 mc/s). The slogan coupled to the call (*CMJK* and *COJK*) is *La Voz del Camagueyan*. The studio uses three chimes and an occasional bugle call between items in the broadcast. Address: Estaciones *CMJK* y *COJK*, Compañía Cubana Nacional de Radio (S.A.), Apartado Postal, 64, Camaguey (Cuba). **COHB**, Sancti Spiritus, last reported on 47.77 m. (6.28 mc/s), would appear to have suspended its transmissions, as all particulars of the station have been cancelled in the latest supplement of the official Berne list.

Short-wave Radio for Electric Services

IN order that defects in the Sydney (N.S.W.) electrical supply service may be promptly remedied, and repairs effected without delay, the local county council has established a fleet of patrol cars equipped with wireless receivers. As soon as a complaint is reported to the electricity supply headquarters the message is transmitted by radio on short waves to the nearest patrol car, and a qualified engineer is on the spot within a few minutes to attend to the matter.

Broadcasts from Uruguay

A REGULAR schedule of radio programmes is now broadcast from Montevideo by the *Servicio Oficial de Difusion Radio Electrica* simultaneously through the medium-wave station **CX6** and the 5-kilowatt short-wave transmitter **CXA4** on 48.98 m. (6.125 mc/s). These stations are on the ether daily from G.M.T. 13.00-17.00, and from 19.00-03.00, the main programmes being broadcast at 22.30 and 00.30. Concerts of Bolivian, Paraguayan and native Indian music are largely featured in the entertainments, and announcements are made in Spanish, with an occasional French translation. The call is: *Radiodifusore CX6* (say-aykiseis), and *CXA4* (say-aykis-ah-cuatro), the studio closing down with the Ted Lewis *Good-Night* song, now so popular with overseas stations. Address: Estacion **CXA4**, Radio Continental, Rio Negro, 1631, Montevideo, Uruguay, South America.

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IMPROVING PICTURE BRIGHTNESS

IN an effort to meet one of television's early objections, namely that of viewing in complete darkness because of the low brightness level of the reproduced picture, cathode-ray tube manufacturers have carried out a number of quantitative tests to determine exactly the factors upon which the picture brightness chiefly depends with C.R. tubes. Judged by modern standards, this work has been extraordinarily successful, for although a completely or partially darkened room does undoubtedly improve the quality of a television picture, especially from the point of view of contrast, when desired full room lighting can be present, and complete entertainment value be derived. The three most important factors upon which this condition depends are the voltage applied to the final accelerating anode, the luminous output of the material used in making the fluorescent screen, and the magnitude of the beam current itself. If steps are taken to increase very materially the value of the beam current, that is, the stream of electrons which is directed towards the screen, certain difficulties are encountered. Not the least of these is, the mutual repulsion of the electrons themselves which brings about an enlargement of the spot area on the screen. This is magnified as the beam is modulated, although, of course, the theoretical standard of tube performance is a spot of light whose overall area is unaltered by the modulating television signal which should only change the degree of intrinsic brightness. When the design of the electrode system is altered to give a stronger beam current, therefore, certain precautions have to be taken to counteract the effect of this increased mutually repulsive field.

Another factor bearing on this same point is a form of electronic lens error which increases as the diameter of the beam is increased. For example, any spherical aberration increases as the cube of the diameter of the beam of electrons.

Improvements in screen material have certainly contributed to a marked extent towards increasing picture brightness, but it is still recognised that pictures observed on the bombarded side of the screen have a greater luminous efficiency than those seen on the relatively flat glass front. Luminous outputs 50 to 100 per cent greater have been traced to this alone, and that is why so many inventors have turned their attention to the design of projection tubes in which the picture thrown by the lens on to a remote screen is derived from the electronic bombardment face. Increases in anode voltages seem to bring about the greatest advantages, and the limit here is only that brought about by the so-called loading capacity of the screen material itself. A fair proportion of heat is generated at the screen face by the electronic impacts, and this has to be dissipated, otherwise the performance efficiency of the tube is reduced in quite a marked manner owing to the character of the screen material being altered.

PATENTS AND TRADE MARKS

Any of our readers requiring information and advice respecting Patents, Trade Marks and Designs, should apply to Messrs. Rayner and Co., Patent Agents, of 5, Chancery Lane, London, W.C.2, who will give free advice to readers mentioning "Practical and Amateur Wireless."

A PAGE OF PRACTICAL HINTS

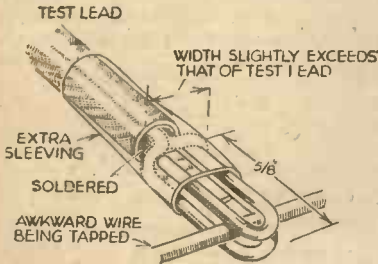
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Midget Test Clips

WHEN making step by step tests in a compactly wired chassis it is often very awkward to retain a tapped test lead



These simple clips are very useful for test purposes.

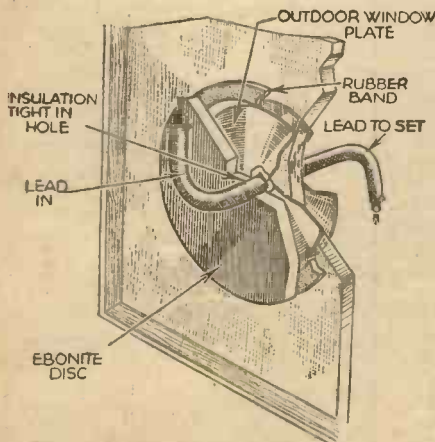
in position, whilst the method of temporarily winding a piece of wire round is altogether unsatisfactory owing to crackle and generally bad electrical contact. I have therefore devised this simple dodge by cutting and bending a paper clip of the wire type in the manner shown in my appended drawing.

The springiness of these clips ensures very satisfactory contact under the most trying conditions and does not tend to weaken after considerable use.

Flex or tinned copper wire test leads can be used, the ends being soldered to the clips as shown.—O. E. KNIGHT (Ingatestone).

A Lead-in Dodge

HERE is a simple dodge for eliminating those hissings and bangings which, in a rainstorm, accompany the use of a metal plate on each side of the window for a lead-in. To the face of a circular piece of ebonite, made $\frac{1}{2}$ in. larger than the metal window-plate, and drilled with a $\frac{1}{4}$ in. hole in the centre, glue a flat rubber ring from a pickle-jar stopper, and fix over the window-plate as shown in sketch. Simple as it is, this device is very effective.—W. PEARSON (Bolton).



A lead-in dodge for eliminating noises due to moisture.

THAT DODGE OF YOURS!

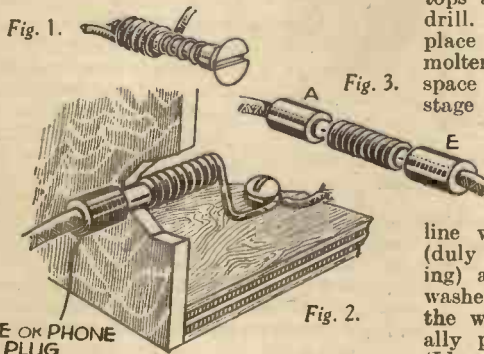
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account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

SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

Simple Spring Sockets

THESE sockets are easily made by winding a piece of stout copper wire around a nail or screw of suitable diameter to form a spring (Fig. 1). There are many uses for these sockets, such as for aerial, earth or phone connections for experimental

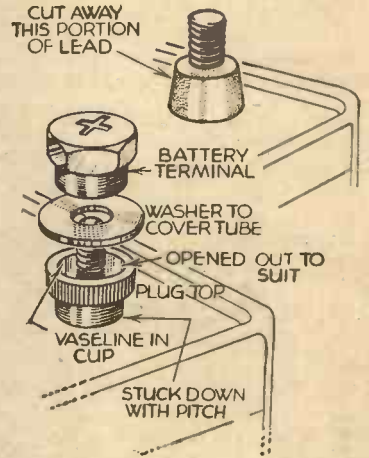


Easily constructed spring sockets.

purposes (Fig. 2), or they can be used to connect aerial and earth plugs at night by simply pushing the plugs in one at each end as in Fig. 3.—T. A. THOMAS (Rhos).

An H.T. Accumulator Improvement

EVERY user of "wet" high-tension batteries is well aware of the bugbear of cleaning and keeping the terminals free from corrosion. I had tried various methods without success, until I decided on a radical change, and the advantage of the following method is that it can be altered slightly to suit all types of H.T. terminals. I decided on the grease-cup principle as being the best, so, firstly, I cut away the lead portion of the accumulator, as indicated, to the level of the battery. I had a number of the red and black plug tops from old G.B. plugs, so I used these for the positives and negatives respectively, although pieces of ebonite lead-in tubes will do equally well, the essential point being that the inner diameter of the head, or tube, is at least



An effective method of keeping accumulator terminals free from corrosion.

double that of the threaded brass terminal on the battery, and of a height to allow the latter to project about $\frac{1}{4}$ in. The plug tops are easily opened out with a twist drill. I then stuck the ebonite tops in place by dipping the bottom part into molten compound, or pitch, leaving ample space all round the brass rod. At this stage I found it a help to slip a washer and terminal top well screwed down during the solidifying process. After dealing with all the battery terminals in this manner, some ordinary vaseline was melted in a polish tin cover (duly punched at the side to assist pouring) and poured into the cavity. A washer placed over the plug top completed the work, a perfect grease-cup effectually preventing corrosion.—E. WILLIAMS (Llanelly).

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THE interesting characteristics of neon gas discharge are admirably suited to the requirements of a tester of this nature, and the principal feature of obtaining varying degrees of luminosity with different potentials provided the basis of this design.

The type of neon lamp used is preferably for operation on alternating current, and although it may be used on D.C., this is not recommended owing to the design and relationship of the electrodes.

Principle of Operation

It will be apparent that with an A.C. potential the collision of ions which causes the luminosity will be governed by the frequency of the supply, but although this

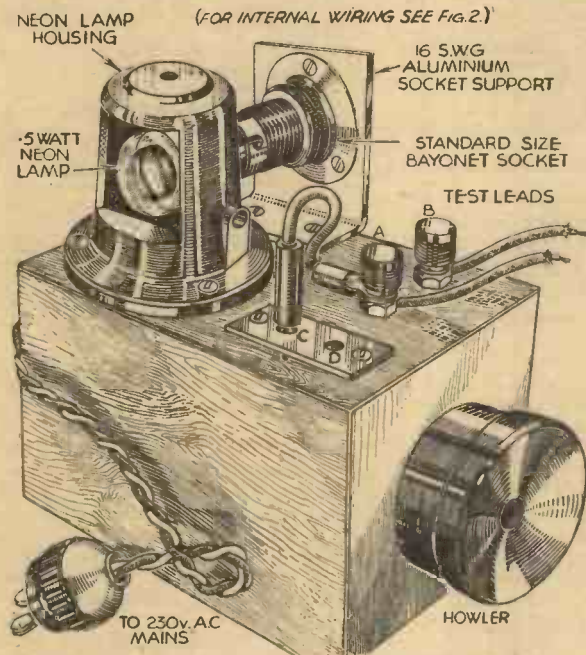


Fig. 1.—A general view of the completed tester, with the various details clearly indicated.

is so, the human eye only perceives a continuous glow, and for the benefit of the uninitiated it would be as well briefly to define here the action which takes place, so that one may be more conversant with the different functions in both direct and alternating current operation.

With direct current supply a continuous action results in ionisation of the neon gas as one electrode is maintained at positive potential, but the difference in polarity when operating from alternating current results in the cessation of ionisation at the zero points of the sine wave. From this it will be understood that the lamp will only glow through each half cycle, but the frequency of this gives the impression similar to direct current action; in some circuits it is possible to utilise the neon lamp for rectification, since the alternate excitation of positive and negative ions gives this condition.

Many constructors will be operating from a 50-cycle supply, whilst others will be on a 25-cycle supply, but the difference in these frequencies will not be detrimental to the tests, provided that the pressure is in the neighbourhood of 230 volts.

The fact that this unit is designed for A.C. operation permits a greater margin for testing as will be seen later, but at the same time, a safety factor is introduced

A MULTI-PURPOSE

Constructional Details
Given in

into the circuit arrangement, since, as will be seen on referring to the theoretical diagram in Fig. 2, one side of the mains input is connected between the neon lamp and a 2 mfd. condenser; thus a direct mains short-circuit cannot be made externally. This point is mentioned here, since, its modifications can be made to the circuit employed whilst retaining the same principles, there is the attendant danger of shock and damage when dealing with the mains in this manner.

The simplicity of the circuit in no way restricts its capabilities as a tester, since the sensitivity of the neon lamp alone provides for extensive variation in potential, these conditions being indicated in similar manner to that depicted in Fig. 4. The inclusion of a howler permits an audible extension to these capabilities when the ionisation in the lamp is not clear enough to note, thus by combining the value of a sensitive earphone as the howler a multitude of other tests can be carried out.

Constructional Details

From the illustrations in Figs. 1 and 3 it will be seen that the construction of this unit—excepting the neon lamp—can in most cases be accomplished by the aid of the proverbial junk box, and if care is taken to ensure good insulation throughout, no trouble should be experienced in its operation.

The neon lamp housing in this instance was obtained by utilising the support of a disused pick-up tone arm, and by being able to recess the lamp, as shown, the very low luminosity resulting in certain tests can be accentuated by the effective shrouding, at the same time affording protection to the lamp itself. It was necessary to drill and file a hole in the support or housing to the size of the lamp base, with two slots to allow the pins on the lamp base to pass through, the bayonet socket finally being aligned for easy fitment.

In Fig. 4 the details of the socket mounting bracket are clearly given, and it will be noticed that the leads to the lamp pass through a rubber grommet, as without this leads may get worn on the aluminium, eventually causing a short-circuit which might result in the constructor getting an unpleasant shock. This bracket should be earthed separately when possible.

The headphone is fitted by two wood screws to the side of the box, as in this way the advantages of a sound box are obtained, apart from the important fact that to use headphones separately would be courting trouble, owing to the use of the mains in this manner, and as some readers may wish to deviate from the original design, the danger of this practice is emphasised.

The wiring is done with 18 S.W.G. tinned copper wire and sleeving, the connections to the lamp and from the mains being of

good quality rubber-covered flex. The rest of the construction can be easily followed from the illustrations, and the application of the unit for simple radio tests can now be dealt with.

First of all it is necessary to make sure that the connections have been correctly made before switching on to the mains, and should a doubtful 2 mfd. condenser have been used, its fidelity should be

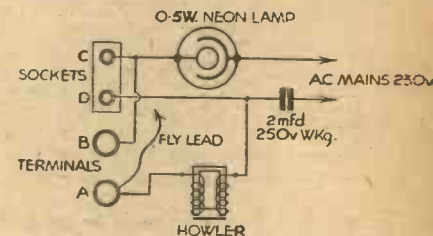


Fig. 2.—This is the theoretical circuit of the Neon Tester.

checked, since this component is performing an important duty.

Simple Tests

Having checked over the wiring the following simple tests can be made:

The test sockets "C and D" should be short-circuited, and on switching on the supply, the neon lamp should light up to full brilliance; now, on removing the short-circuit and connecting the shorting wire

IMPORTANT

NATIONAL (261.1 m. and 1,500 m.)
Wednesday, July 13th.—Come On and Dance, a musical comedy.

Thursday, July 14th.—Symphony Concert.
Friday, July 15th.—The Fall of an Empire, a dramatic radio chronicle.

Saturday, July 16th.—The Taking of the Bastille—July 14th, 1789, feature programme.

REGIONAL (342.1 m.)
Wednesday, July 13th.—Gluts in the Fruit Market, a round-table discussion.

Thursday, July 14th.—Speech by Prime Minister at Birmingham Centenary Banquet.

Friday, July 15th.—Come On and Dance, a musical comedy.

Saturday, July 16th.—The Invisible Man, a play from the story by G. K. Chesterton.

MIDLAND (297.2 m.)
Wednesday, July 13.—Gluts in the Fruit Market, a round-table discussion.

Thursday, July 14th.—Birmingham Hospitals Centre, feature programme. Eye-witness account by Thomas Woodroffe of the King and Queen's visit to Birmingham.

Friday, July 15th.—Seeing Life: To Australia in a Windjammer, a talk.

NEON TESTER

of a Useful Unit are
in this Article

across the two test terminals "A and B," the lamp and howler operate together. This concludes the essential continuity

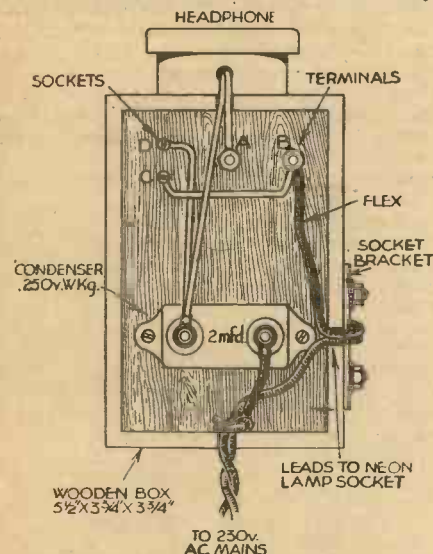


Fig. 3.—The internal wiring employed in the unit.

check, and the following experiments can be tried out.

Some fine aluminium filings can be sprinkled over an old variable condenser,

and on connecting this condenser across the two sockets "C and D" and switching on the mains, the rotation of the moving vanes will show clearly the increase, or tracking, from minimum capacity to maximum, at the same time the spasmodic short-circuit of the fixed and moving vanes (through the filings, which represent accumulated grit, etc.) will be indicated by the fluctuation of the luminosity.

Now choose a fixed condenser of say .0001 mfd., and having removed the variable condenser, connect this in its place, when the low luminosity of the lamp can be compared with other values of capacity, and by getting accustomed to the variations in the intensity of the glow a good idea can often be obtained where more expensive apparatus would be required.

A further test can be made, this time with a doubtful fixed condenser, and assuming this to have an intermittent disconnection, the neon lamp will indicate immediately by fluctuating on and off. The wire connections of the condenser may be the cause of the trouble, and the test will show this by a slight movement of the wire ends.

Connecting a potentiometer of say .5 megohms across the terminals "A and B," the action will be apparent not only from the neon glow but by the audible effect from the howler, and a faulty resistance will be immediately indicated.

If the constructor has any doubt as to the insulation of a transformer, say one of the common L.F. type, the following quick test can be made to see whether any part of the winding is down to frame, or to check the self-capacity against a standard.

Using test prods if the transformer is wired in a chassis, these should be con-

nected to the test terminals and tapped across the secondary or primary of the transformer, then noticing the luminosity of the lamp, the other winding can be short-circuited, and the intensity of the neon glow will immediately alter, but should there be a disconnection in the shorted winding, the difference in glow will be very noticeable, particularly so if a standard transformer is checked against this. For a simple mains test by the mains plug, the fly lead should be plugged into socket "C".

To test the self-capacity of such a transformer, one test prod should be tapped on to the frame, whilst the other should be tapped across each terminal, or end of the primary and secondary windings; a dead short will, of course, cause a full brilliance of the neon lamp, but under average conditions only a low glow will be seen.

High-resistance Tests

Very high resistance tests may necessitate careful listening to the howler close

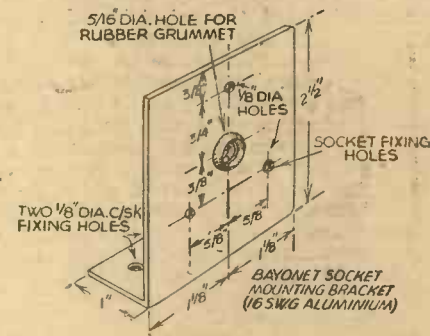


Fig. 4.—The lamp mounting bracket and diagram showing characteristic glow effects produced under test conditions.

to the cap, and this applies in cases where ultra-short-wave condensers, or any condenser of a low capacity of, say, 20 mmfd., are being checked.

When making such tests it is advisable in the case of chassis work to ensure that leads to the components have been removed where they would otherwise introduce stray values.

Some further tests may be mentioned with regard to valves, fuses, dial lights, and insulation. For continuity and checking where internal electrode short-circuits are suspected, there need be no fear of blowing the heaters, filaments or fuses, provided that the component rating is not below 4 milliamperes, this applying throughout, and the value of being able to include such conditions without any alteration to the circuit adds to the advantage of this simple tester. Wire insulation and sleeving tests can be carried out, and in cases where leakage in any aerial lead-in system is suspected of causing H.F. absorption and poor reception through dampness, the luminosity will be sufficiently sensitive to record the amount which may be checked against comparative values of condenser capacities.

BROADCASTS OF THE WEEK

Saturday, July 16th.—The International Six Days: a recorded impression of this week's motor cycle trials in Wales and at Donington Park.

WEST OF ENGLAND (285.7 m.)

Wednesday, July 13th.—Dance cabaret, from the Grand Hotel, Torquay.

Thursday, July 14th.—Concert party programme from the Cosy Nook Theatre, Newquay.

Friday, July 15th.—Serenades and Nocturnes from the Gardens of Marston Court.

Saturday, July 16th.—The Invisible Man, a play from the story by G. K. Chesterton.

WELSH (373.1 m.)

Wednesday, July 13th.—Modernism in Wales—Literature, a talk.

Thursday, July 14th.—Variety programme.

Friday, July 15th.—The Lamp, a chamber music drama.

Saturday, July 16th.—A descriptive commentary on the Welsh League of Youth's Olympiad (Mabolgampar'r Urdd).

NORTHERN (449.1 m.)

Wednesday, July 13th.—Orchestral programme from the Spa, Scarborough.

Thursday, July 14th.—"Romany" talks to hikers.

Friday, July 15th.—Cabaret from the Little Theatre, Salthurn; Concert Party from the New Pavilion, Redcar.

Saturday, July 16th.—Instrumental recital by Frederick Dawson on his seventieth birthday.

SCOTTISH (391.1 m.)

Wednesday, July 13th.—Variety from the Concert Hall, Empire Exhibition (Scotland).

Thursday, July 14th.—Concert Party programme, from the Alhambra Theatre, Glasgow.

Friday, July 15th.—Scottish dance music.

Saturday, July 16th.—Away for the Fair: a recorded impression of the preparations and departure for the Glasgow Fair holidays.


NORTHERN IRELAND (307.1 m.)

Wednesday, July 13th.—Light orchestral programme, from the Grand Central Hotel, Belfast.

Thursday, July 14th.—The Second Concert of Ulster Festival Prize-winners.

Friday, July 15th.—Orchestral programme, from the Orpheus Restaurant, Belfast.

Saturday, July 16th.—A running commentary on the Ulster Derby, from the Maze Racecourse, near Lisburn.



Practical Television

July 16th, 1938. Vol. 3. No. 109.

TELEVISION BY RESONANCE

An Interesting Account of Some American Experiments on New Lines

THE following is an account written by the President of the International Television Radio Corporation of Jersey City, and is given in order that our readers may keep in touch with the various developments which are taking place in various parts of the world in an endeavour to find alternative methods of television reception.

The applications of the principles of resonance have taken long strides since the early days. Electrical resonance is the cornerstone of radio. The breath-taking exactness of each second ticked off by the millions of watches we carry with us to measure elusive time is weighed with an astonishing precision by a resonant device of utter simplicity. Resonance is often a most wicked unwanted customer. It may pile up potentials in power networks, working devastation upon insulators, transformers and generators. It may get into machinery and snap shafting, find its way into ships, automobiles, airplanes and railroads to the discomfort of the passengers, and the rapid deterioration of equipment.

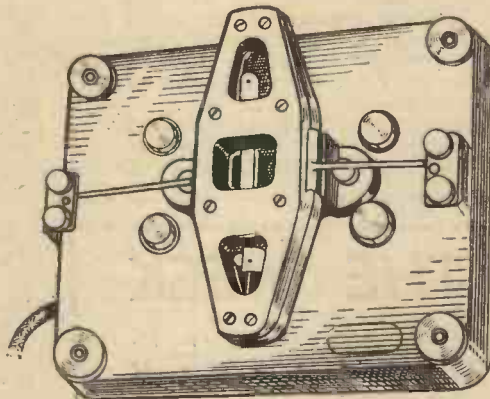
Resonance is the heart of the magnetostriction and piezo electric effects, where infinitesimal motions within the bodies of certain materials are used to control the frequency of substantial forces from ranges of a few cycles a second up to several millions a second.

There are, however, wide gaps that remain a blank in our knowledge of resonance. One gap is obvious, namely, the absence of wide amplitude mechanically resonant devices in the frequency range above one hundred cycles a second. The exploration of this uncharted territory was replete with surprise. Steel that acted like a gun under apparently small applied force. Rigid materials that disintegrated under the influence of high frequency mechanical stresses of a low order of magnitude. Glue, and cements for glass, quickly transformed into fluffy masses entirely devoid of adhesive property. This exploration came about in the perfectly logical search for a means to an end.

Television had been demonstrated scientifically. Unfortunately the solutions possessed inherent features that rendered them non-commercial. The Nipkow rotor school was barred by the expense of the receiving set scanner whose cost rose as the cube of the lineage. A satisfactory low-priced 60-line scanner became a curiosity for 240-line scanning, because the cost rose so enormously. The Cathode Ray school developed pictures measured in inches. If the pictures were enlarged by projection, the cost mounted about as the ratio of the areas, and the applied voltages reached the dizzy and dangerous heights of 20,000 volts in the home. The obvious conclusion from this state of facts was that some other principle must be developed for television scanning. We

undertook this search. One by one, promising principles were discarded on the results of a first order of magnitude inquiry. There finally remained the principle of the oscillating optical element using either a vibrating lens or mirror. But that element had to travel fast, say 10,000 half swings a second over a wide angle.

Since the driving force varies as the square of the frequency, it would require one hundred million times the force to move the mirror at this frequency, as it would to move it at a frequency of one-half swing a second. The mirror had to have a fair size, for the intensity of the illumination on the screen is directly proportional to the area of the mirror. A calculation showed that the power required to drive a satisfactory mirror over the required angle approximated ten kilowatts. This power would melt the mirror with explosive



This is the Priess Unit, employing the resonance principle mentioned in this article.

violence. A model was constructed and from the data obtained on tests at low frequency these calculations were confirmed. Little hope was held out for the helping hand of resonance, for the usual experience with electrical resonance circuits indicated that only an amplitude gain of about fifty to one might be expected. In other words, a power of 200 watts might be used instead of ten kilowatts. This amount of power would fuse the mirror. However, structures were designed, we might say, for the sole purpose of confirming failure, even with the application of the resonance principle.

Then the inexplicable began to happen and happen fast. Steel wires that had withstood a load of a hundred pounds stretched and broke upon the application of a resonant force of a few ounces. Heavy steel mounting frames developed resonant frequencies in their structure that were harmonics of the applied driving frequencies, and vibrated in an odd jumble of ways to react upon the purity of the path of the mirror motion, producing elliptical motion, of varying shapes and frequencies. The

life of the parts was measured in seconds, and it was a turbulent short life. There was no simplicity of cause and effect, for there were many interacting causes, and the effect was always destruction in many variations, and in a short interval. Two weeks of model building, for an active life of two or three seconds.

The job was now one of isolating all extraneous effects so that the resonant member could be studied in motion, free from all other influences. This resulted in a discovery of far-reaching importance, a property of materials that was so far unsuspected. The resonant build-up of a system employing a metal rod in torsion as the elastic element, without pivots and bearings, was of the order of five thousand, or one hundred times as great as suspected. Now at last the reason for the destruction of known materials under apparently safe known applied forces was clear. The forces, instead of having to be multiplied by fifty, must be multiplied by five thousand to determine the peak stresses. For example, if a steel rod had an elastic limit of five thousand pounds, this rod could be destroyed with a resonating driving force of one pound. The energy of the applied force would be stored in the vibrating rod and summed up on each cycle, until at equilibrium the stored-up vibrating energy in the rod became five thousand times as great as the energy expended by each cycle of the driving force.

Here at last was a principle that inherently possessed an activity that multiplied brute force by five thousand. A principle that provided harmonic motion in the purest form we have ever experienced, for the purity of the motion marches step by step with the gain of the motion with respect to the applied force. The track of the motion gave an ideal constancy for scanning.

The rate of decay or decrement could be controlled by merely varying the absolute values of the elasticity and the moment of inertia, while keeping the ratio constant for a given frequency. Vacuum enclosure would still further lower the decrement. Decrements could be exactly measured by the driving frequency-rod motion curves.

Many forms of resonant devices were constructed and tested. The ideal form is one where the elastic element is a rod, firmly embedded in an anchorage of substantial inertia at each end, and with the dynamic moment of inertia element affixed to the centre of the rod.

The natural period of the system could be made independent of temperature, by proper choice of materials for the elastic element and the moment of inertia element, whose separate coefficients of expansion formed a compensating couple in such a way that the elasticity and moment of inertia each raised an equal percentage for a given raise in temperature. This cannot be done with either the piezo electric crystal or the magnetostriction rod, for their substance is both factors jointly, and not subject to the separation that is possible with structure such as the ones we devised.

Now our elementary scanner mechanism had been developed, but as yet the optical element had not been applied. This looked to be an easy task involving nothing more than cementing a mirror to the rod; so just that was done. The result was an average mirror life of a few seconds. The cement,

under the action of an intense high-frequency mechanical motion, turned to a fluffy dust. Bezeling a mirror somewhat in the manner of a jeweller's setting was tried. This likewise did not work, for the mirror developed an infinitesimal play in its mounting which prevented the vibrating motion from building up after the slightest play had developed. Other methods were tried without success. Ultimately a portion of the surface of metal welded to the rod was polished and plated and the surface plated with iridium or rhodium; and the problem was solved. There can be no joints, no possible relative sliding movement or parts, or the gains inherent in the system are lost. The final solution was operated steadily for a run of fifty billion swings without observable deterioration.

It was a simple matter to mount the high-frequency vibrating mirror in a cross frame that vibrated slowly at right angles to the original motion, and thus produce a scanner capable of dissecting two or three million picture elements a second at the studio, and reassembling the same number of picture elements a second in the home. There, at last, was a scanner with no wearing parts, and costing about as much as an inexpensive radio speaker to build.

As actually constructed, the rod has an angular twist of 4 degrees on either side of neutral, or a total swing of 8 degrees, providing a scanning angle of 16 degrees. The mirror device optically doubles the mechanical angle, since the angles of incidence and reflection for a mirror are equal. Only one-half a watt of low voltage power

is required to drive the mechanism. If a higher definition is desired it can be designed and we have built scanners that exceed the allowable channel limitations determined by the rules of the Federal Communications Commission and our ability to construct such ultra high-frequency amplifiers. The power to drive the low-frequency motion is infinitesimal.

Here is a scanner that should bring television in the home with a set to retail at a low price, and provide a projected picture approximating the size, quality and brilliancy of a home motion picture. A blank in our knowledge of resonance has been sketched in. Other uses and devices will follow. This principle has already been applied to a clock mechanism that runs with microscopic power, and to relays sharply responsive to frequency for the operation of remote control devices. These relays have a valuable unique property of inherently preventing contacts from sticking, for the total summed up force required to cause the movable contact to finally reach the fixed contact is, in its full summation, the force available for breaking the contact.

Briefly, this excursion into the unknowns of resonance has sprouted mechanisms of importance. The ten-kilowatt impossibility and monstrosity becomes a docile steady performer needing but a half watt to satisfy its requirements. Much more will be done by others in this new resonance field. There are always many who follow if even so little as a gleam of ultimate success shows. (Radio News).

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TELEVIEWS

Active Preparations

FOLLOWING on the permanent installation of cathode-ray tube projection equipment in the Tatler Theatre it has now been announced that identical Baird apparatus is being put into the Tivoli and Marble Arch Pavilion cinemas. The essential wiring, etc., is in progress, and there is no doubt that this is the forerunner of a scheme to equip the leading British cinemas with big-screen television apparatus. As a result of the C.E.A. Exhibition at Folkestone in conjunction with daily demonstrations at the Tatler, a large number of exhibitors desire instalment of the apparatus as soon as prices, policy, etc., can be announced, and details concerning these items will be made known shortly. A service organisation for this work has already been built up, and it is confidently anticipated that a mutually satisfactory settlement of all questions of copyright will give the necessary impetus to this important development of television. As in the case of the Derby and the Trooping of the Colour, an invited audience saw the opening morning transmission of the Test Match from Lord's cricket ground. The pictures came through with remarkable clarity and left no doubt in the minds of those watching that these outside broadcasts, because they represent instantaneous action, provide an excellent medium for holding the interest of cinema and theatre patrons. In congratulating the B.B.C. on their enterprise in providing viewers with such an excellent service, it is to be hoped that the requirements of places of public entertainment will in no way be lost sight of. It is interesting to

note that in some of the more recent specifications of ordinary cinema equipment questions of electrical interference are being watched carefully because of the trouble that would accrue to sound and vision apparatus.

Proper Commentation

THE commentators charged with the task of giving a description of any outside event which is being televised have one differing very materially from ordinary broadcast work. In the latter case he has almost unlimited scope, a point in his favour with which he is known to take full advantage. For television, however, an entirely new technique must be developed. The fact that every viewer can see the same as the commentator must never be lost sight of, otherwise there will be a tendency to relate at length items which are clearly apparent on the screen. In the early days, slips are no doubt inevitable but these need to be eradicated very quickly, and just recently when the outside broadcast van has been so much in evidence the mistakes have been rather glaring. The correct attitude to adopt is one of somewhat imposed reticence, otherwise the illusion of reality built up by the interested viewer will be destroyed. Technical improvements in picture quality and detail have been so marked of late that complete descriptions of the scene are not required; they are obvious to the viewer, and the commentator should deal with facts known to be outside the viewers' knowledge, and in this way complete satisfaction and service will be rendered. Another point which has to be watched carefully is that associated with the fading in of different cameras when more than one is employed for a television broadcast. The commentator should know which one is in operation and the nature of the scene shown, say, for example, whether an extended view or close-up picture is on the screen.

FIFTY YEARS' UNBROKEN SERVICE

SIR FELIX POLE, Chairman of Associated Electrical Industries, Ltd., addressing the employees of the Edison Swan Electrical Co., Ltd., at Ponders End factory recently, told them



Sir Ambrose Fleming's thermionic valve. This also shows the earliest valveholder improvised in the Swan laboratories.

that they should be proud to be working for the oldest electric lamp concern in this country, and, equally interesting, the company to whom Sir Ambrose Fleming was Consultant when he produced the first radio valve.

The occasion was the presentation by Sir Felix to Mr. Charles Corbett, who had completed 50 years' unbroken service with the company, and Sir Felix pointed out that the company's own sixtieth anniversary was very close.

In 1878 Sir Joseph Swan exhibited at Newcastle-on-Tyne the first electric lamp, and in 1881 formed the Swan Electric Light Co., Ltd., to manufacture and market electric lamps.

Two years later marked an historic event in the electric lamp industry, when the famous names of Thomas Alva Edison and Joseph Swan were coupled, by the amalgamation of their interests and patents, in the formation of the Edison and Swan United Electric Light Co., Ltd. The factory became established at Ponders End, where, not a stone's throw from Sir Joseph Swan's original clock tower, Sir Felix made his presentation to Mr. Corbett last week. In 1916 the company's name was changed to The Edison Swan Electric Co., Ltd.

The First Valve

About the time of the amalgamation Edison noted the irregular blackening of the inside of the lamp bulb during life. Later, this "Edison effect" was investigated in the laboratory by Sir J. Ambrose Fleming (then Professor J. A. Fleming), and a number of special carbon filament lamps were made for him, for experimental purposes. The result was, in 1904, the Fleming Thermionic Valve.

Although this valve was no more than a simple carbon lamp of the period, with a metal plate placed between the legs of a hairpin-shaped filament, it could detect

wireless signals without the disadvantages common to the old coherers, and other mechanical detectors. Much remained to be done before the valve could be brought to that stage of comparative efficiency which was reached with the advent of broadcasting, but something of the physics of the valve had been learned.

It was about 16 years previous to this great event that Mr. Corbett joined the company, but even at this early date, Sir Ambrose was busy at the Royal Institution attending discussions on the subject. When theory was turned into mechanical form, Mr. Corbett was in charge of the Testing Department, where he handled these precious experimental valves, and the subsequent improvements which Sir Ambrose made.

SENSITIVITY CONTROL

IN practical designs of radio receivers it is often found necessary to alter the gain of one or more stages to suit different operating conditions. It may, for example, be desirable to alter the gain on different wavebands to make the overall sensitivity of the receiver approximately the same.

A convenient way of making this change in stage gain is to use valves of the so-called "variable mu" type, and alter the grid bias. This method is perfectly satisfactory in receivers not fitted with A.V.C. systems, but when A.V.C. is fitted the only practical way of obtaining various values of initial bias is to use a resistor in the cathode circuit. The effect of this resistor is to spoil the control of the A.V.C. applied to the normal signal grid.

A method has recently been evolved by Mr. N. Browne, of Electrical and Musical Industries, which overcomes this difficulty, and allows very large changes in stage gain to be made. If a mixer valve of the Marconi X.64 type is used as an amplifier, and various values of negative bias applied to the normal mixer grid, i.e., G3, it will be found that the slope of the signal grid G1 can be varied. The effect, however, of applying A.V.C. to the signal grid is maintained. This particular characteristic of the X.64 valve may be used in various other automatic or semi-automatic devices. An example of this is where the gain of the first I.F. amplifier is controlled by the strength of the oscillator. This arrangement would, with proper choice of component values, keep the sensitivity of the receiver, from the mixer signal grid onwards, constant over the band or bands, by reducing the gain in the I.F. amplifier when the oscillator is very strong.



Sir Felix Pole, congratulating Mr. Charles Corbett, noted that the latter had already "swapped" the customary gold watch for a radio set.

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LOUDSPEAKER FAULTS

(Continued from page 430).

Fairly elaborate apparatus is necessary in order to identify short-circuited turns in a field winding and the use of an ohmmeter which is really accurate will in most cases enable the serviceman to ascertain whether or not these exist.

Mismatching

The speaker is generally provided with a matching transformer mounted on the speaker chassis and this should be suitable for the valve in use in the output stage. Where distortion is present and all normal tests fail to reveal the trouble, the fact should not be overlooked that the output valve may have been replaced by one having a different impedance and thus the speaker is not matched. A good output transformer with multi-ratio tappings or terminals is a good accessory for the serviceman and will enable him quickly to ascertain whether the output transformer is at fault. The speech coil leads should be disconnected from the existing transformer and the universal matching transformer then joined to the speech coil and connected in the output circuit.

Where a speaker and receiver combination produces a tone which is too deep, and it is found that this is due to the thickness of the cone, it may be found that modifications in the circuit do not enable the pitch to be raised satisfactorily. A simple remedy in this case is to remove the bolts holding the speaker to the baffle and to replace them with fairly large distance-pieces between baffle and speaker (Fig. 3). This will leave an air space between the speaker and the baffle and will serve to raise the tone appreciably in most cases.

A "Buzz" Test

Finally, when a speaker is to be tested, one of the simplest methods is to "buzz" it at a low frequency. The standard mains 50 cycle supply is ideal for this purpose and will reveal many faults in a speaker which may not be discernible by ordinary means. To enable the speaker to be used on a mains supply without risk of damage an old mains transformer may be employed. The primary is usually tapped to suit mains from 200 to 250 volts, and there will probably be 10 or 15 volts available at one of the tappings when joined to your particular mains. The speaker may be connected to this spare winding or spare terminals as shown in Fig. 2. An excessive voltage should not be employed.

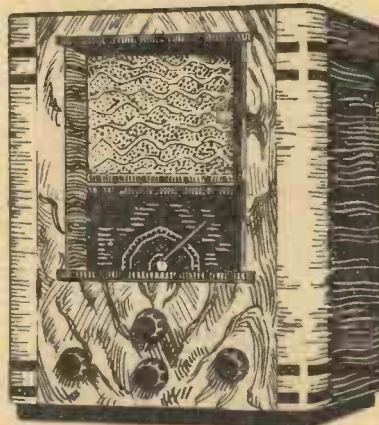
TRADE NOTES

New Tungram "E" Valves

A FURTHER valve is now available in the Tungram "E" range, and this consists of an output pentode, reference EL6. The price of this is 18s. 6d., and it is rated to deliver an output of 8.8 watts. It has the same standard 6.3 volt heater and consumes 1.35 amps. The working anode and screen voltages are 250, and the slope is 15 mA/V.

Peto-Scott All-wave 3

THE accompanying illustration shows the All-Wave battery three-valve obtainable from Messrs. Peto-Scott, reference Model 8022. This incorporates an H.F. pentode of the variable-mu type as H.F. amplifier, triode detector and a Harries output pentode. Variable selectivity is provided by alternative aerial tappings, and the receiver is mounted on a stove-enamelled pressed-steel chassis. The dial, as may be seen, is of the large glass-fronted type with clear identification, and the drive is through a dual slow-motion gear providing ratios of



Model 8022.—Peto-Scott All-wave SG Battery Three.

9 to 1 and 80 to 1. The H.T. consumption is approximately 10 mA, and the receiver tunes from 18 to 52, from 200 to 550, and from 900 to 2,100 metres. The price is £7 12s. 6d. cash, or 7s. 6d. deposit and 18 monthly payments of 9s. 5d. It may also be obtained without batteries for £6 12s. 6d.

New Davenset Chargers

MESSRS. PARTRIDGE, WILSON & CO. are introducing a new series of chargers and rectifying apparatus in which the selenium-oxide type of dry metal rectifier is employed. These are to be known as the Davenset Drimet range, and some interesting features are incorporated in them. Service engineers and others who are interested should write for details to the makers at Davenset Works, Leicester.

New K.-B. Models

THREE new 1938/9 season's receivers are announced by Messrs. Kolster-Brandes, and leaflets are obtainable from the makers giving full details of them. They include a 4-valve all-wave battery superhet at £9 9s., a 5-valve all-wave A.C. superhet at 9½ guineas, and an 8-valve all-wave A.C. superhet (with an 8-watt push-pull output stage), at 14 guineas.

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New light weight super-type **HEADPHONES**, recommended for short-wave work and testing. List Value 15/-, Bargain **3/6** Postage 6d. extra.

★ **3 MATCHED BATTERY TYPE VALVES,** 2-volt Philco type (2 S.G. H.F.'s and one Output Pentode): List value 35/-. **YOURS FOR 5/6 only. POST FREE.** 3 valve-holders, data and circuits given FREE. Ideal valves for experimental purposes. Short-Wave, All-Wave receivers and replacement purposes. **BARGAIN 5/6** Post Free

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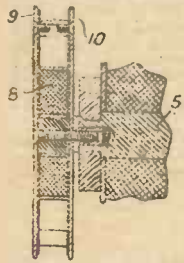
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LATEST PATENT NEWS

Group Abridgements can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume or in bound volumes price 2s. each.

LOUDSPEAKERS.—Mead, J. E. and Spratt, H. G. M. No. 479,751.



Avoiding interaction by fitting a special coil and magnet system to a loudspeaker.

A television receiver comprises a cathode-ray tube and a loudspeaker whose field is neutralised by an auxiliary magnetic system attached to the rear of the loudspeaker 5 and comprising a coil 8 between magnetic plates 9, 10. Specification 448,653 is referred to.

PHONOGRAPHIC RECORDERS.—Ronag Akt. Ges. No. 477,868.

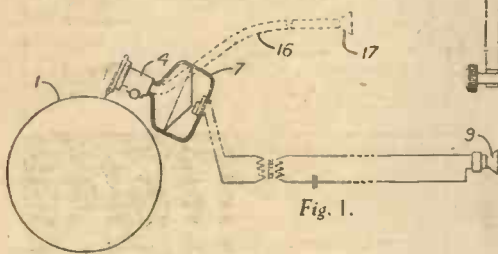


Fig. 1.

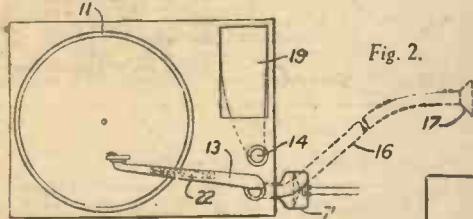


Fig. 2.

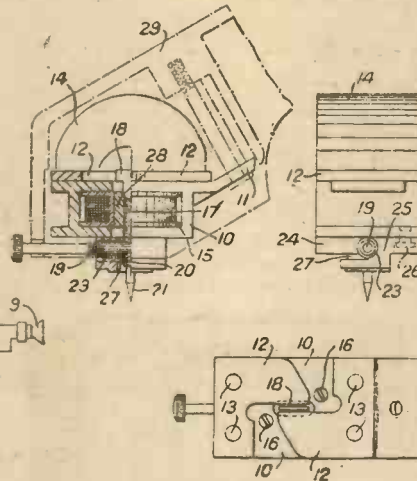
An ingenious gramophone improvement.

An electrically excited diaphragm device 7 is constructed as an independent unit and detachably connected to an acoustically operating recording sound-box so that it can be replaced by a speaking tube to enable a record to be made either of sound received by a microphone 9 or of sound received by a mouthpiece 17. The connection between the device 7 and the sound-box may be by a short tube 4, as shown in Fig. 1, for recording on a cylinder 1, or by a tone-arm device 13, as shown in Fig. 2, for recording on a disc 11.

GRAMOPHONE PICK-UPS.—Cosmocord, Ltd. (Braun, W. M.). No. 477,172.

In an electromagnetic pick-up the pole-faces of the magnet member are arranged one behind the other along the length of the pick-up and the magnet pole-faces or the pole-pieces are each formed with a portion extending across the width of the pick-up and with a portion extending towards the opposite pole-face or pole-piece. The pole-pieces 12, which are L-shaped, are mounted on pins 13 formed on a die-cast rectangular frame member 10 in which a bobbin 15 is held by screws 16, and the permanent magnet 14 which is semicircular in cross-section and of a length greater than its width, has L-shaped pole-faces corresponding to and substantially equal in area to the pole-pieces 12. The armature 17 is provided with two supporting arms 19

surrounded by rubber sleeves 23 held between curved surfaces formed on a projection 24 integral with the frame 10 and on a limb 25 secured to the frame by screws 26, the limb 25 overlapping the projection 24. The armature is separated from the limb 25 by a washer 27 and is damped by rubber packing 28 inserted within the bobbin 15. The magnetic arrangement is mounted within a casing 29 by a screw passing through an extension 11 formed on the frame 10.



These illustrations show the main features incorporated in the Cosmocord pick-up invention.

A NEW LIGHT-SENSITIVE DEVICE

THE more common forms of light-sensitive devices have been fully exploited to meet the multitudinous needs of television, but little has been heard of those which have seemed more difficult to incorporate in service equipment. An outstanding example of this is the established principle whereby the specific inductive capacity of phosphorus changes when subjected to the alternations of light. A scheme has now been propounded whereby this fact can be put to practical use, in spite of the small magnitude of the changes present. The idea is to use the phosphorus as the dielectric of a two-plate condenser, one of these plates being a form of wire mesh to enable elements of a picture area to be projected directly on to the surface of the phosphorus. To amplify the electrical changes produced in this way the condenser forms one arm of a simple Wheatstone bridge balance. In the opposite arm is included a pair of electrodes of a cathode-ray tube which resemble somewhat the line or frame deflector plates of an electrostatically operated C.R. tube. The variations in the balance of the bridge, brought about by the changes in light applied to the phosphorus condenser, produce changes of potential between the pair of electrodes. A beam of electrons directed from a cathode source between these plates is therefore diverted by an amount proportional to the voltage changes. By placing an aperture between the plates and the tube's screen, the number of electrons passing through will depend on the light signal, since more or less of them are diverted from the aperture according to the strength of the signal. A simple form of intensity modulation is thereby provided by the device, and in this way it is capable of being applied to various television schemes.

NEW PATENTS

These particulars of New Patents of interest to readers have been selected from the Official Journal of Patents and are published by permission of the Controller of H.M. Stationery Office and the Official Journal of Patents can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. weekly (annual subscription £2 10s.).

Latest Patent Applications.

- 17508.—Baird Television, Ltd., and Maitland, C. E.—Radio-receivers. June 13.
- 17613.—Baird Television, Ltd., and Tingley, G. R.—Cathode-ray tube arrangements. June 14.
- 17727.—Chart, F. J.—Radio-receiving antenna coupling arrangements. June 14.
- 17669.—Kolster-Brandes, Ltd., and Chatterjea, P. K.—Dipole aerials. June 14.
- 16607.—Bosch, F. J. G. van den.—Wireless-receiving apparatus. June 2.
- 16609.—Bosch, F. J. G. van den.—Cathode-ray tubes. June 2.
- 17064.—British Thomson-Houston Co., Ltd.—Automatic frequency control-circuits for radio-receivers. June 8.
- 16811.—Cole, Ltd., E. K., and Shackell, A.—Tuning-apparatus for radio-receivers, etc. June 7.
- 16707.—General Electric Co., Ltd., Cherry, E. C., Edwards, G. W., and O'Kane, B. J.—Apparatus for receiving television, etc., signals. June 3.

ceiving television, etc., signals. June 3.

Specifications Published.

- 486,548.—Williams, W. E.—Electron-discharge devices for use in television and like systems.
- 486,666.—Standard Telephones & Cables, Ltd., Bond, W., and Davies, G.—Radio sets.
- 486,787.—Farnsworth Television, Inc.—Image-dissector tubes for use in television systems.
- 486,604.—Okolicsanyi, F. von.—Electric remote-control systems for television apparatus.
- 486,889.—Marconi's Wireless Telegraph Co., Ltd., Rust, N. M., and Levin, N.—Tuning and other indicator and scale arrangements suitable for use for example in radio receivers or wave meters.
- 486,896.—Radioakt.-Ges. D. S. Loewe.—Apparatus for transmitting images of moving visual phenomena.
- 486,801.—Furstenzeller, J.—Electrical apparatus for the reproduction of sounds by means of at least two loudspeakers. (Convention date not granted.)

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at the uniform price of 1s. each.

RADIO CLUBS & SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

RADIO SOCIETY OF NORTHERN IRELAND

We give below particulars of the Leonard Trophy Contest, which is open to all transmitting stations in Ireland, EI and GI, and the rest of the world.

Dates of contest: October 1st, 1938, at 12.00 G.M.T. to October 2nd, at 24.00 G.M.T.; October 8th, 1938, at 12.00 G.M.T. to October 9th, at 24.00 G.M.T.; October 1st, 1938, at 12.00 G.M.T. to October 16th, at 24.00 G.M.T.; October 22nd, 1938, at 12.00 G.M.T. to October 23rd, at 24.00 G.M.T.

Awards: For the leading Irish station the Leonard Trophy will be awarded for one year (replica also). For the leading station outside Ireland a gold medal. For the second station outside Ireland a silver medal.

All logs must reach the hon. secretary, R.S.N.I., H. F. Ruberry, 19, Little Victoria St., Belfast, Northern Ireland, on or before December 31st, 1938.

PROPOSED CLUB FOR WEST BROMWICH

READERS residing in the West Bromwich district, and who may be interested in the formation of a local Junior Radio Club, are invited to get in touch with A. Riley, 1, Boulton Square, West Bromwich, Staffs.

THE MAIDSTONE AMATEUR RADIO SOCIETY

ALTHOUGH the summer months are now with us, the society is by no means inoperative. Meetings are held every Tuesday in the club-room, 24, Upper Kent Road, as usual, but definite programmes are only provided on alternate weeks. A visit has been arranged for Wednesday, July 20th, to the Mazda Valve Works at Brimsdown, Middlesex, and members are eagerly awaiting an interesting afternoon. It is hoped that some field days will be arranged for July and August.

New members are always welcome, and for their benefit here is the subscription rate: A nominal entrance fee of 6d., followed by a weekly subscription of 3d. The membership now stands at thirty-six, and the society has been in existence for nearly a year. Hon. Sec.: P. M. S. Hedgeland (2DBA), "Hill View," 8, Hayle Road, Maidstone, Kent.



Replies in Brief

The following replies to queries are given in abbreviated form either because of non-compliance with our rules, or because the point raised is not of general interest.

P. M. (Ferndale). The values depend upon the H.T. available, and the anode resistance must be made high enough to give amplification and at the same time low enough to permit adequate H.T. .1 mfd. should be ideal for the coupling condenser.

R. A. H. (S.E.12). Your idea should work out, but some experiment may be necessary to find the best values. The rod could, of course, be attached to the grid terminal of an ordinary oscillating detector stage.

H. McG. (Southampton). You are probably thinking of the Northern Polytechnic. This is the only one we can trace.

J. H. M. (Warrington).—We cannot supply a blueprint in your particular case.

D. R. (Chilwell).—We are unable to supply a blueprint for the particular type of set you refer to.

J. A. M. (Wisbech).—Full details may be obtained from the makers at Chase Road, North Acton, London, N.W.10.

J. G. R. (Port Talbot).—Two resistances would have to be joined in series in the H.T. negative lead, and the tapping taken to the first L.F. valve. One hundred and fifty ohms in series with 750 ohms would be about right.

A. A. R. (Hillingdon).—The coil is supplied by Messrs. Wright & Weaire, of 740, High Road, Tottenham, London, N.17.

W. R. C. (Nottingham). The circuit is not irregular. I.T. positive may be returned to earth, and the common negative terminal—earth connection is not essential. The circuit was, of course, in skeleton form.

A. E. B. (Northfield, B'ham). We cannot supply diagrams for individual requirements. We have published many articles on the subject.

G. F. (Long Eaton). You should select a receiver from the blueprint list included in each issue and in the appropriate issue describing the set will be found a list of parts and operating data.

A. H. (Lowestoft). The coil type is essential before connections may be given. You do not mention the particular type, and did not enclose a stamped envelope for reply.

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THE SUM TOTAL OF A GOOD CIGARETTE



PLAYER'S NAVY CUT CIGARETTES 'MEDIUM' OR 'MILD' 10 FOR 8 20 FOR 14 6

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Modulation Hum

ALTHOUGH this trouble was at one time very acute it appears to have given very little trouble during recent months. As usual with receiver faults, however, when a given fault arises it appears to occur in dozens of different receivers about the same time and quite a number of queries have been received recently in which this trouble has occurred. It is revealed by the fact that when a station is tuned in the hum becomes louder, sometimes, with a powerful station, drowning the received signal. There are two methods of avoiding this trouble, and in some cases it will be found that one proves more

Where possible, the speakers should, therefore, be pointed away from the stage and feed-back troubles should not then occur. Another member wishes to use two mikes and asks if they may be connected in parallel. This is quite an orthodox arrangement, and each mike should be provided with its own volume control so that they may be "faded" and controlled individually. To maintain accurate matching the transformers associated with each mike should be provided with tapped windings, or fed to a further common transformer of the matching type.

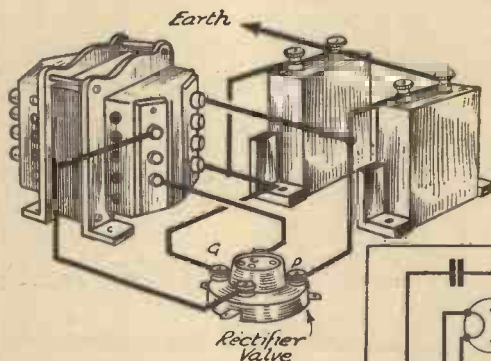
Card Exchanges

Many members are interested in the collection of QSL cards, not merely as identification of the reception of a station, but from a collector's point of view. Many amateurs find an interest in this and are prepared to exchange cards, and the following letter has been received from a member in New Zealand: "I was wondering whether I could exchange cards with some of your members. I know

about fifty members of the New Zealand DX Club who would like to exchange cards, and if your members like, I would act as intermediary and forward all cards sent to me. I can guarantee a quick reply.—Ben J. Rayner (DX

107T), c/o V. Kempton, Moroa, Greytown, New Zealand."

The following letter comes from a member in Dumbartonshire. "Being a member of the B.L.D.L.C. since October 10th, 1937, I feel that the time has come for me to send on a log of DX stations from this district. Since I joined the club I have been making a set which would give good results on the medium and long waves and 50 per cent. results on the short waves. I have now got the set working excellently. It is an Sg-v-2 all-wave with ganged tuning condensers, ceramic valveholders, and Eddystone 6-pin coilholders. My coils are B.T.S. Inductors. The only district I have not heard is W5 in the U.S.A. My aerial is 20ft. long and 30ft. high and runs N and S.—J. STEWART."

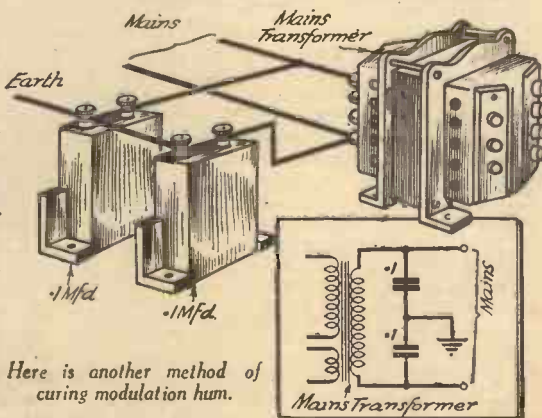


This is usually the most effective way of avoiding modulation hum.

effective than the other. Both are illustrated on this page and it will be seen that in one case a fixed condenser is joined from each anode of the rectifying valve to earth, and in the other case two fixed condensers are joined across earth and the mains input leads. The latter could, of course, be the only scheme when a metal rectifier is used, although the trouble does not seem to occur so easily when this type of rectifier is employed. The condensers should be of a type suitable for use at the voltage available at the points to which they are joined, and when used in conjunction with the rectifying valve it may be found preferable to join the condensers direct to the centre-tap on the H.T. winding, placing them as close as possible to the transformer.

Microphone Operation

When using a microphone difficulty is often experienced due to feed-back, and a member in Wales who is running a dance-band outfit is finding it very difficult to get a stable arrangement. Theoretically, if the mike is placed on the stage, and the loudspeakers are fitted forward of the footlights or front of the stage this trouble should not arise, and the only suggestion we can make is that speakers are placed down the hall, facing the stage. This is bad practice unless the mike is of a type which is very directional and thus only picks up sounds from the front of it.



Here is another method of curing modulation hum.

LETTERS FROM READERS

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

My Ideal Circuits

SIR,—The request for an ideal circuit impels me to pass on my simple circuits to other readers who may be interested. Just recently I changed from battery to mains. Previously, with a battery set, I used an H.T. eliminator, and for an S.W. set I cannot suggest a better one than that described in PRACTICAL AND AMATEUR WIRELESS for December 12th, 1937, and also in subsequent issues. A friend and I made up the set (trans. coupled) and it worked excellently.

For a medium- and long-wave set (battery) I have been using for some time, at Sandbanks, near Bournemouth, the circuit shown in Fig. 1, and the results were quite good. It was better on the long waveband than the medium.

At Sandbanks the aerial rested on two large holly bushes about 8ft. from the ground, running north and south, and screened by trees on the east. We received four long-wave stations and about six

1937, with a mains aerial. The night was damp, with a light ground mist. (The stations were Pittsburg W8XX on 48.86 m., and Chicago W9XF on 49.18 m.) One thing I am pleased about concerning the two- or three-valve set (Fig. 2) is that there was and is no mains hum.

The first two mains valves I had were Osram MH4's. The set works fairly well. With my set, as I only have a long-wave coil, I have found that by putting a tuning condenser (value approx. .0003) in series with the aerial, it is possible to tune in the Regional, which is received quite well here. The vanes are "open" or apart from the fixed vanes. My set is built on a wooden

baseboard with an earthed piece of tin screwed on underneath.—R. GUILLAUME (Weybridge).

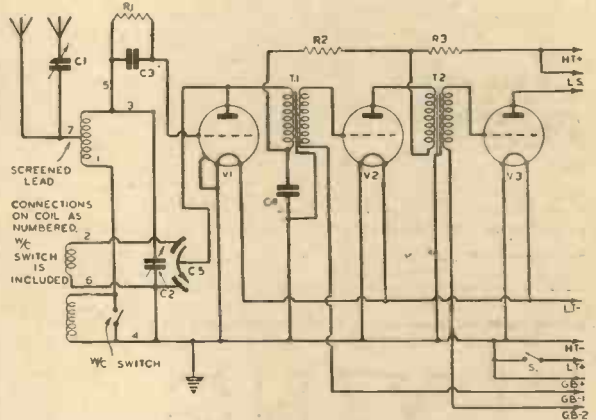


Fig. 1.—The 3-valve battery set mentioned in Mr. Guillaume's letter. Component values are as follows: C1, .0005 mfd. (preset); C2, .0005 mfd.; C3, .0002 mfd.; C4, 1 mfd. (or over); C5, .0001 mfd. (diff. react.); T1, Ferranti type AF4 (ratio 3:1); T2, Igranic (2nd stage), (ratio 5:1); V1, Mullard PM1HL (screened); V2, Mullard PM1LF; V3, Mullard PM2. Coil, Cossor, Cat. No. F.C.1110

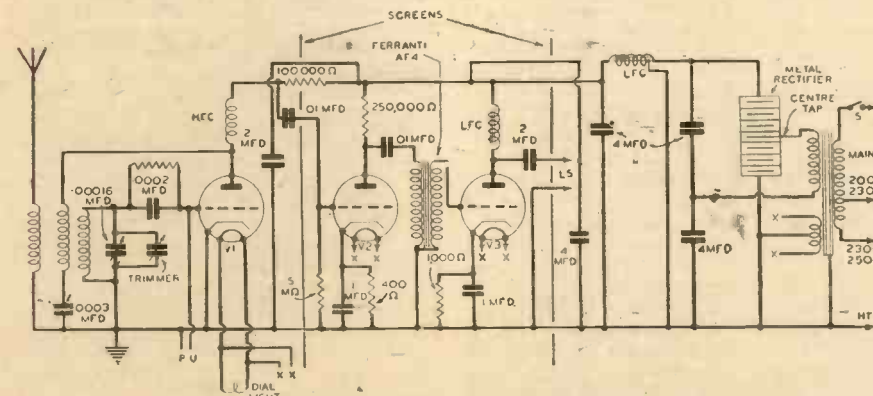


Fig. 2.—Circuit diagram of Mr. Guillaume's 3-valve mains receiver.

medium-wave stations. This set has now been superseded by a mains set.

When I made my first mains set (Det., L.F., parallel trans. feed), I considered an H.F. stage with a pentode or var. mu valve. In that set, as in the present one, I use 6-pin Eddystone plug-in coils. If I had an H.F. stage I thought it would have to be tuned to be of any use. At present I have coils to cover approx. 9.50 metres and 1,000-2,000 metres.

From queries that have been published it seems difficult to gang the condensers right, and I guess it would be more difficult with two separate condensers. I therefore decided on a Det., 2 L.F. set, using R.C.C. and parallel trans. coupling. Even now I am not sure whether R.C.C. is the best.

The first time we tried it out (as a 2v. set) we brought in two American stations, and that is the only time I have received Americans. Referring to my log, I see that it was on Wednesday, December 15th,

baseboard with an earthed piece of tin screwed on underneath.—R. GUILLAUME (Weybridge).

The P. & A.W. "Cyclo" Converter

SIR,—I wish to express my gratitude to you for the "Cyclo" Converter described in the issue of April 30th. This unit was built up and working within a few days, and I was astounded with the results. During the past five weeks I have rarely failed to pick up either W3XE, W2XAD, or W8XX on 19-metre band.

On a Sunday night recently a dance band from Wayne came through, and was a consistently good programme from 22.30 to 23.00, and I had just previously listened to "Shadyside" from Pittsburg. I have the unit coupled to an H.F. bandpass-pen. det.-R.C.-pen.-set, which, while entirely a PRACTICAL AND AMATEUR WIRELESS receiver, has been constructed from remnants of dozens of articles taken from

PRACTICAL AND AMATEUR WIRELESS. It's a set I am proud to own, and would not entertain exchanging it for any commercial set. The latter has its good features, but don't we home constructors just smile when we read of some interesting idea or gadget we can easily adapt to our set while the commercial set owner can only read and wish.

In conclusion, I have not the slightest hesitation in saying to those in doubt, build the "Cyclo" converter, and get the worth-while entertainment from the Columbia-Westinghouse and National programmes as a change from B.B.C. and European stations, and bear in mind these programmes can be got during afternoons

and evenings on 16- and 19-metre bands,

To the Editor of PRACTICAL AND AMATEUR WIRELESS I repeat my remarks of some four or five years ago: many thanks for hours of good constructional reading.—FRANK B. HORSEFALL (Leeds, 2).

CUT THIS OUT EACH WEEK.

Do you know

- THAT wire-wound resistors which are not inductive may easily be made or obtained ready-made.
- THAT an ordinary pentode may be used as a high-efficiency triode by strapping screen and anode.
- THAT an H.F. pentode makes a very efficient anode-bend detector.
- THAT care should be exercised in using substitute H.F. valves as some have the grid and others the anode joined to the top cap.
- THAT in most cases the smaller the cone of speaker the less the low-note response.

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 name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed to: The Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

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QUERIES and ENQUIRIES

to the aerial. The turns must, of course, be wound in the same direction as the frame aerial windings and should be wound over the frame to provide the necessary coupling.

Short-wave Design

"I am going to build a short-wave superhet on lines recently laid down by you, but am uncertain regarding one point. This concerns the frequency-changing stage. Shall I use a pentagrid, heptode, triode-pentode, or what? Could you enumerate the merits of the various arrangements and suggest what is best? I wish to tune down to 10 metres on the set and perhaps go up to the broadcast bands."—H. R. (Perth).

IT would be difficult to go into all the points concerned in the choice of this stage. If you are out to get the best from the circuit, irrespective of the difficulty of setting up and adjusting, we think the best idea is as outlined in the article in last week's issue, namely, a heptode with separate oscillator. A good H.F. pentode may be used as a triode for the oscillator stage and by suitable design "pulling" may be obviated, whilst the oscillator may be controlled to provide various results. Most frequency-changers become inefficient as the frequency is increased (wavelength lowered) and thus the combination mentioned may be made to work at maximum efficiency right down below 10 metres.

Three-valve Superhet

"I understand that you designed some time ago a superhet in which only three valves were employed. I have been going into this matter with a friend and we fail to see how it is possible to use three valves in a superhet combination without introducing reflex arrangements—which I also understand you did not do. Can you confirm this and let us know how such a small number of valves may be used in an efficient manner in this type of circuit?"—L. A. (Bournemouth).

THE circuit referred to is certainly efficient and it is possible, if you desire, to improve upon it without increasing the number of valves. The combination was frequency-changer (pentagrid), followed by a pentode as I.F. amplifier. This was fed into a Westector which took the place of a valve as second detector. This was coupled to the output pentode. If desired, a further Westector may be used for automatic-volume control.

Portable Aerial Connection

"Could you give me Vidor's address? Also, would you explain where to connect an external aerial to my portable receiver, which is a three-valve commercial model?"—W. S. P. (Holywood).

THE address of Messrs. Vidor is West Street, Erith, Kent. With regard to your portable, if an external aerial socket is not fitted, the aerial will have to be joined direct to the grid connection of the first valve. As this will probably result in very poor selectivity you may prefer to use a coupling winding. Two or three turns of wire may be wound round the lid of the cabinet and the end joined

H.F. Chokes

"Could you explain the merits of the H.F. choke—that is, the type for various couplings and whether screened or un-screened should be used? I see from a catalogue that there are three or four different types, and these are sold both screened and un-screened—hence my doubts."—K. R. (Cromer).

FOR ordinary reaction purposes the choke is not very critical and most "general purpose" chokes may be used. For coupling purposes, however, the choke

RULES

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.
- (5) Grant interviews to querists.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

should be of high impedance and with low self-capacity, and the impedance should be higher with an H.F. pentode or S.G. valve than with a triode should this be used. This would account for the various types. Whether to use a screened or un-screened choke will depend upon the receiver design, and screening merely prevents interaction with other inductive components which may be placed near to it.

I.F. Transformers

"Is the gain of an I.F. stage dependent entirely upon the I.F. transformer? I should like to know how to choose this type of component, as I am thinking of making my own and consequently can use any type of construction of accessory in the making."—C. D. E. (Bridport).

THE efficiency is certainly dependent to a very large extent upon the transformer, and if you are making your own components the expenditure of a little amount of thought and care will be well repaid. Use Litz wire for the windings, and for trimming use air-spaced condensers.

An iron-core winding will not be necessary in this case, but the transformers will have to be well screened. The screens should be large enough to leave at least half an inch of space between the windings and the nearest metal. The band-width may be adjusted by making provision for moving the primary and secondary windings in relation to each other.

Valve and Component Tests

"I am anxious to make some tests of the apparatus in my receiver but am uncertain how to go about it. The valves, for instance, have been in use continuously for two years, whilst some of the components may also be now in a state rendering them fit for replacement. What apparatus must I get for such test purposes?"—H. E. (Southampton).

ELABORATE equipment would be needed to make reliable tests of components and valves. However, the simplest scheme with the valves is to take them to a good dealer who is provided with a reliable valve-tester and it will be only a matter of a few minutes to know whether they are good or bad. If you can obtain new valves you could easily make tests by substitution. With regard to the components, these are unlikely to have deteriorated (except for resistors, perhaps), and good modern components may prove a worth-while policy as replacement.

The Faraday Screen

"I have several times seen references to a Faraday screen in your paper and should like to know what this is, and how it is used. I believe it is for short-wave work, but am uncertain."—H. T. (Cambridge).

THE screen is interposed between the aerial coil and the first tuned coil, and is mainly to eliminate interference. In its simplest form it consists of several turns of bare wire wound round a tube, each turn being separated. A strip of metal is then placed across the turns and soldered across to each turn firmly. Exactly opposite this strip each turn of wire is cut through and then opened out flat. Alternatively, the turns may be cut close up to the connecting strip. Each wire must be kept from touching except where connected to the connecting bar, which is earthed.

Trimming

"I have a mains superhet with all refinements, but it is sadly out of line. I have tried for hours to get it properly adjusted, but find it almost impossible. I have no signal generator or other device, and have to rely upon ear. Can you tell me the best way to set out to get the set properly lined up?"—H. U. S. (Crewe).

IT is admittedly very difficult without suitable apparatus to line up a superhet. If the receiver incorporates automatic-volume control this should be cut out for trimming purposes as it renders it very difficult to ascertain how adjustments proceed due to its varying action. The I.F. transformers should first be adjusted to an approximate position judged by the background noise, and the oscillator then brought into line by using a similar gauge. The tuned circuits are adjusted next and the oscillator modified to bring wavelength readings into the correct position. It is certainly a hit-and-miss procedure and will take some time without a proper oscillator.

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U.S.A. Tubular Electrolytic condensers, 8mf. 500v., 3 for 2/6; 8 + 8 mf. 450v. + 8 mf. 250 v.; 8 + 8 mf. 450 v. + 10mf. 50v., 2 for 2/6.

T.C.C. 15mf., 100v., Dry Electrolytics, 4d. each. Gossor 1 + 1 mf. Condensers, 3d. each.

2-Gang .00016 all brass short-wave steatite based Condensers, 2/11 each.

Potentiometers, 1/- each, 10,000, 20,000, 250,000, 500,000, 2 meg.; with switch, 1/3 each, 10,000, 20,000, 250,000, 500,000. Special Offer, 25,000 ohm. Potentiometers, 3 for 1/6. Tubular Wire-end Condensers, .0001, .0003, .0005 and .002, 1/- dozen, your choice.

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THE SIMPLEST ALL-WAVER— See page 454

Practical and Amateur Wireless

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EVERY
WEDNESDAY

Edited by F.J. CAMM

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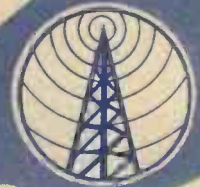
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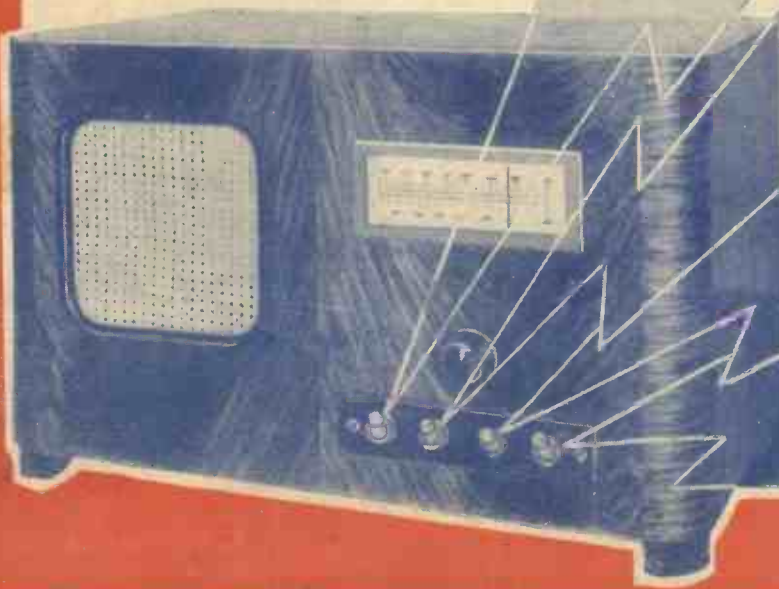
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A NOVEL QUALITY RECEIVER—SEE PAGE 453



Practical

and Amateur

Wireless



Edited by F. J. CAMM

Technical Staff:
W. J. Delaney, H. J. Barton Chapple, Wh.Sch.,
B.Sc., A.M.I.E.E., Frank Preston.

VOL. XII. No. 305. July 23rd, 1938.

ROUND *the* WORLD of WIRELESS

Automatic Tuning

THE majority of the receivers at this year's Radio Exhibition will undoubtedly feature push-button or automatic tuning as the main point, and in this issue we give another article on the method of making use of the principle with existing equipment. It must be pointed out that at the moment push-button units are not generally available. One or two manufacturers are proceeding with plans and should be able to supply ready-assembled units at the Show which could be incorporated into any receiver with a minimum of difficulty. A scheme which we favour, and which we hope to describe as soon as the button units are available, is the building of a complete tuner unit on the superhet principle which could be built into a receiver, used as a separate unit, or even as a remote-control device. It would employ the superhet circuit and be, more or less, a superhet converter. This would enable any set to be modified by the connection of about three leads and would introduce a complete automatic tuning assembly in the minimum of time. No doubt a unit of this type will be on the market before long, and will enable many existing receivers to be brought up to date.

Scottish Transmitter

THE new B.B.C. transmitter at Kincorth, near Aberdeen, is being tested on the air, and signals may be picked up on a wavelength of 233.5 metres after midnight. Details are not yet available concerning the probable date when the station will be put into operation.

Another Lucerne Plan

AS mentioned recently there is a possibility of another wavelength shuffle next year. At the meeting of the I.B.U. to be held in October the recommendations of the Cairo Conference will be considered and it is reported that the Technical Committee of the I.B.U. has already held preliminary discussions regarding the matter. According to the I.B.U., the number of receivers registered in the world at the end of 1937 was 87,400,000, and of these approximately 31,200,000 were in Europe—excluding the U.S.S.R.

P.A. Equipment

TO control huge crowds in mass demonstrations, speakers have been buried in the ground at certain foreign centres.

We now understand that this principle is adopted at the Birmingham Pageant which is held this month, and the Pageant Master directs operations through a microphone. This scheme ensures that everyone hears the orders simultaneously and there is no delay due to the sound having to travel over ground to be deflected by wind, etc.

Car Radio

FROM an American station special programmes are broadcast on Sunday afternoon for the entertainment of car

body upsets the balance and trips a relay or carries out any other work which raises an alarm.

Radiolympia Poster

AS television is playing a large part in this year's radio show, the poster to be used for advertising is to combine the eye and an ear. On a black ground an orange eye with a white ear superimposed will attract attention and indicate that the exhibition is to appeal to the viewer as well as the listener.

Paris Television

IN response to many enquiries we are able to point out that standard television equipment as used for the B.B.C. requires no modification to receive the Paris television transmissions. The wavelength is close to the B.B.C. wavelength and the line definition is 445. Further details will be given as soon as they become available.

Another Questionnaire

THE B.B.C. is anxious to obtain data from listeners regarding their summer listening habits. A special form will be sent to every listener who applies on a postcard, and this form carries a list of twenty-one programmes, ranging from orchestral music to running commentaries on sport, and listeners are asked to put a cross against the type of programme they like. Their remarks may be made in a special place provided. No signature is required.

Colwyn Follies

THESE popular entertainers, under the direction of Ernest Binns, will broadcast from the Pier Pavilion, Colwyn Bay, on July 22nd.

Television Land-line

IT is announced that the twin television cable between London and Manchester is practically completed by the Post Office and the section from London to Birmingham is now in partial use. Orders have been placed for an extension to Newcastle. The London-Birmingham section is being employed for 40 telephone lines and it is stated that the cable may be used for the simultaneous transmission of 300 two-way telephone conversations. It is anticipated that a second B.B.C. television transmitter will be constructed at either Birmingham or Manchester.

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drivers. It is claimed that this gives the driver something to occupy his mind and prevent him from speeding, with a consequent reduction in the number or risk of accidents. We understand that the B.B.C. has in hand plans for propaganda for car radio, and will encourage its use by special programme references from time to time.

Radio Burglar Alarms

VARIOUS suggestions have been made from time to time for the use of ordinary radio apparatus as a burglar alarm. The use of the light-sensitive cell is well known, and now a new suggestion has been put forward in which a circuit is finely balanced and the presence of a human

ROUND the WORLD of WIRELESS (Continued)

Broadcasting in the U.S.A.

IT has been computed that there are, in the U.S.A., no fewer than 725 broadcasting stations, and these are controlled by some 600 different companies; 280 of the stations are wholly or partially owned by newspapers.

Vienna Station's New Home

WE are informed that the "Reichssender Wien," formerly Ravag, has moved at last to the new Broadcasting House in



These illustrations show how a shopkeeper protects his safe by placing a Philophone underneath it where it cannot be seen. Should anyone approach the safe, the slightest noise will be intensified in the master unit, in his bedroom upstairs, sufficiently to awaken him.

the park of the Theresianum College, founded nearly 200 years ago by the Empress Maria Theresa. The College, which was the Austrian Eton, still remains, and retains plenty of ground, with old trees, bushes and turf, for all its practical needs. Active broadcasting will not begin till September, but most of the executive departments, with staffs, have been transferred.

New R.A.F. Wireless School

IN order to meet the increased requirements of the R.A.F. for wireless personnel, a temporary school to accommodate approximately 3,000 airmen pupils and a staff of about 200 airmen and civilian instructors is to be opened in the autumn at Yatesbury, Wiltshire. A site for the permanent school will be selected later.

Esperanto in Italy

IN a recent international radio competition, organised by the Italian Broadcasting Authorities, more entries were received in Esperanto than in all other languages (English, German, French, Dutch) together. This is the fourth such competition, and in consequence of the result the authorities have now increased their broadcasts in Esperanto. Many other countries are also broadcasting in Esperanto nowadays; there are, in fact, over eighty broadcasts in the language every month.

INTERESTING and TOPICAL NEWS and NOTES

Music Broadcasts

BEETHOVEN'S ballet music, "Prometheus," conducted by Sir Adrian Boult, will be broadcast by the B.B.C. Orchestra on August 4th (Regional), and on August 2nd (Regional) a performance of

Industrial News Bulletin

WE understand that the B.B.C. has been considering including, in the interests of British industry as a whole, a short weekly bulletin of industrial news. The matter has not yet got beyond the stage of preliminary enquiry.

Cabaret from Bournemouth

DANCE Cabaret will be broadcast from the Royal Bath Hotel Ballroom, Bournemouth, in the Regional and West of England programmes on July 27th. The artists will include Billy Thorburn and his Music, with Eddie Gurey and the Billy Boys.

Song Recital

MIDLAND listeners are to hear, on July 20th, a second broadcast in the series entitled, "Songs I Like," in which the singer gives personal reasons for the choice of songs included in the programme. This time the singer will be the well-known soprano, Miriam Licette.

Military Bands Broadcast

THE most famous military band in France, the Garde Républicaine, will share a programme with the B.B.C. Military Band on July 24th. The Garde Républicaine Band will be heard playing from Paris in the first half of the programme, while the B.B.C. Military Band will broadcast from London.

Variety from the North-East

"BON-ACCORD" is the title of a studio variety entertainment with a strong flavour of the North-East, to be broadcast on July 21st. Among those taking part will be Roland Smith, assisted by Flossie Miller, in a sketch telling how Mrs. McHaggis fared at the Empire Exhibition; Lizzie Blacklaw, in an original monologue; and Leslie and Cowe, broadcasting accordion duets for the first time. The show will be presented by Howard M. Lockhart.



SOLVE THIS!

PROBLEM No. 305

Atkinson made a four-valve short-wave receiver and as a tuning indicator endeavoured to make use of a 1 mA. meter which he had in his junk box. He connected this in the anode circuit of his anode-bend detector, but found that the needle went right off the scale. He accordingly decided that the meter was useless and purchased a new one. How could he have utilised the original model without difficulty, and at the same time given it wider scope than his new model? Three books will be awarded for the first three correct solutions opened. Envelopes should be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 305 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, July 25th, 1938.

Solution to Problem No. 304

When Jonson made the alteration he overlooked the fact that a fixed condenser had to be joined between the anode and the primary winding. Without this his H.T. supply was short-circuited. The following three readers successfully solved Problem No. 304, and books have accordingly been forwarded to them: J. Hoyle, 5, Barnes Avenue, Rawtenstall, Rossendale, Lancs.; L. Cowan, 44, Norman Street, Glasgow, S.E.; A. H. Poulton, Horsbrook, South Brent, Devon.

Bach's B minor Mass, by the Eisteddfod Choir and the London Philharmonic Orchestra, will be broadcast from Wales. The forty-fourth season of Promenade Concerts in the Queen's Hall will begin on the evening of August 6th. Sir Henry J. Wood will again conduct, and the season will last for eight weeks. The whole of the opening night will be broadcast in the National programme.

Exploring Caves

THE limestone country at the head of the Tawe and Neath valleys has in recent years been yielding up its secrets. Huge caves have been discovered, with stalactites and underground rivers. The explorers who were the first to discover this new world will come to the Western studio on July 28th and tell the story of their adventures in a programme entitled "Exploring Caves."

An Interesting Conversion

How an Obsolete Battery-operated Receiver was Adapted to A.C. Mains Operation

MANY experimenters have an obsolete battery set in their workshop, so a few notes by one who has just converted an old set to A.C. mains operation, with very satisfactory results, may prove of interest and benefit to other readers.

The schematic diagram of the original receiver is shown in Fig. 1 from which it will be noted that the circuit consists of a screen-grid amplifier preceded by a pair of band-pass coils, and followed by an H.F.

valve reduced when receiving a very powerful signal, but the signal strength itself is cut down. This arrangement gives very good control of the volume and also helps selectivity.

An H.F. pentode (Marconi type W.42) was chosen for this stage, and for its operation only two extra resistances and two non-inductive condensers were required. The only additions to the detector circuit were a decoupling resistance and

self-contained cabinet with speaker and battery compartment at the top, and it was decided to mount the mains equipment on the battery shelf, which was first of all covered with copper sheeting.

The mains transformer, rectifier, voltage doubler condensers, thermal delay switch, and electrolytic smoothing condenser were then mounted in position. A bracket was made to fit the latter, which was of the cylindrical-can variety, although the bracket can be dispensed with if a condenser in a rectangular impregnated carton is available.

The thermal delay switch (Bulgin type S.100) was deemed desirable to enable existing condensers to be used. The switch is joined between the positive terminal of the rectifier and the speaker field (or smoothing choke if this is used instead), and does not switch on the H.T. supply until the receiving valves themselves have warmed up sufficiently to ensure that they take their full current immediately the H.T. voltage is applied. This prevents any voltage surge, and as the smoothed H.T. supply at the full valve load is about 200 volts, the existing condensers may safely be used.

Power Pack

The power pack was then wired up, all "earth" leads being taken to the copper foil covering the shelf, and sufficient length of wire to reach the receiving chassis itself was left available for the H.T. positive, "earth," and valve heater lines.

The on-off switch S.6 is mounted on the same spindle as switches S.1-S.7 which control the wave-range, dial lights, etc., so one side of the mains had to be taken through this switch on the receiver chassis, and then back to the mains transformer.

The H.F. pentode and mains output valve used were of the 7-pin type, so new valveholders were provided for these stages, and one of the 5-pin valveholders thus removed was transferred to the detector

(Continued on next page)

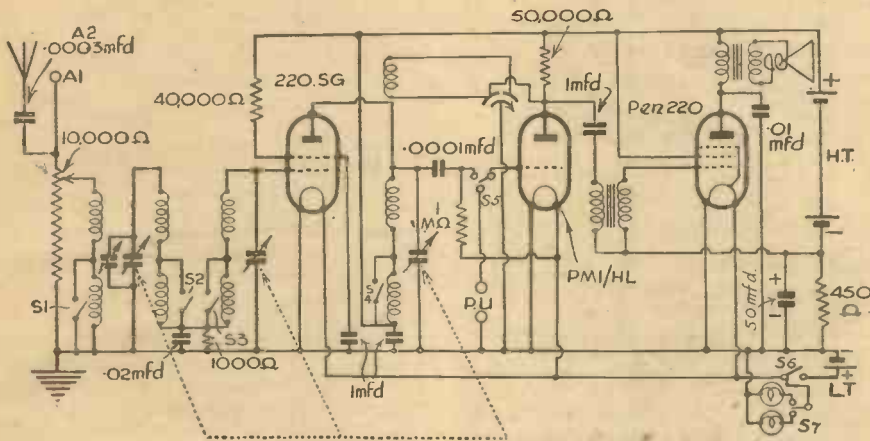


Fig. 1.—Circuit diagram of the original battery receiver.

transformer connected to a leaky-grid triode detector. The latter is, in turn, connected to a pentode output valve through a parallel-fed transformer, and automatic bias is applied to the output stage by means of a 450-ohm resistor. Volume control is by means of a potentiometer connected across the aerial coil.

As was to be expected, all the valves had long outlived their useful life, and there were three schemes to be considered, viz.:

(1) Whether to purchase new battery valves, an H.T. battery and an L.T. accumulator.

(2) Obtain new battery valves, and an L.T. accumulator, and get the H.T. supply from the mains through an eliminator.

(3) To convert the set to all-mains operation with mains-operated valves.

Suggestion 1 was ruled out straightaway as it was decided that the valve combination available would hardly give sufficient selectivity and volume to meet present-day conditions.

As regards scheme 2, the cost of this was almost as much as a complete conversion. It was certainly simpler than scheme 3, but would not give quite the same results as complete all-mains operation, and the latter was eventually decided upon.

Using Existing Components

An examination of the chassis and components showed that, providing surges in H.T. voltage were avoided, most of the components could be utilised and, excepting the mains equipment, very few extra parts would be required. The circuit was then redrawn for mains operation, and Fig. 2 should now be compared with Fig. 1.

The original aerial potentiometer is now also part of the cathode bias resistance, so that not only is the sensitivity of the H.F.

condenser in the anode lead, while the output valve required only the substitution of a different value of bias resistance.

The battery receiver was fitted with a P.M. moving-coil speaker, but a spare energised model was available, so it was decided to use that with a Westinghouse metal rectifier, style H.T.16, for the power supply. This, together with its mains transformer and smoothing condensers, hardly costs more than a good H.T. battery and new accumulator, and will certainly last a good deal longer.

The original receiver was fitted in a

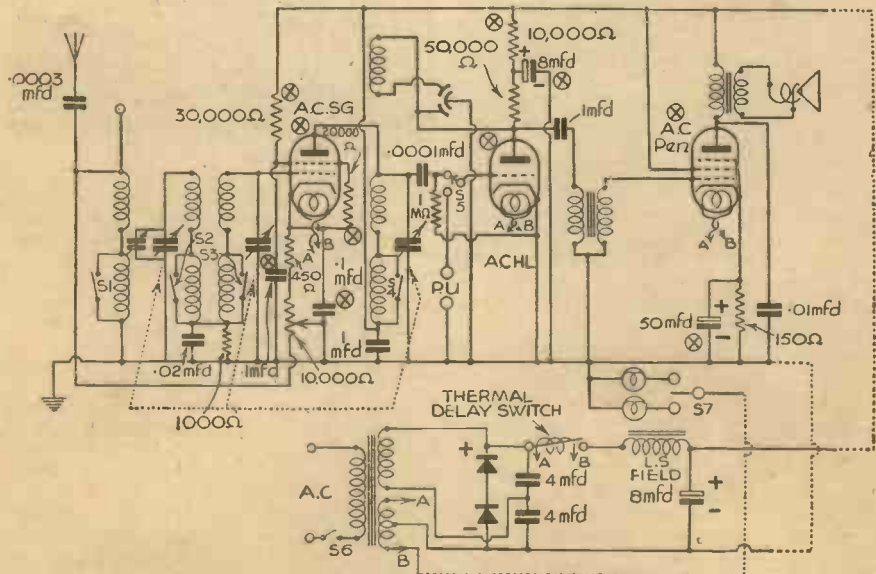


Fig. 2.—Theoretical circuit diagram of the A.C. mains version. The only new components utilised are marked X.

AN INTERESTING CONVERSION

(Continued from previous page)

stage to provide for the 5-pin valve to be fitted there.

The L.T. wiring to the valveholders was retained intact, with the exception of the lead from the output valve to chassis. A new lead from this valve leg to one side of the L.T. winding on the mains transformer was provided, the other side of this winding being taken to S.7. 2.5-volt lamps were used for the dial lights, as these were connected across one half of the L.T. winding only and the voltage available was therefore only 2 volts. The grid leads to the three valves were then reconnected as no alterations were necessary to this part of the circuit.

A terminal, insulated from chassis, was then fixed in a convenient position and used for H.T. connections, or might quite easily have been the screen valve-leg of the output valve, as the screen of this stage is subjected to the full H.T. supply.

The anode of the H.F. pentode receives the full H.T. volts, while the potentiometer arrangement used for the screen voltage follows normal procedure, and is quite easily wired up. Note that the two 0.1 mfd. decoupling condensers should be of the tubular non-inductive variety.

The addition of the decoupling resistance and condenser in the anode lead to the detector valve was but a few moments' work, and the low-potential end of the two windings of the intervalve transformer were then taken direct to earth, instead of through the 450-ohm resistance to chassis.

The cathode of the output valve was quickly wired, using the existing 50-mfd. electrolytic condenser, and a new 150-ohm resistance; a lead was then taken from the anode to one side of the speaker output transformer, the other side of which was connected direct to the smoothed side of the L.S. field-winding.

Excellent Results

A number of foreign programmes were received at full loudspeaker strength, a particularly good performance for a receiver which was designed and constructed some eight years ago.

Total cost of the complete conversion was between £4 and £4 10s., and when considering this cost, it must be remembered that the cost of a new set of battery valves, H.T. battery and L.T. accumulator would account for an expenditure of approximately £2 10s., so the extra power, quality of

	2 7-pin valveholders (Bulgin).
	1 8-mfd. electrolytic condenser (Dubilier).
	2 0.1 tubular condensers (Dubilier).
	1 10,000-ohm resistance (Bulgin ½-watt).
	1 20,000-ohm resistance (Bulgin 1-watt).
	1 30,000-ohm resistance (Bulgin 1-watt).
	1 150-ohm resistance (Bulgin 1-watt).
VALVES	1 W.42 (Marconi).
	1 AC/HL (Mazda).
	1 AC2/Pen (Mazda).
POWER PACK	1 Westinghouse Metal Rectifier style H.T.16 (Premier Supply Stores).
	1 Mains transformer or same with 4-volt c.t. L.T. winding (Premier Supply Stores).
	2 4-mfd. condensers (Dubilier BE. 355) (one block).
	1 8-mfd. electrolytic condenser (Dubilier).
	1 Thermal delay switch (Bulgin type S.100).

output, and lasting performance of the power pack were well worth the extra cost of less than £2.—W.A.F.

IMPORTANT BROADCASTS OF THE WEEK

NATIONAL (261.1 m. and 1,500 m.)

Wednesday, July 20th.—The Pageant of Radio, in memory of Marconi, 1874-1937.

Thursday, July 21st.—The Dark Lady of the Sonnets, by George Bernard Shaw.

Friday, July 22nd.—Dance Band programme.

Saturday, July 23rd.—Commentaries on the Fourth Test Match, from Headingley, Leeds, and White City Athletics: Princeton and Cornell v. Oxford and Cambridge.

REGIONAL (342.1 m.)

Wednesday, July 20th.—Variety from the Argyll Theatre, Birkenhead.

Thursday, July 21st.—Dialect Spelling Bee, from Northern and Western.

Friday, July 22nd.—Reflections, a musical reminiscence.

Saturday, July 23rd.—Barnel's Folly, a Devonshire comedy by Jan Stewer.

MIDLAND (297.2 m.)

Wednesday, July 20th.—Songs I Like—2, Miriam Licette.

Thursday, July 21st.—Variety from the New Hippodrome Theatre, Coventry.

Friday, July 22nd.—Reflections, a musical reminiscence.

Saturday, July 23rd.—Folk Dance Party: a programme of English Country Dances.

WEST OF ENGLAND (285.7 m.)

Wednesday, July 20th.—How to Look at a Map, a talk.

Thursday, July 21st.—Week-end Away: The Blackdown Hills, a talk.

Friday, July 22nd.—Speedway: Bristol v. Harringay, a commentary on part of the match, from Knowle Stadium, Bristol.

Saturday, July 23rd.—Barnel's Folly, a Devonshire comedy by Jan Stewer.

WELSH (373.1 m.)

Wednesday, July 20th.—Christmas Evans, a dramatic programme.

Thursday, July 21st.—Llanidloes Children's Music Festival, from China Street Schoolroom, Llanidloes.

Friday, July 22nd.—The Haslewood Diamond, a play for the radio by Arthur Watkyn.

Saturday, July 23rd.—Dance Band programme from the Craigsides Hotel Hydro, Llandudno.

NORTHERN (449.1 m.)

Wednesday, July 20th.—Music at Twilight, instrumental and vocal programme.

Thursday, July 21st.—Dialect Spelling Bee, from Northern and Western.

Friday, July 22nd.—Orchestra and organ in Handel organ concerto, from Manchester Town Hall.

Saturday, July 23rd.—Water Polo: England v. Scotland, a running commentary on part of the International Water Polo Match, from Roundhay Baths, Leeds.

SCOTTISH (391.1 m.)

Wednesday, July 20th.—Speeches at the Installation of Lord Tweedsmuir as Chancellor of the University, from the McEwan Hall, Edinburgh.

Thursday, July 21st.—Bon Accord, a studio variety entertainment.

Friday, July 22nd.—Orchestral programme, from the Concert Hall, the Empire Exhibition (Scotland).

Saturday, July 23rd.—Orchestral programme.

NORTHERN IRELAND (307.1 m.)

Wednesday, July 20th.—Band concert.

Thursday, July 21st.—Portrush night, feature programme.

Friday, July 22nd.—A Hymn recital from St. Anne's Cathedral, Belfast.

Saturday, July 23rd.—Piping, fiddling and singing programme.

“EXHIBITION”

A COMING TELEVISION PROGRAMME

It is interesting to note that although television cameras cannot travel to Glasgow, something of the spirit of the Glasgow Exhibition will, it is hoped, be captured in a special “Exhibition” programme to be televised in the afternoon on August 2nd and again in the evening on August 4th.

The Empire Exhibition at Glasgow is, in this programme, treated as the climax to the whole gamut of exhibitions since this form of public display began at the end of the eighteenth century. In a series of swift vignettes viewers will see how exhibitions have been staged since that first show of merchandise at the Castle of St. Cloud, Paris, just after the French Revolution, when an effort was made to interest the public in Sevres porcelain and Gobelins tapestry.

Queen Victoria, Prince Albert, and an almost forgotten worthy, Paxton, designer of the Great Exhibition of 1851, will appear; from this it will be a short step to the great Exhibition of 1889, which saw the erection of the Eiffel Tower; then by easy stages viewers will arrive via Wembley, and the various international exhibitions to Glasgow, 1938.

Original methods of treating cold facts have been attempted by the authors, Reginald Beckwith and Andrew Cruickshank, both of whom are familiar with the television medium. For example, to make interesting some facts and figures concerning the Crystal Palace of 1851, the television camera will alight upon a bored school boy contemplating a bowl of goldfish. From time to time his attention is attracted by the voice of the lecturer until there comes a moment when miraculously the bowl of fish is transformed into the glass structure which amazed visitors to the Great Exhibition in Hyde Park.

Models and film will help to bring the Glasgow Exhibition to life on the television screen, and an attempt will be made to portray scenes at the Exhibition with a touch of Glaswegian comedy. “Exhibition” will be produced for television by Moultrie Kelsall, himself a native of Glasgow.

A Novel Quality Receiver

Details of an Unusual Three-valve Receiver for High-quality Reproduction

WE have published several interesting circuits from time to time in these pages, and readers have submitted details of special receivers which they have built up. The accompanying circuit shows an arrangement which has been developed by Mr. Standford, of King's Lynn, and the design is very interesting from many points of view. This reader claims to be able to justify every component, both from its theoretical and practical point of view. The following are his comments regarding the components which he has incorporated in the completed receiver:

- (1) The speaker is the Magnavox Duode 33 (1,250 ohm field).
- (2) The best output transformer I have found to be the Sound Sales 036.
- (3) The smoothing choke may be any well-known make with an inductance of more than 10 henries and rated to carry 120 mA. In series with this choke there should be a resistance (to carry 120 mA) of such value that, added to the D.C. resistance of the choke, should total about

nearest point on a 16 S.W.G. aluminium chassis—a suitable size is 18in. by 12in. by 3½ in.

(10) I know of no substitute for the R.I. Micron coils in this circuit.

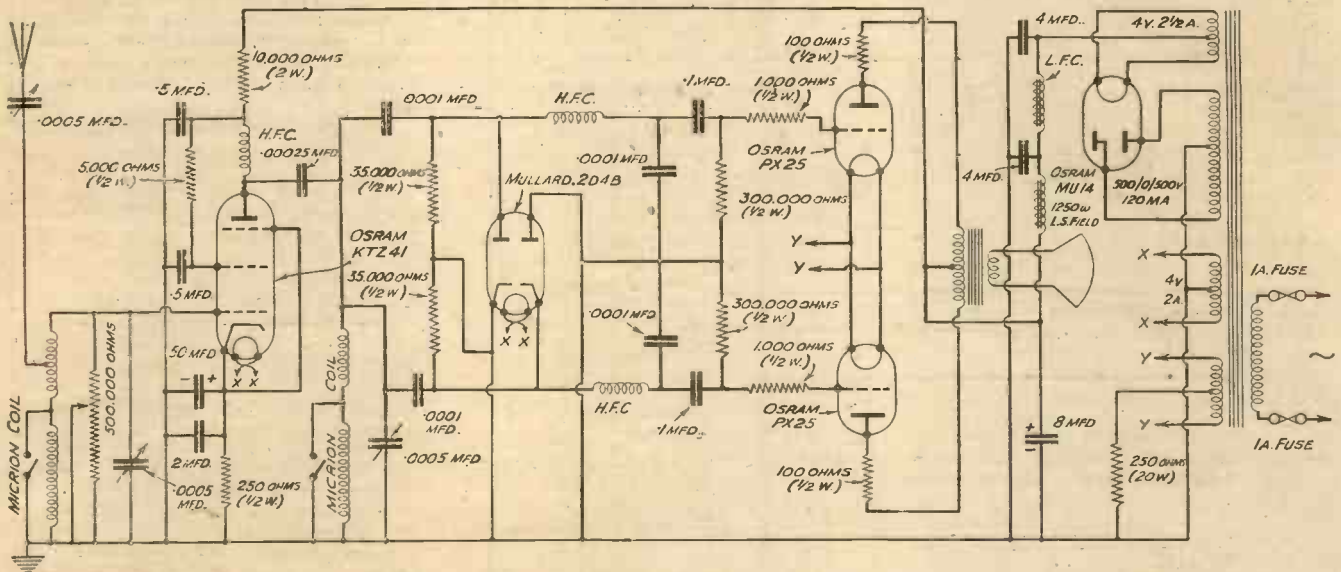
Details

There are a number of novel points in the circuit and it would be as well to enlarge upon them somewhat:

- (a) A variable series condenser in the aerial, when adjusted in conjunction with the parallel tuning condenser, gives subtle variations of selectivity and sensitivity. A two-gang tuning condenser is definitely not suitable for the two coils.
- (b) Only an Osram KTZ41 can give the large and flat output needed. It is not a valve intended for other than short-wave work, but in this circuit it is abundantly worth while. It does, however, get quite hot under working conditions, but this need occasion no alarm.
- (c) The push-pull diode detector circuit is used for the double purpose of greater sensitivity and greater output. The

and I experience no difficulty whatever on the grounds either of sensitivity or selectivity. Were I much nearer London I feel certain I could get all the extra selectivity needed (I could then afford to lose some sensitivity) by using a tapping on the intervalle coil, by reducing the intervalle coupling condenser from .00025 mfd. to .00005 mfd., and by using a fixed series aerial condenser of .00001 mfd. If this did not suffice, I would resort to band-pass (top-coupling) in the aerial input circuit but, frankly, I dislike the double-hump, whatever may be its width. However, this circuit is offered mainly for the benefit of readers similarly placed to myself—and of these there must be a large number.

"The total consumption of the set is 111 mA and the mains current consumption approximately 100 watts, and I think I can safely assert that all causes of distortion (added L.F. stages, reaction, instability, non-linear H.F. output, non-linear rectification, and valve-developed harmonics) have been reduced to the barest possible minimum. Further, the signal-to-



Circuit of the novel-quality receiver suggested by Mr. Standford.

400 ohms. A Sound Sales type H2512 choke, with no series resistance, is suitable.

(4) An indirectly-heated rectifier valve is essential. Departure from the Osram MU14 is not advisable.

(5) The common bias resistance for the output valves can well be a Bulgin wire-wound type.

(6) The critical condenser is the .00025 mfd. from the anode of the KTZ41 valve. Messrs. T.C.C. make a .00025 mfd. 1,500 volts working mica condenser, which is safe beyond all doubt and is not expensive.

(7) The three H.F. by-pass condensers (.5 mfd. + .5 mfd. + 2 mfd.) can be Dudilier non-inductive cylindrical aluminium types, LCG, LCG, and 9200.

(8) The H.F. chokes can be the Eddystone copper screened type.

(9) Screening need not be elaborate, and all earth returns can be direct to the

Mullard 2D4B is a splendid valve for this purpose. The load resistances of 35,000 ohms each are specially chosen to give the correct feeds to the output valves; and the rectification is practically perfect up to 90 per cent. modulation.

(d) The PX25 valves work at 325 volts anode minus 25 volts grid, and 50mA consumption each. Their output (combined) under these conditions is approximately 7 watts maximum undistorted. This is obtained with the 2D4B working under its maximum conditions in this circuit, and, conveniently, 7 watts is also the maximum acceptance of the Magnavox Duode 33 (1,250 ohms field) speaker.

Mr. Standford goes on to say:

"I am here roughly 100 miles each from Droitwich and London Regional (the only two stations I personally want to listen to from the point of view of entertainment),

noise ratio is very great indeed, and transients are splendidly reproduced."

NOW READY!

WIRELESS COILS, CHOKES AND TRANSFORMERS, AND HOW TO MAKE THEM.

Edited by

F. J. CAMM

2/6, or 2/10 by post from Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

THE SIMPLEST ALL-WAVER

The Conversion of a Simple Single-valve Receiver into an All-wave Set is Described in this Article

THE "Simplest Short-wave Two," described in PRACTICAL AND AMATEUR WIRELESS dated April 3rd, 1937, and which first appeared as a single-valve receiver in the issue dated September 14th, 1935, has proved so popular that there are probably many readers who would like to try the experiment of converting it into an all-wave receiver. In order to do so we will confine our attention to the detector stage as the L.F. stage needs no alteration.

There are a number of arrangements which can produce satisfactory results. Roughly, the various methods can be classed under three types:

1. Arrangements in which a number of separate coils are used, and are brought into circuit, as required, by selector switches.

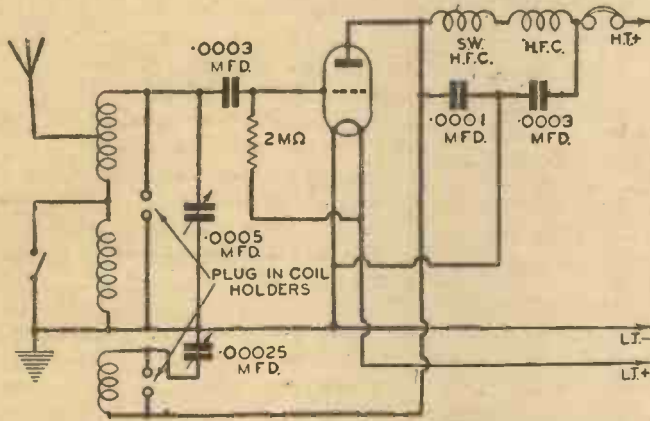


Fig. 1.—A simple scheme for an all-wave set. Plug-in coils may be added.

2. Triple-range coils, in which a number of coils are wound on one former and made to operate over at least three separate wavebands.

3. Plug-in coils, by means of which any waveband within certain limits may be covered.

There is, however, another arrangement which has received little attention, but which lends itself very well to amateur use. This arrangement is shown in Fig. 1. Here the set is a normal medium- and long-wave receiver, using a dual-range coil, while sockets are provided for plugging in coils to cover the short-wave ranges. To tune to the short waves the receiver was set for the medium waveband, and then the short-wave coil was plugged in. The medium- and short-wave coils were thus actually in parallel. This system appeared in PRACTICAL WIRELESS in November, 1933, and has been used in the circuit now to be described. Instead of plug-in coils, however, an on-off switch has been used, as being more suitable to present-day needs.

Aperiodic Aerial Coupling

It was felt desirable that provision should be made for an aperiodic aerial coupling

on the short waves, and also that a small fixed condenser should be placed in series with the main tuning condenser; this to be cut out automatically when not required on medium and long waves. Also, whatever form of switching was adopted, it was desirable to include automatic control of the L.T. current.

Simple Switching

At first it seemed that the usual more or less complicated switching would be required, but after one or two experiments it was found possible to achieve all this by using a Bulgian 10-point 5-way rotary switch, No. S.153. As this switch also

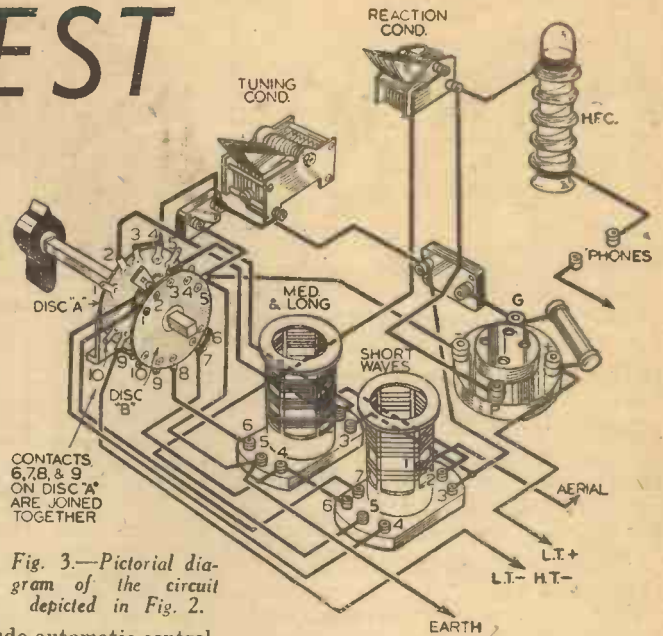


Fig. 3.—Pictorial diagram of the circuit depicted in Fig. 2.

Many readers will, no doubt, have all the material on hand, except the switch, therefore an alternative home-made one has been included which, if carefully made, will operate quite efficiently.

If the reader will now examine the theoretical and pictorial diagrams (Figs. 1 to 3) he will see that one end of the short-wave coil is permanently in circuit and all that is necessary is to join the other end to earth. Similarly, to tune in the medium waves we have simply to connect points 2 and 6 to earth. The L.T. and H.T. nega-

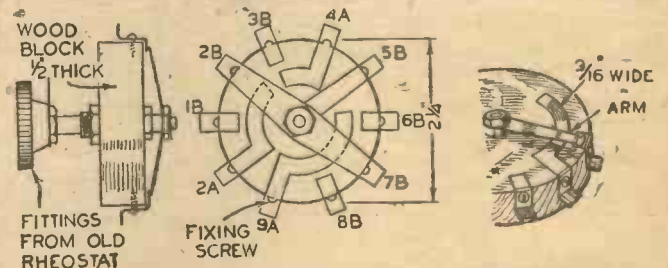


Fig. 4.—Details of the home-made switch.

controls L.T. current, the finished receiver has only three controls, viz., tuning condenser, reaction condenser, and switch.

tives are joined together, and as the switch is rotated, they, too, are joined to earth, thus completing the current circuit.

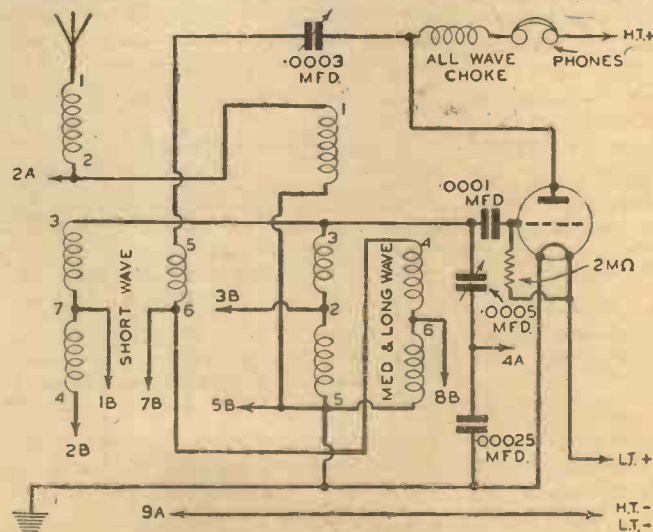


Fig. 2.—A comprehensive all-wave arrangement with self-contained switching.

The rotary switch which has five positions has provision for two short-wave ranges.

1. Short-wave range
2. Short-waverange
3. Medium waves—also shorts out of circuit a small fixed condenser.
4. Long waves—also shorts out of circuit a small fixed condenser.
5. Off position—L.T. and H.T. negative disconnected.

Components

The medium- and long-wave coil is a standard component, but it must have a separate aerial winding, while all the

(Continued on page 467.)

ON YOUR WAVELENGTH



"Communications" Receiver

I DO not know why it is that we must always borrow our technical terms from other countries, particularly English speaking countries, newer than our own. It is understandable in industries such as aviation and the motor car that we should use such words as hangar, fuselage, volplane, cabane, chauffeur, garage, and so on, because those industries were really born abroad.

In wireless, we are very fond of borrowing Americanisms and including them as part of our standard vocabulary. Such words as tweeter, woofer, toob, and so on, have been imported from America, and I am sorry to see that we are bagging their latest monstrosity "communications" as descriptive of a special type of high fidelity receiver. Apart from the paradox of the term "communications" receiver the word itself is non-descriptive of the particular features of the set. I cannot see any reason for its use, especially as there are so many dozens of other words which could be used. I therefore do not propose to use it.

The Wireless Public

AT a recent meeting of the International Broadcasting Union it was mentioned that the total number of radio receivers, according to official licence statistics, in use throughout the world was nearly 87,500,000 at the end of 1937, and allowing an average of four for a family we arrive at the total of about 350,000,000 listeners. It is considered that of the total number of radio receivers 31,200,000 are in use in Europe, representing about 120,000,000 listeners. This sounds a lot, but when you remember that the entire population of the world could be accommodated in a box having one mile sides you will appreciate that the world is a very small place. It is impossible to imagine any individual who is not a listener, if we exclude the babes and sucklings and, of course, the crooners!

Our Stand at the Exhibition

WILL readers please note that our Stand has been changed from No. 10 to No. 9. The change is one of digitation only for the site is the same as formerly. I am hopeful

By Thermion

this year that I shall meet even more readers than I did last, and I hope also that someone will claim that guinea! It will be interesting to observe the result of doing away with the cabaret, and whether the inclusion of a piano section will give a fillip to that industry. Considering that radio has so badly affected the sale of pianos, and that at the Exhibition they will be sold side by side in competition with radio sets, it would indeed seem that the lion is lying down with the lamb. The piano is still the most perfect instrument; self-contained and the only one upon which you can obtain orchestral effect. It seems such a pity that so few people now learn to play the piano.

Another Lucerne Plan

THE International Broadcasting Union has just concluded its summer meeting at Ouchy, Lausanne. These meetings, which took place under the presidency of Monsieur Antoine Dubois (Director of Nozema, Holland), were attended by sixty-six delegates representing the broadcasting services of twenty-three European countries, three American chains, Porto Rico and the Dutch East Indies, and the observers of ten European Postal - Telegraph administrations; by the Japanese Postal-Telegraph administration, the Bureau of the International Telecommunications Union at Berne, the International Institute of Intellectual Cooperation and by the Section of Communications and Transit of the League of Nations.

In the course of the meeting the Greek broadcasting service and the Spanish Republican broadcasting service were elected active members of the I.B.U. In addition the following associate members were elected: the Argentine Government station LRA of Buenos Aires; the broad-

casting service of the Department for Press and Propaganda attached to the Mexican Foreign Office and the Mutual Broadcasting System (United States). The broadcasting service of General Franco's administration was admitted as a special member.

The meetings had a particular importance owing to the fact that the World Telecommunications Conference, which was held in Cairo last spring, had invited them to draft the basis of a plan for revising the wavelengths for European broadcasting with a view to a conference of P.T.T. administrations to be held in Switzerland next year. Preliminary discussions to this end took place in the Technical Committee in regard to certain fundamental points of this plan which will be definitely elaborated by the I.B.U. during its Brussels meeting next October.

The agenda of the Technical Committee, under the presidency of Monsieur Raymond Braillard, Director of the Brussels Checking Centre, included the preparation for the European Broadcasting Conference to be held next February in Switzerland with a view to revising the plan of Lucerne which at present controls the allocation of waves to European broadcasting stations.

As regards broadcasting on short waves, the President of the Technical Committee was asked by the Council, following the wish expressed by the Cairo Conference, to draw up a memorandum containing all useful information regarding the present aspect of the question, with a view to a possible world conference on short-wave broadcasting.

The Technical Committee has informed the Council of the results of its studies concerning certain acoustical questions and in particular the revision of the Vienna Convention standardising the pitch of the note "la," used internationally as a tuning note for orchestras, and suggests for this purpose that a new conference should meet as soon as possible in co-operation with the International Acoustical Committee.

The Technical Committee has studied certain questions in connection with telephone lines intended for the transmission of broadcast programmes and those of television and has submitted its proposals to the

International Consultative Telephonic Committee which has been asked by the administrations to study these problems.

Finally, it has noted the report of the Director of the Checking Centres indicating the excellent effect of the transfer of the service to the new building specially built at Brussels, which will enable it to increase its efficiency for checking, on an international basis, broadcast transmissions, a work which it has carried on for the last eleven years.

The question of the unauthorised recording of broadcast transmissions with a view to selling such recordings to the public—a practice which has unhappily developed in certain countries where the legislation does not seem able to check it—was the object of considerable study. The various possibilities of obtaining international protection for broadcast transmissions against any unauthorised recording were examined and measures were immediately taken to organise a campaign against such utilisation of transmissions.

Jubilee

ON Saturday, July 23rd, will be celebrated the 50th anniversary of the Pneumatic Tyre invention, for it was on that date in 1888 that Dunlop filed his famous specification. Those who lived in the early days of air tyres did not realise that they were living through history, any more than we realise that we are living through radio history. Amazing inventions sneak up on us, and we don't realise their significance. I suppose that it takes a few decades to mellow a thing; some of us look back on the early days of radio with feelings of veneration. We like to refer to them as the good old days, forgetful that at the time we probably considered them very bad days. I suppose that it is a sign of old age to presume that things are not so good as they were, when as a matter of fact they are progressing all the time. Much as we may criticise modern radio, it is superlatively better than the radio of 1922 vintage. It is of little avail to live in the past. It looks very picturesque to see a stage coach on the roads to-day, but business would be impossible without the Underground, the bus, motor-cars and trains. It may be nice to think of Shakespeare's Open Air Theatres, but we all enjoy the covered comfort of the modern theatre. We like to look back upon our early days in radio, but we must all admit that we prefer 2-volt valves to 6-volt, a wide choice of programme instead of only one

Notes from the Test Bench

Chassis Connections

DIFFICULTY seems still to be obtained in making satisfactory earth contacts on a metal chassis. Quite a number of receivers which fail to give good performance are eventually found to be faulty simply because of poor earth contacts. A very good plan to avoid this trouble is to make only a few common earth points, using a holding-down bolt for a component as the anchoring point. If aluminium is employed for the chassis a burr should be left when the hole is drilled and the tag should be placed immediately on this—that is, without washers or any other metal between chassis and tag. Then, when the lock-nut is tightened up the metal will spread, the sharp points will penetrate the tag and a sound contact will be obtained. If possible, one such point should be provided for each stage, and all earth connections should then be taken to the appropriate tag.

Earthed Spindles

A CASE was recently experienced where a constructor had substituted a volume control of alternative make and had ruined three valves. The reason was that the spindle in the specified component was insulated from the component and was, in an electrical sense, "dead." Certain volume controls and potentiometers now on the market have the spindle "live"—that is, the moving arm is in direct electrical contact with the spindle and mounting bush, and accordingly, if it is mounted on a metal panel which is earthed there is a risk of damage, or at the very least the component will be shorted and will not function. This point should, therefore, be borne in mind when mounting any control of the type mentioned on a metal panel.

Modifying Coils

IN an endeavour to modify the tuning range of a coil a constructor connected various fixed condensers in parallel and series, with complicated switching. Such a scheme is not advisable, as maximum signal strength is obtained with a definite L/C ratio and in most cases it will be found preferable to remove turns to enable a tuning range to be lowered, or to add turns to enable it to be raised. On the medium and short waves it will be found in most cases that maximum volume is obtained with the minimum parallel capacity and thus the inductance should be as large as possible for the wave-range which it is desired to cover.

or two. It may have been exciting in those days to wait for Writtle's weekly half-hour programmes, and we may like to talk of 2MT. It may impress the more youthful hand, and perhaps our knowledge of those early days makes us better judges, even if more critical. There is only one thing which was better in those days—we did not have to suffer crooners with diseased throats, raving lunatic band conductors, jazz and spelling bees. By means of radio we have no doubt learned how the other half lives. The experience, however, has not been altogether pleasant. The Yankee method of pronunciation, and the gross liberties they take with our language, hurt the English ear. Notwithstanding all this, radio is vastly better to-day and it will be still better 20 years hence.

Car Radio

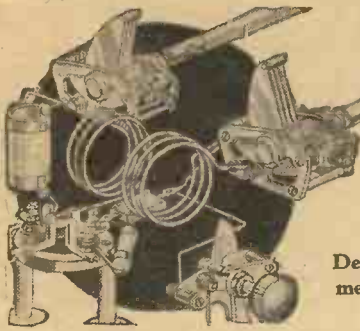
A QUERY I frequently receive relates to licences for car radios. If the car radio is installed in the car you require an extra receiving licence. If it is a portable receiver which may be removed from the car you do not require another licence. Thus it would seem that car radios are subject to a 10s. tax. Personally, I think that it is wrong, and is operating against the popularity of car radio.

Another Listeners' Vote

CARRYING its researches a stage further, the B.B.C. is now inviting listeners to name the kinds of programmes they like and to answer some questions about summer listening habits.

The questions are set out on a special form which will be sent to every listener who applies for it; all that is needed to secure it being a postcard bearing the listener's name and address and the number of forms required. Listeners willing to help the B.B.C. in this fresh effort to discover what listeners want are asked to address their postcards to the B.B.C., Broadcasting House, London, W.1, and to write the word "Questions" in the bottom left-hand corner.

On one side of the coloured forms which will be sent to all applicants is a list of twenty-one types of programme, ranging from orchestral music to running commentaries on cricket, and listeners are asked to put a cross against the kinds of programme they like. Alongside is a big space for listeners' remarks. On the other side of the form are three questions about summer listening and a special question for those who like serious opera.



Short Wave Section

SIMPLE 5-METRE CIRCUITS

Details for the Construction of a Simple Under-10-metre Receiver or Adapter, with Instructions for Making the Coils and H.F. Choke.

It appears that comparatively few experimenters yet take a really active interest in the wavelengths below 10 metres. One reason is that they are not at all sure that there is anything worth while to listen to, another is that the fact that television receivers are of a rather complicated nature leads them to believe that an ultra-short-wave receiver of any type must be similarly involved, and another is that they are under the impression that a suitable set for reception must be expensive.

All of these are fallacies. Many amateur transmitters in all parts of the country regularly work on the 60 megacycle (5-metre) band; if you do not believe this, just listen to some of them on 20 and 40 metres on Sunday mornings, when you will frequently hear them discussing 5-metre work and telling each other when next they are to carry out tests on the ultra-high frequencies. It is true that the range of reception is usually limited to the so-called optical range, but that gives added interest to any "freak" reception over greater distances and adds a little more of the "spice" with which S.W. work abounds.

Simplest Circuit

The complication of a television receiver is largely due to the fact that it consists of two sets in one—one for sound, the other for vision—as well as powerful amplifiers and the time-base; the two last mentioned are frequently far more involved than all the rest of the outfit. It is a fact that a very simple type of receiver is capable of providing extremely interesting results, especially if a little care is taken to keep the design "clean" and to find the most effective aerial system. For example, a super-simple circuit such as that shown in Fig. 1 is perfectly satisfactory in normal conditions, whether it is used as a single-valve receiver or as an adapter in conjunction with an amplifier or existing receiver. When used with a receiver it can be connected to the pick-up terminals if the pick-up bias voltage is cut down to zero.

It will be seen that a three-turn aerial winding is used, and this should, for preference, be connected to a dipole or doublet aerial. Alternatively, the lower end can be connected to earth and a normal aerial (better still a short-wave aerial) joined to the upper end through a neutralising condenser or an air-dielectric trimmer. The grid coil is a five-turn component with centre tapping joined to the earth line. The full coil is tuned by means of a good-quality tuning condenser with a maximum capacity of between 20 and 50 mfd., and fitted with a good slow-motion drive. Reaction is controlled by means of a similar variable condenser, but preferably with a maximum capacity of not less than 45 mfd., and also fitted with some form of slow-motion control.

Output Feed

The H.F. choke should be of the special ultra-short-wave pattern, and details of

construction will be given later, as also will particulars of the coil. Other components are standard. Although resistance-capacity output feed is shown, this is not essential, but it is desirable, because it helps to isolate the phones or amplifier from the anode circuit of the U.S.W. unit. Another method of feeding phones is shown in Fig. 3, where it will be seen that a standard de-

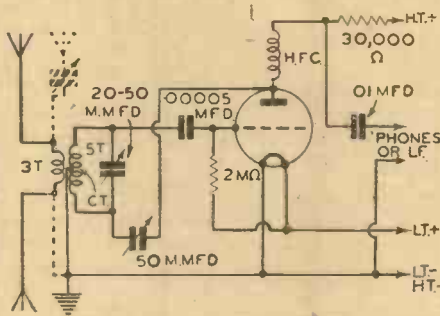


Fig. 1.—Theoretical circuit diagram of a super-simple single-valve short-wave receiver.

coupling circuit is employed to prevent instability.

Baseboard Construction

Component layout is more important than the actual circuit, but this is perfectly straightforward, and the only precaution to be taken is that all leads are short and direct, and that everything is rigid; it will be appreciated that slight vibration of wires or coil turns can easily cause "tuning flutter" to such an extent that reception is impossible. The parts can well be placed on a small wooden baseboard as suggested in Fig. 2. If the coils are wound on paxolin tubes and do not require a connector base,

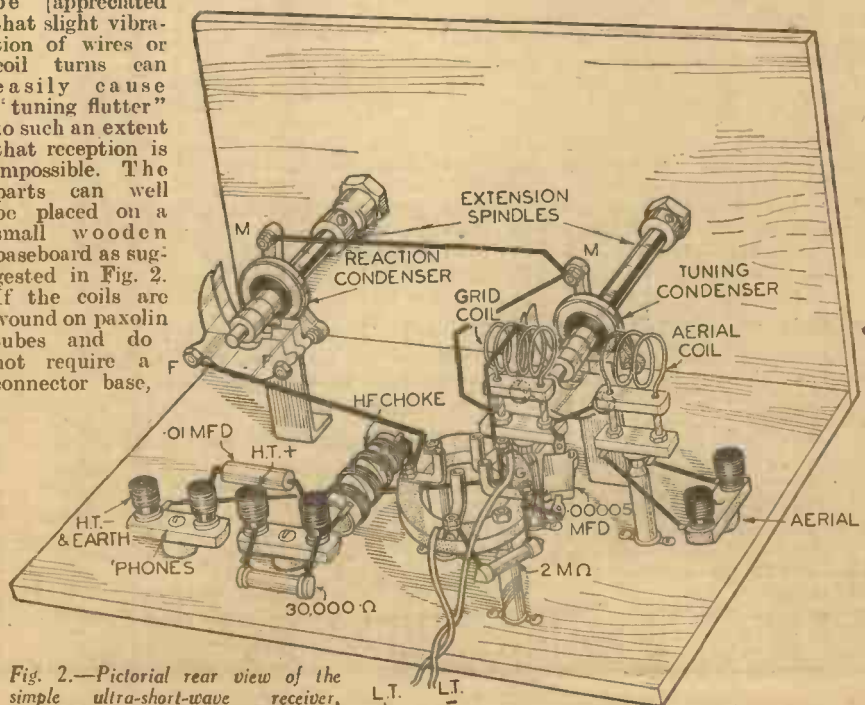


Fig. 2.—Pictorial rear view of the simple ultra-short-wave receiver, showing layout of components.

the ends can be attached directly to the terminals of the tuning condenser. If they are of the type requiring connecting sockets, the sockets should be mounted on small pillars or wooden blocks so that they are as near as possible to the condenser terminals.

There are plenty of ready-made coils available in various types, and any is suitable for this circuit. If they are to be home-made it is best to use 16- or 18-gauge bare tinned copper wire, winding this as tightly as possible on paxolin tubes about 3/16 in. in diameter. The turns should be spaced about 1/16 in., and it will usually be found best to anchor the ends by means of metal clips pushed through the tubing or by tying with thinner wire passed through holes in the tube.

When using this form of construction, the principal difficulty is to prevent the turns from springing open. For this reason it is often better to wind the wire on a 1/4 in. rod, allowing the coil to spring back to roughly 1/8 in. in diameter, and then to clamp them by means of a couple of fibre- or ebonite strips, notched to receive the turns and held together at the ends with short bolts and nuts.

Silver-plated Coils

The best form of coil is that made from silver-plated copper tubing. This is perfectly rigid, whether the ends are fitted to a two-pin plug or to a steatite base with soldering tags. In either case it is a simple matter to ensure that the connections are short. In addition to the slightly greater efficiency of the silver-plated tubing over solid wire there is the further advantage, when the coils are of the plug-in type, that they can easily be interchanged to cover two or three wavelength ranges between, say, 4 and 10 metres. If desired, they can, in fact, be replaced by coils wound to tune to the normal short-wave bands.

H.F. Choke

If it is desired to make the H.F. choke, this can be done quite easily by winding about 40 turns of 30-gauge enamelled wire on a paxolin or glass tube from 1/4 in. to 3/16 in. in diameter. Arrange the winding in four

(Continued on next page)

(Continued from previous page)

sections of five turns each, spacing these about $\frac{1}{8}$ in. apart. The spacing is to reduce the capacity as much as possible.

The ends of the winding can be brought out to small terminals fitted to the ends of the tube, although it is rather better to use soldering tags held in place with small rivets. The ends of the winding can be soldered to the rivet heads, connecting leads being soldered to the tags. This method of making connections is preferred because of the lower capacity provided when the choke is fairly near to other components, particularly those in the grid circuit. It will be understood that terminals, being of greater surface area, can form a condenser of greater capacity than tags.

Tapping the Coil

It will be seen from the circuit that a tapping is made to the centre of the grid coil, and this should be made by soldering a length of stout-gauge copper wire or tinned-copper wire to the middle of the winding. Take reasonable care to make the connection exactly in the centre, because this position is most satisfactory; it is scarcely necessary to emphasise that an error of $\frac{1}{16}$ in. in finding the centre is fairly appreciable in a winding only about 10 ins. long.

The valve may be of almost any type, but an H.L. or L type is as good as any. It should be fitted in a good short-wave valveholder which may be mounted on insulating

pillars, which are made in various lengths by manufacturers of short-wave components such as Eddystone, B.T.S. and Bulgin. The insulators cost only a few pence each, and are better than wooden supports for both the valveholder and the coils.

Suitable Aerials

Despite the fact that almost any type of reasonably efficient aerial can be used, it

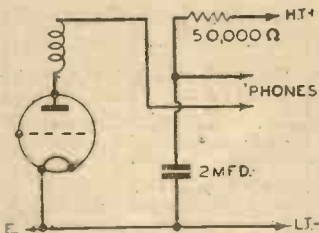


Fig. 3.—Showing an alternative method of feeding the phones.

is certainly worth while to experiment with a few simple patterns with a view to finding that which is most suitable in the particular circumstances and location. A doublet with 8ft. arms and cross-feeder type of lead-in is generally as efficient as any, and can be erected horizontally, vertically or at an angle. It is still better to use a couple of 8ft. copper tubes clamped

between two blocks of teak, or to use one of the various 5-metre aerials of this type which can be bought ready for erection.

Directional Effects

One important advantage of this type of aerial is that it can be mounted on a short pole or clothes-prop in such a manner that it can easily be turned to different angles. It is often found that useful directional effects can be put to good use by orientating the aerial in this way, and it will nearly always be found that optimum signal strength from one particular transmitter is obtained with the aerial in one, fairly critical, position. Those who are fortunate enough to be within about 25 miles of Alexandra Palace can make some interesting tests by using the transmissions from there as "test signals," since they are of sensibly uniform strength.

Even when using a doublet aerial it will be found worth while to try it in a few different positions. In all cases it should, of course, be as far away from walls and trees as convenient, whilst it is wise to keep it as far as possible away from main motor roads; the ignition system of cars and heavy motor vehicles are powerful "transmitters" on the ultra-short waves.

Apart from a superhet the super-regenerative circuit is probably the most efficient on the ultra-short waves, but this is rather more expensive to build and is not as convenient for the newcomer to 5-metre work as that described.

Leaves from a Short-wave Log

Vatican City on Various Channels

HVJ, Vatican City (Italy), is trying out new frequencies. On weekdays a broadcast is still regularly made on 19.84 m. (15.12 mc/s) between G.M.T. 15.30, 15.45. From 19.00-19.15, the 50.26 m. (5.968 mc/s) channel has been abandoned in favour of 49.75 m. (6.03 mc/s). On Sunday morning at G.M.T. 10.00 religious music and an English talk are now given on 31.41 m. (9.55 mc/s).

Hawaii Calls

A SPECIAL broadcast made through KKP, Kahuku, on 18.71 m. (16.03 mc/s), each Monday morning from G.M.T. 01.30, has been made a regular feature for relay through the Columbia Broadcasting System network throughout the U.S.A.

Albania on Short Waves?

It is reported that a 3.5-kilowatt transmitter is to be installed in the vicinity of Tirana. So far, Albania has not possessed a broadcasting service.

Better Signals from Brazil

ALTHOUGH sharing the same channel as COCO, Havana (Cuba), in the earlier evening hours, namely, from G.M.T. 21.00, the radio programme provided by the Radio Club of Pernambuco can be heard at good volume through PRA8, Recife (Brazil) on 49.92 m. (6.01 mc/s). Identification of the broadcast is facilitated by the five bell-like notes struck at intervals. The power of the transmitter is now 5 kilowatts.

Listen to South Africa

ZRJ, Johannesburg, on 49.2 m. (6.097 mc/s), now works daily from G.M.T. 04.45-16.30 with programmes both in English and Afrikaans (Cape Dutch). The 7-kilowatt Pretoria station ZRH, at Roberts Heights, for its broadcast from G.M.T. 04.45-12.30 uses the 31.5 m. (9.523 mc/s) channel, changing over to 49.94 m. (6 mc/s) for the evening session from G.M.T. 15.00-21.00. ZRK, Cape Town, of which the 7-kW transmitter is at Klipheuvell, the centre of the Wireless Telegraphy and Telephony system of the Union of South Africa, is on the air on 31.23 m. (9.6 mc/s) from G.M.T. 04.45-16.45, and again on 49.2 m. (6.1 mc/s) from 17.00-21.00, with programmes alternately in English and Cape Dutch. Finally, ZRD, Durban, on 48.8 m. (6.15 mc/s), operates from G.M.T. 04.45-05.45; 08.30-12.30, and 14.00-20.45 or 21.00 on weekdays, and on Sundays from 13.00-16.30 and 17.00-20.00. Although only rated at 10 watts the broadcasts have been heard in Great Britain. Small experimental stations are also operated at Salisbury and Mafeking.

The 61-Metre Band

THE short-wave band over 60 metres has become an interesting one for DX searchers inasmuch as to this position a number of South American short-wave stations have recently moved whilst seizing the opportunity to increase their power. A recent sitting provided many additions to the log. HJ3ABH, Bogota (Colombia), on 61.22 m. (4.9 mc/s), *La Voz de la Victoria*, may be identified by its three chimes reminiscent of the N.B.C. (U.S.A.). The studio closes down towards G.M.T. 03.00 with Schumann's *Träumerei*. On 61.35 m. (4.89 mc/s) will be found the new 5-kW station YV1RX, Maracaibo (Venezuela), and on 61.48 m. (4.88 mc/s) another 5-kilowatt, HJ4ABP, Medellin (Colombia), *Emisora Philco*, now moved up from 48.9 m. (6.135 mc/s). The recently constructed HJ3ABO, Bogota (Col.), is also testing on 61.6 m. (4.87 mc/s). HJ1ABE, Cartagena (Col.), with its bugle call and rendering of a Sousa march every hour, remains a regular signal on 61.73 m. (4.86 mc/s), whilst HJ3ABD, Bogota, calling *Columbia Broadcasting*, may be picked up on almost any night on 61.9 m. (4.84 mc/s). On 62.11 m. (4.83 mc/s) HJ1ABD, *Ondas de la Heroica*, has been identified by an announced address: Apartado Postal, 252, Cartagena (Colombia). HJ7ABD, Bucaramanga (Col.), previously logged on 51.17 m. (5.853 mc/s), now appears to be testing on 62.24 m. (4.82 mc/s). This studio gives a bugle call followed by a series of chimes. Slightly above, on 62.37 m. (4.81 mc/s), HJ2ABA, Tunja (Col.), has also been logged with its slogan: *Ecos de Boyaca*. Transmission times announced corresponded to G.M.T. 18.00-19.00 and 00.30-02.30. Power is 5 kilowatts.

HJ2ABC, Cucuta (Col.), moved up from 31.34 m. (9.572 mc/s), is now firmly established on 62.63 m. (4.799 mc/s). Interval signal: 5 notes (C, D, E, F, C). Has been heard working to G.M.T. 03.30.

And, finally, HJ1ABB, Barranquilla (Col.), with its three deep gong tone notes, is now on 62.75 m. (4.78 mc/s).

WIRELESS COILS, CHOKES AND TRANSFORMERS, AND HOW TO MAKE THEM.

Edited by F. J. GAMM.

2/6, or 2/10 by post from Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

A PAGE OF PRACTICAL HINTS

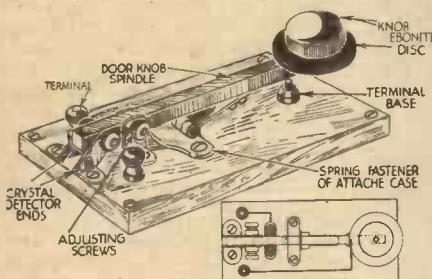
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Simple Morse Key

I HAVE often desired an efficient morse key, but was unable to afford to buy one. However, I have managed to construct one for myself.



A simple but efficient morse key.

The accompanying sketch clearly shows the required necessities. The baseboard is made of an old crystal tuning coil, with spring of a disused attaché-case fastener, and the bar is a door knob spindle.—DAVID JONES (N.W.6).

Keeping Soldering Irons Tinned

ELECTRIC soldering irons sometimes get a little too hot, and the solder on the iron becomes covered with a coating of oxide. This nearly always happens when the iron is left for a short while, so to prevent this I kept the copper bit immersed in solder. How this was done is illustrated in Fig. 1, and the tinned part of the bit is thus kept covered with the molten solder, and remains well tinned.

Before I used an electric iron I heated my old bit with the point in the solder. This was done by heating the crucible in which the bit was resting. The crucible is a narrow one, to avoid wasting the heat.

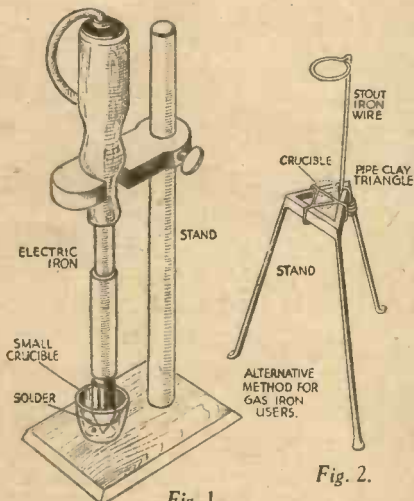


Fig. 1.

A novel method of keeping soldering irons tinned while in use.

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-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." DO NOT enclose Queries with your wrinkles.

SPECIAL NOTICE

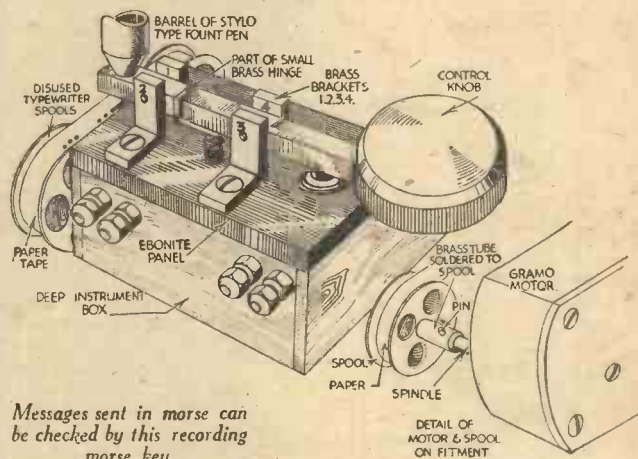
All wrinkles in future must be accompanied by the coupon cut from page iii of cover.

The crucible is held in place by a pipe-clay triangle (Fig. 2). A piece of thick wire is twisted round the iron support with the loop for holding the handle of the iron. I heated the crucible with a blow lamp, but any convenient source of heat is suitable. This method also keeps the iron nicely tinned. The crucibles can be obtained from any chemist.—J. A. PAYTON (Oundle).

A Recording Morse Key

I RECENTLY made the morse key illustrated, and I thought that the use of a record for checking the message sent would be helpful. I managed this by using a gramophone motor, two disused spools from a typewriter, and a stylo fountain pen. The contact bar was cut, and a small hinge soldered to each end giving the play necessary for the movement.

Two extra brackets (1 and 2) were screwed into position, and the pen fitted. The spools of paper are kept continually moving by the gramophone motor, and the paper is kept in close contact with the pen by two round pegs driven in the side of the box. By pasting the paper tape to the sheet of paper I have a record of progress.—A. WARD (Edgware).



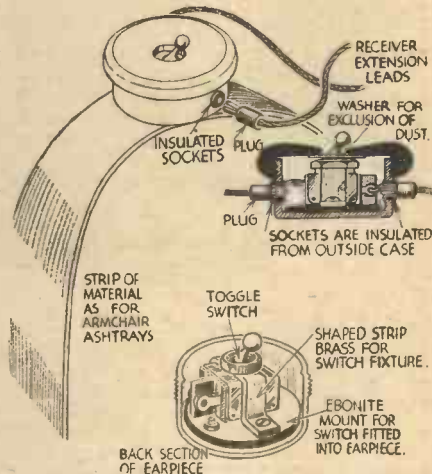
Messages sent in morse can be checked by this recording morse key.

An Extension Switch

A DETACHABLE switch and mounting were made for extension purposes in the following way. An earphone was dismantled, and the case only used, the coils, etc., being put on one side for future use.

A piece of ebonite is cut to fit into the base of the carpiece, and a toggle switch is fitted to it by means of a piece of brass strip

bent to shape, as shown. The whole is dropped into the casing and bolted into place, soldered connections being made to



A handy switch arrangement for extension purposes.

insulated sockets in the side of the case, and plugs attached to extension leads. A thin washer can be placed over the dolly of the switch to prevent dust, etc., getting inside. The finished switch and mount is fastened to a piece of leatherette in the manner of armchair ashtrays, and enam-

elled to match the colour scheme of the furniture.—W. EMERSON (Huddersfield).

EVERYMAN'S WIRELESS BOOK

By F. J. CAMM

3/6 or 4/- by post from Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2

AUTO-TUNING

Suggestions for Conversion
Selection of a Few Stations

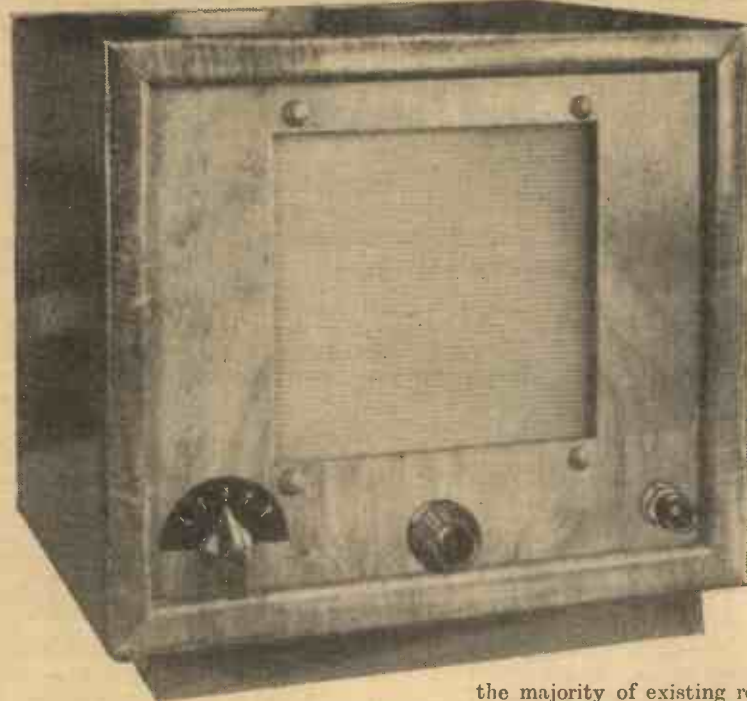


Fig. 1.—A simple automatic receiver in which station selection is carried out by means of a rotary switch.

THIS season's commercial receivers will feature mainly the push-button or dial method of tuning, and will consequently appeal to the non-technical members of the family. The idea is not new, as we have already explained, but the housewife who is at home all day will undoubtedly find that a receiver in which the operation of a switch or a button selects a station, without the problem of finding the right spot on the dial, is not only a time-saver, but also an advantage. Many housewives fail to use the standard domestic receiver as often as they would prefer, simply because they are rather confused

the majority of existing receivers so that the advantages of automatic tuning may be incorporated, and although it is obviously impossible in a single article to explain how every individual receiver may be modified, the following instructions will serve to indicate the lines of procedure, and from them it should be possible to make the adjustments to most standard receivers.

Buttons or Switches

The manufacturers are not yet able to supply complete push-button units which may be built into a receiver, but as soon as they become generally available they will be described in these pages. Consequently, the constructor must make use of switches for station selection, and whilst these will operate in just the same manner they have the disadvantage that when a change of station is needed the switch in use will have to be returned to its original position before the new switch is operated. This is the only drawback to the use of standard toggle switches. It is not a difficult matter to follow this point, however, as should a new switch be operated without the former one being set back the station will not be received and a glance will show that more than one switch is in the "On" position. For a simple receiver the ordinary on-off or two-point switch may be used, and naturally with such a receiver only two or three stations will be heard. With a more ambitious receiver, where about half-a-dozen stations or more can be tuned in, more than one tuning circuit will be in use, and thus multi-point switches will have to be used. Bulgin four-point toggle switches, type S.88, will enable four circuits to be switched, but care will have to be taken to avoid interaction where an H.F. and Detector stage is controlled on one switch.

Where three or more circuits are to be operated, or where the risk of interaction is to be avoided without modifying the wiring, the multi-contact rotary type of switch should be employed and this will actually enable a neat automatic receiver to be built up on the lines of that illustrated in Fig. 1. This is a five-station set of the superhet type, with a volume control as

the only additional panel device. The set is switched on and off by the right-hand control and the appropriate station selected by a ganged rotary switch of the Bulgin S.154 type.

Circuit Arrangements

To make the use of these switches perfectly clear we show in Fig. 2 to 7 the method of use, and in each case it should be noted that a switch or a contact for "manual" control may be provided so that the normal tuning condenser may be retained for normal operation. In Fig. 2, two ordinary on-off switches are shown, the one marked "M" being used for manual operation, or in other words switching in

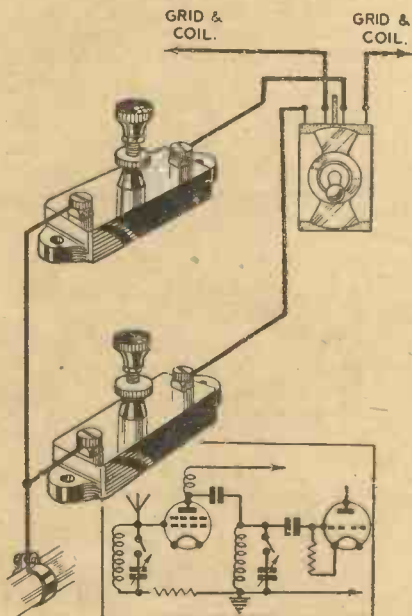


Fig. 2.—A simple scheme in which ordinary on/off switches are employed. Only two are shown, but any number may be used.

by the number of controls, or are uncertain just how to set the tuning indicator. Fortunately, it is a simple matter to modify

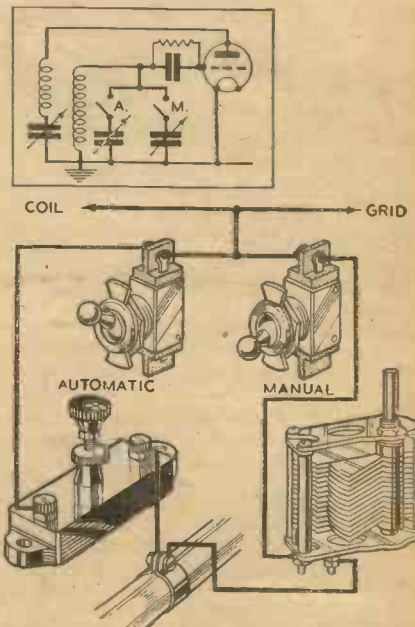


Fig. 3.—For tuning more than one circuit, combination switches of this type may be employed.

the ordinary variable condenser. This is a simple detector circuit and the reaction control would be brought out as a panel control merely to increase the strength of a weak station should it be required. The second switch brings into circuit an ordinary pre-set condenser with a maximum capacity of .0005mfd. or .0003 mfd., and this should be adjusted to one of the stations it is required to hear. The lock-nut attached to the adjusting screw of the pre-set should be tightened when the station is accurately tuned, so that it will not move and upset the adjustment. A similar pre-set and associated switch should be provided for each station which can be obtained, and all the switches may be placed in a neat row on a small bakelite or ebonite panel inset into the cabinet on the lines shown in the cover illustration this week. If desired, to simplify matters the manual control switch may be placed apart so that it will not be overlooked when it is desired to change from manual to automatic.

FOR AMATEURS

Existing Receivers for the Automatic

By W. J. DELANEY

Switching Several Circuits

In Fig. 3 a two-circuit device is indicated, and the Bulgin S.88 switch is shown here. Although the two pre-sets for each station are here shown in a line they may, of course, be placed anywhere on the chassis, preferably close to the coils which they tune, and the leads run by the most direct route to each condenser. Some

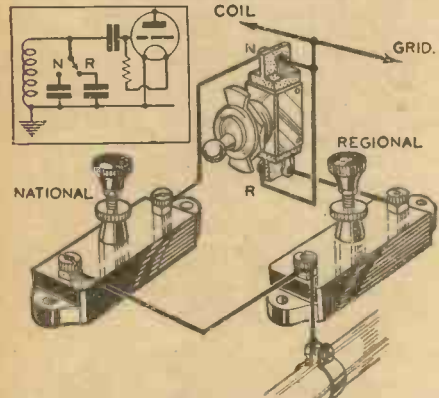


Fig. 4—A change-over switch to bring in the required pre-set.

shielding may be found necessary, but where possible it should be avoided as it will raise the capacity and in some cases may prevent the condenser from tuning low enough to obtain the required station. A similar scheme to this may be employed in a simple superhet, which will require two or three tuned circuits, but in this case the oscillator

tuning condenser must be carefully placed as it must not be capable of interaction with the remaining circuits.

Change-over Switch

It may be thought desirable in some districts merely to provide two stations for normal use, say, the National and Regional. In this case the matter is simplified and a simple single switch of the change-over type may be employed. In Fig. 4 is seen how such a switch should be wired for a simple circuit of the type indicated in Fig. 2, one pre-set being connected to each pole of the switch. In this case, of course, manual control is not available unless a separate on/off switch is used to bring into action the change-over switch, and this could be effected by a separate switch as shown in Fig. 5.

Plug and Socket

There is a further scheme which will avoid the necessity for returning a switch when a change is desired, and which will

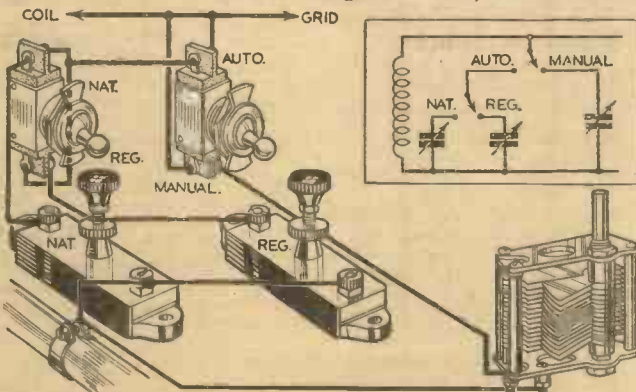


Fig. 5—A change-over switch to bring in auto or manual tuning.

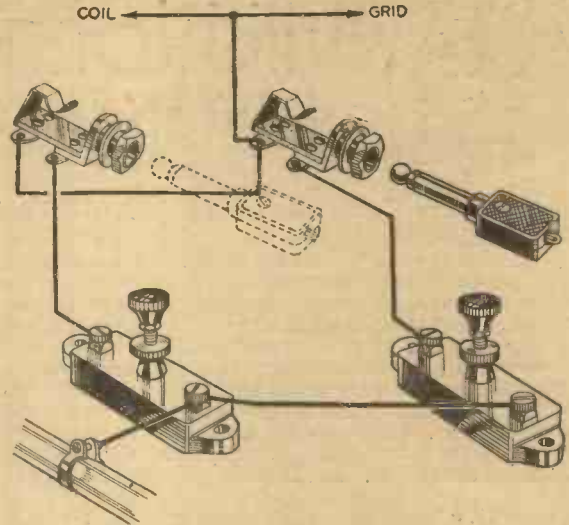


Fig. 6—Using jacks and a plug instead of switches. This scheme may be used to prevent unauthorised use of the set.

ensure that all difficulties are removed. This consists of the plug-and-socket method of connection, and is illustrated in Fig. 6. For this ordinary single-circuit jacks are needed and these cost slightly less than the ordinary toggle switches. Used in conjunction with them is an ordinary jack plug and this should be provided with a short-circuiting wire, and the jacks should, of course, be arranged in a row fairly close together as in the case of the switches. One contact on each jack should be joined to a condenser and the frames of each jack connected to earth. For manual control a separate jack may be provided and wired as shown in Fig. 7. The jack may be left in any plug, according to the station being received, and if it is desired to safeguard it against loss two short lengths of flex may be attached in place of the shorting wire and these may be anchored inside the receiver at a shorting strip of metal.

In view of the fact that the pre-set may work out of adjustment due to vibration or atmospheric conditions, a good plan is to mount all the condensers on a strip in such a position that the adjusting screw

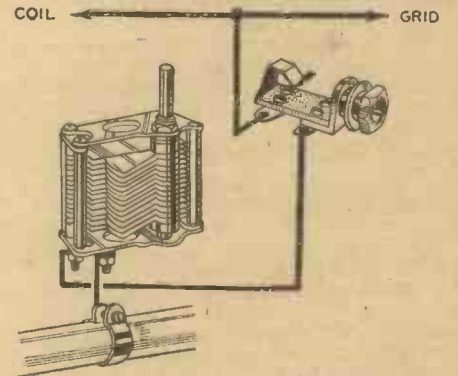


Fig. 7—A separate jack enables manual tuning to be used.

may be easily accessible through holes in the cabinet or panel. Then an ordinary screwdriver may be used, as desired, for readjusting those which require it.

At least one of the ideas mentioned should be found applicable to the various types of receiver now being used by our readers.

TELEVISION at RADIOLYMPIA

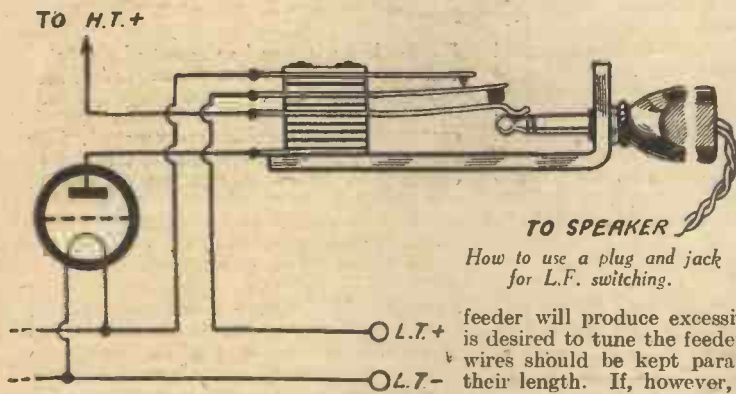
AS each individual television receiver manufacturer has this year to make his own viewing arrangements within the allotted stand space at Radiolympia, it is not yet known how satisfactory these will be when compared with other attempts on a more general scale. One thing will have to be studied carefully, however, and that concerns the correct viewing distance to do justice to the reproduced results on the varying sized screens. It is hoped that there will be no limitations of space which will necessitate some of the distributed audiences witnessing pictures when too close to the set. It is well known that if an artist's painting is seen at close range, almost all the brush marks will be apparent, and quite a wrong impression given of the picture's value. To anyone seated in the front rows of a cinema the figures on the

screen become quite out of proportion, while scratches or defects on the film's celluloid surface are grossly magnified and tend to destroy much of the pleasure secured under more favourable circumstances. It is the same with television receivers. Although, comparatively speaking, the pictures themselves are not very large, since they are traced out at high speed by a series of lines of varying intensity along their length, it is important for the correct viewing distance to be ascertained so that the normal texture of the lines is not visible. This adds in quite a large measure to the enjoyment furnished by this miracle of modern science, and as a general rule a minimum of six to eight feet has been found satisfactory for home viewing to secure the best pictorial effect. The question of light is not so important.

The British Long-Distance Listeners' Club

Speaker-phone Connections

A MEMBER who is keen on logging American stations sits up until the early hours of the morning and finds that at times the volume from the loudspeaker is so great that there is a risk of annoying sleeping members of the household. He wishes to use 'phones in a simple manner so that during normal hours it will be possible to put those stations which are good enough on the speaker. Obviously the best plan in such a case is to use the plug-and-jack method of connection. In the accompany-



Aerial Feeders

THE use of twin feeders for ultra-efficient dipole and similar aerials is becoming more general. A member is experimenting with the television transmissions and has noted that the impedance of the lead has been mentioned in various reports and he has accordingly been trying various types of lead to obtain different surge impedance values. He asks if there is any data on the subject. The following short table gives the spacing, in inches, of two leads to obtain various surge impedance

values and perhaps this will be of interest to other members who are experimenting in this direction. When using twisted feeders they should not be tuned, as standing waves on the

feeder will produce excessive losses. If it is desired to tune the feeder, then the two wires should be kept parallel throughout their length. If, however, the feeder has to turn the corner of a house or make an angle for any reason, or if it has to run close to a large, earthed body, then the twisted arrangement should be employed.

Wire Gauge	200 ohms	300 ohms	400 ohms	500 ohms	600 ohms
8	.42	.987	2.25	5.26	12.1
10	.380	.783	1.81	4.17	9.61
12	.340	.621	1.44	3.31	7.62
14	.213	.493	1.14	2.62	6.04
16	.189	.391	.903	2.08	4.79
18	.134	.309	.716	1.65	3.50
19	.106	.264	.568	1.31	3.01

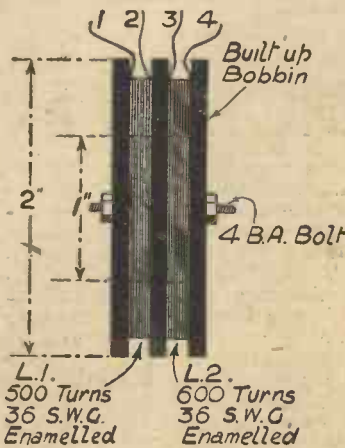
ing illustration is seen a very good scheme in which the output valve may be switched out at the same time and thus the battery-user will find this a very economical scheme. An ordinary short-circuiting jack is, of course, joined in the anode circuit of the preceding valve and both phones and speaker are fitted with a plug. When the plug is removed from the output stage the output valve filament circuit is broken. With this scheme the phones may be used with a smaller number of valves for searching, and if a very weak station is located they may speedily be transferred to the output stage to obtain the advantage of the additional amplification. Similarly, the speaker may be used in the previous stage if the signal warrants it, or if the accumulator is running low and economy is desired.

Quench Coil Details

A MEMBER who is experimenting with super-regenerative circuits wishes to wind his own quench coil and asks for details. Actually this is not a difficult job, but, as with all similar components, some experiment may be necessary to obtain the maximum performance under all conditions and with various circuit arrangements. A good standard scheme is to make up a former from two lin. discs of wood and three 2in. discs. These are bolted together to form two bobbins as shown in the second sketch on this page. The two quench coils are then wound with 36 gauge wire of the enamelled type and the ends held in position merely by winding a few turns of thin tape round the bobbins. The coil may be kept in position by the wiring, or may be bolted to the chassis by using a very long bolt or length of studding for the centre locking device of the coil former.

Unusual Ideas

WE have not received, for some time, details from members regarding the results of unusual or unorthodox ideas



Constructional details of a quench coil.

which they have tried out. Such work is full of surprises and many interesting facts emerge from work carried out in this connection, and we should be pleased to pass on any ideas which may have occurred to members in this connection.

TELEVISIONS

Magnetic Focusing

THE essential feature for good magnetic focusing in cathode-ray tube television reproducers is a uniform axial field with negligible fringing or leakage flux at the ends. This is generally produced by a solenoidal coil through which is passed a steady direct current, the magnitude of which can be adjusted at will to give the sharp focused lines of the picture. As a rule different forms of compensating devices are desirable to allow for any irregularities. Local heating will cause the resistance of the coil to alter, and this brings about a change in the current, which if excessive gives fluffy picture lines. Also, as has been mentioned before in these columns, changes in beam intensity while modulating it with incoming picture signals alter the size of the scanning spot, and this can be reduced in effect by a reversed focusing coil arrangement. It seems strange, however, that some form of permanent-magnet focusing has not been found to give the type of field required. Permanent-magnet loudspeakers work side by side with their electromagnetic counterparts, and it is only natural to expect that a similar development would occur with cathode-ray tubes. As far as is known, there is no commercial television set available with permanent-magnet focusing. It should be quite a simple matter to add a solenoidal coil to give a range of field intensity variation sufficient to cover any focus changes that may be necessary for the set user. Alternatively, the magnet could be designed so as to have a form of flux bypath which could be altered to bring about the necessary changes. Perhaps as the science progresses and set controls are still further reduced in number, permanent-magnet focusing will be possible, and the scheme certainly seems worthy of close investigation.

Good News

THE country of Czechoslovakia has been in the news recently for more reasons than one, but it is not known generally that the Ministry of Posts has been undertaking experimental television transmissions with a view to securing technical data, prior to the introduction of a regular service of signals. Although undertaken on quite modest lines, considerable success has been obtained, and as soon as the political situation has returned to normality, it is proposed to open public viewing rooms in Prague so that the public can become familiar with the type of programme radiated. Naturally, the final decision concerning the magnitude of the service will depend almost entirely on the public reaction, but it is anticipated that this will be favourable. Perhaps the most important item of news associated with this Czechoslovakian enterprise is that the Post Office has decided to employ the British television picture standards. These were found satisfactory during the test transmissions, and this course was adopted because the relatively small market would have meant that sets could only be manufactured at very high cost. As it is, British sets can be used in that country, and this will provide an initial outlet for receiver export for those enterprising manufacturers who take advantage of the service. It is expected that the wavelength for vision will be approximately 6 metres, so very little alteration will be necessary to adapt a standard English set for use abroad.

Automatic Record Changers

An Explanation of the Manner in which Some of the Popular Changers Work

TAKEN as a whole, the human race is a lazy one and it generally hails with enthusiasm the advent of any device or mechanism which can save the carrying out of some monotonous process. I suppose that it is this natural laziness which has contributed so largely to the popularity of the automatic gramophone. In spite of the fact that these automatic mechanisms are by no means cheap, more than two thousand are sold in England every week, and if it were not for the comparatively high price which one must pay for such complicated luxuries, the number

out. For example, there is the placing of the record on the turntable, the lifting of the tone-arm or pick-up, the movement of the pick-up over the edge of the record, the dropping of the pick-up on to the edge of the record and the feeding-in to the playing grooves—to name only the few motions concerned with the start of a record, and when one considers also the various operations at the end of a record, the changing or repeating mechanism, and the necessary

provision for different sizes of records, it will be realised that an automatic gramophone cannot be a very simple affair. In fact, the various devices which control the sequence of operations are among the most ingenious of modern mechanisms.

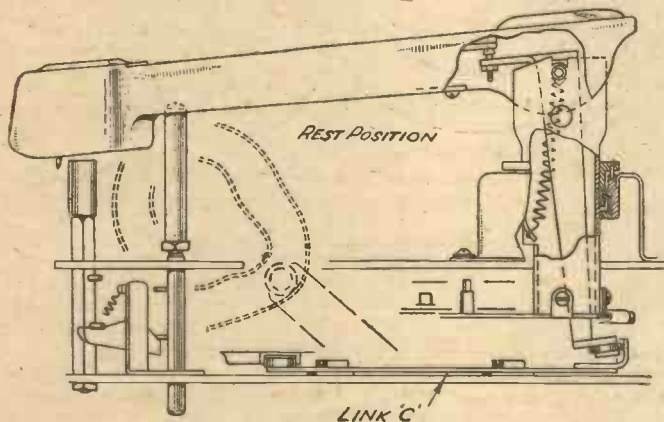


Fig. 2.—Diagram of pick-up lifting mechanism.

sold would undoubtedly be considerably higher.

Important Features

A complete description of even one of the many delightful mechanisms now available would be far too long for these pages, but a brief outline of the more important features and some of the mechanical "dodges" may be of interest. In the operation of a gramophone there are a number of separate operations to be carried

to be carried out are complicated, they follow each other in a definite sequence. This fact enables the actions to be controlled by various types of cam gearing, and the cam arrangements really constitute the "brains" of the whole mechanism.

Four Cams

There are too many individual actions which operate simultaneously for one cam to be able to control all, and the majority of automatic mechanisms contain no fewer

than four. In the H.M.V. mechanism, which is perhaps one of the best known, two of the cams control the jaws which support the records and drop them, one at a time, on to the turntable; another cam controls the lifting of the pick-up arm, and a fourth controls the lateral movement of the arm. The contours of the respective cams are so designed that each motion takes place in its proper sequence, but since the automatic sequence only comes into action at the start or end of a record, the cam gear must be de-clutched and out of action during the actual playing period.

The following brief description of the H.M.V. mechanism will serve to give a general idea of the operations which have to be carried out by an automatic gramophone, and although the constructional details are very different in the various makes, the changing sequence is similar in all.

At the end of a record, or at the beginning of a fresh series, the changing mechanism requires to be brought into action in order to place the next record on to the turntable and bring the pick-up on to the disc. In the H.M.V., the cam gear is brought into operation by means of a "trip" mechanism which is shown in Fig. 5.



Fig. 1.—The H.M.V. Automatic Record Changer. The records are supported by the blades of the two pillars, which may be set for either 10 in. or 12 in. records.

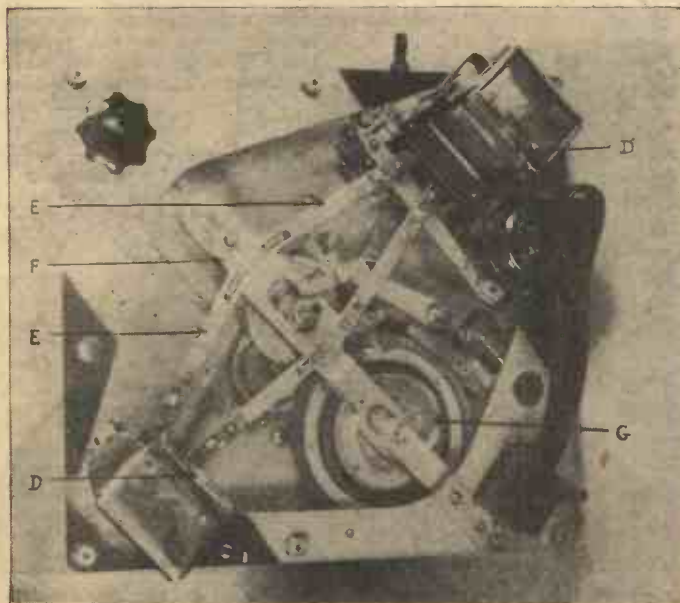
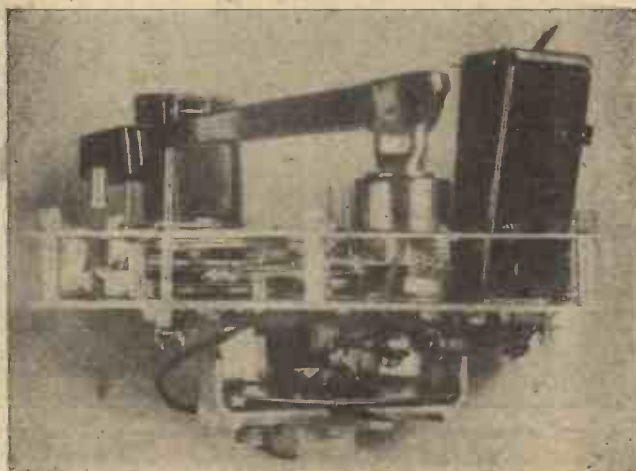


Fig. 3.—Showing the cams, links, and guide-plates of the record-dropping mechanism.

Fig. 4.—(Below) A side view of the H.M.V. mechanism.



The Trip Arm

It will be seen that the turntable spindle carries a small wheel which rotates with the turntable and which has a single square-shaped tooth. When the mechanism is tripped, either by pressing the starting button or automatically by the pick-up reaching the end of a record, the trip arm releases the point of the clutch lever and the square tooth on the turntable spindle engages with a similar tooth on the clutch lever and carries the whole clutch assembly round with it. The clutch wheel is geared through an idler wheel with the set of cam gears and hence, as soon as the mechanism is tripped, either by depression of the starting button or by the pick-up reaching the end of a record, the cam gear commences to make a single rotation and the changing cycle is carried out.

Since the cam gear comprises four independent cams, it will be clear that four separate sequences occur together, two of which—those connected with the raising and traversing of the pick-up—can be followed in Fig. 5. The cams are shown in the positions which they occupy during the actual playing of a record, and they remain stationary until the mechanism is tripped, when they commence to rotate quite slowly in a clockwise direction.

The Pick-up Traverse Cam

The top cam, shown black in Fig. 5, is called the "pick-up traverse cam" and engages with a small roller on the end of lever A. This lever is pivoted near its centre and at the other end it engages with the lower part of the pick-up pillar. It thus controls the lateral traverse of the pick-up.

As the cam rotates, the roller end of lever A is gathered in by the edges of the cam, and by the time it has completed half a turn, the roller is at the point of minimum radius, B, and the pick-up is then right outside the periphery of the record.

During the time when the pick-up has been moved outside the record, it has also been raised above the record surface by means of the second cam shown dotted in Fig. 5. This cam engages with a roller on the end of the link C which is connected to the bottom of the pick-up lifting lever as shown in Fig. 2.

While the pick-up is raised and right outside the periphery of the record as described above, the next record, which has hitherto been resting on the rest plates D (Fig. 3), is allowed to drop on to the turntable by the withdrawal of the rest plates under the action of the links E, the

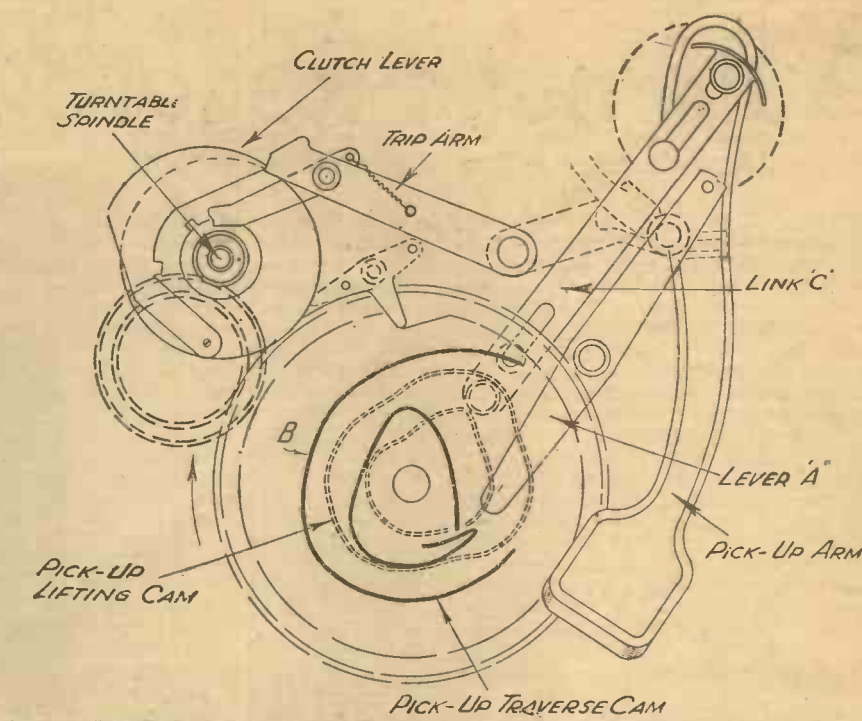


Fig. 5.—Simplified diagram of the H.M.V. unit showing clutch mechanism, gearing, and pick-up cams.

sliding guide plate F, and the heart-shaped cam G.

Further rotation of the cams brings the pick-up again over the edge of the record, and at this point the increasing radius of the dotted cam in Fig. 5 causes the pick-up to be lowered on to the record and fed into the playing grooves. The rest plates have now returned to their normal position, and the separator plates, which have been isolating the bottom record to be shifted slightly to the right, thus passing over the shoulder of the spindle of the pile from the others above, withdraw and deposit the pile of records on the bottom rest plates.

The Mechanical Sequence

The cam assembly has only made one rotation during the changing cycle, which is now complete, and the clutch gear is

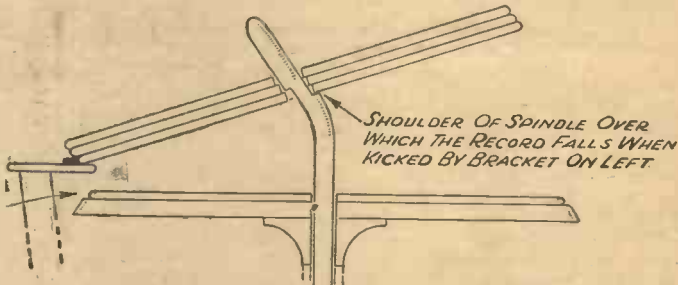


Fig. 6.—Diagram showing the principle of operation of the latest Garrard mechanism. The little pegs on the arms of the bracket shown on the left cause the bottom record to be shifted slightly to the right, thus passing over the shoulder of the spindle.

thrown out of action. The playing of the record proceeds and the changing cycle is not repeated until the mechanism is again tripped by the pick-up reaching the end of a record or by the pressing of the rejector button.

(To be continued)



Fig. 7.—The latest model introduced by the Garrard Company. The records are supported partly by the bracket seen on the left and partly by a special notched spindle which, of course, does not rotate.



Practical Television

July 23rd, 1938. Vol. 3. No. 110.

The German Standard

THE standards to be employed for the German television service have now been decided upon, and it is expected that they will be inaugurated early in August so as to coincide with the opening of the Berlin Radio Exhibition. Interlaced scanning is to be employed with 50 frames, 25 pictures per second; the total line definition being 441. No picture ratio has been stated but no doubt, as in this country, it will be five to four. Following also on B.B.C. practice, and decided upon after months of test transmissions, positive modulation is to be employed. Full white will be represented by 100 per cent. modulation, and the black picture level is 25 per cent. carrier. This is 5 per cent. lower than our own service, and seems to indicate that the form of synchronising to be employed by the German manufactured sets will be of a high standard. Bearing in mind the reverse form of modulation proposed for the U.S.A., which, however, has been strongly criticised by technicians in that country, it is gratifying to find support for the English method forthcoming from another European nation. The average picture brightness, or D.C. component, as it is so often referred to, will be included in the radiated picture signal, and as readers know, this scheme is a most efficient one, giving a pictorial picture value very superior to any television transmission in which it is absent. Although the sound and vision carrier waves in Britain have a separation of 3.5 megacycles, in Germany this has been reduced to 2.8 megacycles. Assuming a picture format of 5 horizontal to 4 vertical, the maximum modulation frequency calculated on standard lines is approximately 3 megacycles. It is obvious, therefore, that with the carrier separation chosen the full value of the picture definition cannot be radiated. It would have seemed a better plan to have decided upon the English standard of 405, for this would have fallen within the frequency and had the additional advantage that a step forward would have been made towards picture standardisation, which is so essential if receiving equipment is to be interchanged and an export market opened.

Carrier Arrangements

FOLLOWING also on proved English practice, the carrier frequency for vision has been chosen higher than that for radiating the sound signals. The transmitters at Berlin, and the Feldberg, in Taunus, are to operate on the same wavelengths of 6.28 metres for vision and 6.6 metres for sound. Field tests have proved that with the powers to be employed by these stations and the distance separating them geographically, there is little risk of mutual interference, even for receivers on the fringes of the anticipated service areas. The ultra-short-wave television transmitting station established on the Brocken, however, will operate on 7 metres for vision and 7.5 metres for sound. With this choice there is room for another station inside the allotted band, and no doubt as

soon as the German service gets into its stride a fourth station will be erected. This will establish a lead for the Germans which will be the envy of the English provinces, for after almost two years' service from Alexandra Palace a decision concerning further B.B.C. television stations seems as far off as ever. In the light of this position, people in the Midlands and North should redouble their agitation for the establishment of their station claims. For programme distribution purposes, cables have linked up the three German stations, and it has been decided to employ a carrier frequency of approximately 4 megacycles for relay purposes, and it is possible that



For the first time in history, a television broadcast was recently given with bees as the subject. The broadcast was given from the grounds of Alexandra Palace and viewers saw bees of the Wood Green and Southgate District Beekeepers' Association. The illustration shows 70-year-old Mr. Ernest Stebbings, a member of the Association, handling bees nonchalantly without wearing a net during the broadcast.

suppressed carrier methods will be employed for the work. It is claimed that this method will enable the cables to be used to their fullest capacity, and although difficulties may be encountered with modulation at the relatively low cable carrier frequencies, it is felt that this is preferable to an expensive cable designed for very high carrier frequencies. In announcing this technical data, it has also been suggested that receiver manufacturers employing superheterodynes should embody an intermediate frequency of 8 megacycles, but whether this will be followed remains to be seen when the sets are on show at the Berlin Radio Exhibition.

Extending Television's Scope

A FEW years ago designs for an apparatus were published which had as its main object the televising of scenes from the bed

of the ocean. With television still undeveloped, the scheme was never put to practical use, but with the present good pictures using high-definition standards the idea has been resuscitated. The scheme is to house in a suitable metal container having glass window ports a television transmitter which is cable-linked to a distant receiver. This container could be used from a salvage boat to survey wreckage prior to the diver making his descent. No synchronising difficulties would arise, since the scanners at the receiving and transmitting ends are fed from a common source of supply. An alternative to this scheme is for a submarine to use similar apparatus to act as an extended periscope. Instead of the submarine rising, it would remain at maximum depth, and allow the television equipment to rise to the surface, and so furnish observations via the boat's receiver.

Producing Saw-tooth Pulses

SEVERAL methods have been used quite successfully in order to produce the saw-tooth shaped pulses so essential for line and frame deflection purposes in cathode-ray tube television work. One simple way was to use a slotted disc which served to chop a bright beam of light

focused on to the cathode surface of a photo-electric cell. This gave a square-topped impulse which, when fed to the grid of a suitably coupled valve, produced a definite saw-tooth pulse. Valve generators with "shapers" are also used, and another proposal is to employ a miniature cathode-ray tube. A local valve oscillator feeds sine-wave oscillations to two deflector plates of the tube, and this has the effect of sweeping the tube's electron beam across two slotted electrodes. The result is a narrow rectangular shaped pulse produced by the beam's sine-wave movement, and when this is applied to the grid of the appropriate time-base generator valve a saw-tooth pulse is generated. This method is said to be simple and accurate, and capable of operation over a very wide frequency range.

FERRANTI MODEL 513AM

Review and Test Report of a
New Universal 3-Band Receiver

THE accompanying illustration shows the general appearance of this Ferranti model, and one of the first points which strikes the eye is the inclusion of side controls. As will be mentioned later, this enables the tone control to be placed in an easily accessible but out-of-the-way position, and keeps down the number of controls mounted on the panel front. The cabinet is neatly finished with a three-colour tuning dial. The circuit employed is a superhet, with an octode frequency-changer; pentode I.F. stage;



Model 513AM reviewed on this page.

double-diode-triode as second detector, A.V.C. and L.F. amplifier; and a double-diode-pentode in the output stage. A half-wave rectifier is included in the mains section to rectify the A.C. supply when the set is used on this type of mains. There are one or two novel points in the frequency-changing stage, the first of which is the inclusion of a stabilising resistance in series with the control grid. The oscillator grid is coupled to the control grid by means of a few turns of twisted wire, whilst a special tuned circuit prevents interference from unused wavebands. The intermediate-frequency employed is 450 kc/s., and resistance-capacity coupling is employed between the L.F. and output stages.

Controls

The tuning is carried out by a single control, operating a double-ended pointer. Medium waves are marked round the sides and top of the rectangular dial, whilst long waves are marked at the lower edge. The short-wave stations are indicated in the centre, and three separate colours are employed for the markings. Green is employed for the medium waves, red for the short waves, and blue for the long waves, and the wavechange selector switch (on the right) carries three dots with these colours so that the waveband in use

may easily be seen. On the left is the combined on/off volume control, which operates on the grid of the double-diode-triode valve. The tone control, which is mounted in a sunken escutcheon on the left of the cabinet, is joined across the triode section of this valve and consists of the usual condenser and resistance in series.

On the mains side a simple input scheme is provided, and two chokes with a by-pass condenser are included to remove the risk of interference which might be carried via the mains supply. In place of the customary fuse a thin wire is provided as connection between one mains pin and one of the chokes just mentioned and this is designed to blow in the event of an overload. An external speaker may be joined to a pair of sockets appropriately marked.

Test Report

The receiver was tested on an A.C. mains supply on our usual aerial and gave a very good performance. Hum was negligible, and selectivity was sufficiently good to enable all worth-while stations to be received. The gain was particularly high on the long waveband and very little interference was experienced on the German station. On the medium waves the performance was quite up to standard, although in the particular model submitted for test the pointer had apparently become loose and thus the station names were not accurately registered. On the short waves the performance was very good and no noticeable drift was observed. The gain was very good for a receiver of this type, and the efficiency of the input interference circuit was particularly noticeable in this receiver. The quality of reproduction was particularly good and the effect of the tone control most marked. The maximum output from the last valve could be fully handled by the speaker without risk of cabinet boom or resonance.

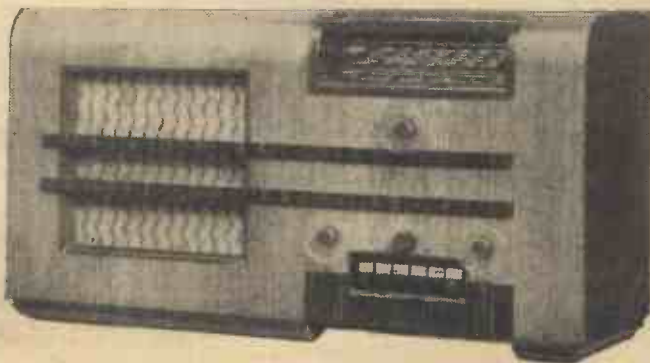
The ranges covered in the receiver are from 16.5 to 51, from 200 to 550, and from 900 to 2,000 metres. The price is 13½ guineas.

THE WIRELESS CONSTRUCTOR'S ENCYCLOPEDIA

By F. J. CAMM 8th Edition 5/- net
(Editor of "Practical and Amateur Wireless")

Wireless Construction, Terms, and Definitions explained and illustrated in concise, clear language.

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A new Ferranti push-button receiver—Model 617PB.

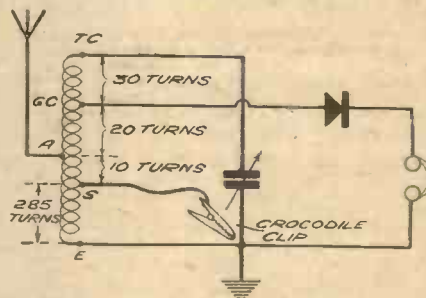
THE SCHOOLBOY'S CRYSTAL RECEIVER

How to make the coil for the receiver which is shown in Blueprint AW427

AS the copy of PRACTICAL AND AMATEUR WIRELESS in which details for building this crystal receiver is now out of print, we are reprinting here the constructional details of the coil, as many readers are desirous of making up this interesting and simple receiver. The coil is a very efficient unit, covering both medium and long wavebands, and is made up on two separate formers. These are of paxolin, and are 4ins. in length. The larger of the formers is 2½ins. in diameter, and the other 1½ins. in diameter, the latter being held in position in the centre of the large former. For this purpose small spacers of ebonite are employed, and are held in position with short screws. Alternatively a disc of wood may be cut and screwed to the baseboard to which the inner tube may be attached, and the outer tube may be held in position with small metal angle brackets.

Winding Details

The inner tube carries the long-wave winding, consisting of 285 turns of 36 gauge enamelled wire, arranged in the centre of the tube. On the large tube are wound sixty turns of 26 gauge enamelled wire, also exactly in the centre of the tube. When placing this winding on, however, you must make a tapping at the tenth and twentieth turns from the lower end.



Theoretical circuit of the Schoolboy's Crystal Receiver. Blueprint AW.427 shows the wiring, and may be obtained for 6d. from this office.

Anchor the ends of the windings by passing the wire through two small holes pierced about ¼in. apart. To the top of the larger tube a single terminal is fitted, and this should be immediately above the holes where the end of the winding comes. At the bottom of the larger tube four terminals are mounted, and the connections to these are as follows: The top of the inner winding is joined to the bottom of the outer winding, and the two wires are joined to the terminal on the bottom marked S in the blueprint (one side of the wave-change switch). The bottom of the inner winding is connected to the next terminal marked "E" (Earth). The top of the outer winding is joined to the top terminal marked "TC" (fixed plates of the tuning condenser), and the tapping points on this winding are joined to the remaining terminals in the following order. The lowest tapping, that is, the one which is ten turns from the bottom of the coil, is joined to the A terminal, and the centre tap is joined to the GC terminal, which in this set is connected to the crystal detector.

The theoretical diagram of this receiver is given here for those who wish to make up the circuit, and who are interested in the theoretical connections.

RADIO CLUBS & SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

THE EXETER AND DISTRICT WIRELESS SOCIETY

THE second of the summer visits by the above society took place on Monday, July 4th, and members were conducted over the Exeter Gas Works. The visit lasted well over two hours, and the whole process of making gas was explained; all the apparatus shown in action. One of the most interesting processes was that where the gas is washed and scrubbed to dispose of ammonia, and after this has taken place, the gas is passed into a number of purifiers which contain many tons of iron oxide. The calorimeter room was also shown together with the company's laboratory.

Although this visit is not strictly connected with radio, it shows the varied fare which the Exeter and District Wireless Society serves to their members during the season when no weekly meetings are held.

Meetings will commence in September, and full details will appear in due course. Hon. sec., W. J. Ching, 9, Stwell Place, Heavitree, Exeter.

GLOUCESTER RADIO CLUB

THIS club, founded early this year, has been fortunate in being able to maintain good attendances through the summer. As many similar organisations disband during the light evenings this is regarded as a promising omen for the winter season, when we should like to see a further increase in membership.

On Sunday, July 3rd, a field day was held in the Stroud area, the band chosen being 160 metres. The transmitter, built and kindly loaned by Mr. J. Hamilton (G5JH), was installed in a deep hollow in Cranham Woods, and was operated by Mr. Fred Hitchcock (G5HC). The first party to locate it was that led by Mr. G. Otley (G8BK), and at the high tea, held later at a nearby hostelry, everyone declared that it was the most enjoyable event yet held. A further and more ambitious field day will be held early in August, and we shall be pleased to welcome anyone interested.

On Wednesday, July 6th, Mr. Lane delivered an excellent impromptu address on "Transmitter Design and Operation," which feature was greatly appreciated by the members of the club. Hon. sec., Geoffrey G. E. Lewis, 30, Kitchener Avenue, Gloucester.

BRADFORD SHORT-WAVE CLUB

THIS club has now obtained its full licence, and the call sign allotted is G3NN. During the next three weeks, tests will be carried out under this call, in readiness for the coming field day, which is to be held on Baildon Moor on July 30th and 31st.

Camping equipment will play a large part in this event, which, it is hoped, will surpass its predecessors. Power for the transmitter will be obtained from a generator driven by a 6-volt accumulator, and it is hoped that a few tests will be carried out which may help the QRP fan. Further details may be obtained from the secretary, S. Fischer, Edenbank, 10, Highfield Avenue, Idle, Bradford.

EASTBOURNE AND DISTRICT RADIO SOCIETY

AT the meeting of the Eastbourne and District Radio Society held in the Science Room at Cavendish Senior School at 7.30 p.m. on June 27th, a Morse test and instruction conducted by one of the members, Mr. W. A. Morgan, and a demonstration of the Lissen Hi-Q-Short-Wave Superhet Four were held.

The Lissen superhet attracted considerable attention and proved very sensitive. Mr. S. M. Thorpe, A.M.I.R.E., also demonstrated at the end of the meeting a spark coil giving about 60,000 volts output.

Full information for those interested in the society can be had from the hon. sec., T. G. R. Dowsett, 48, Grove Road, Eastbourne, Sussex. Annual subscription only 5s. per annum.

CHADWELL HEATH RADIO SOCIETY

THE above society has changed its name to Romford and District Amateur Radio Society, with headquarters at Y.M.C.A. Red Triangle Club, North Street, Romford. New members are welcomed either at the above address on Tuesdays at 8.30 p.m., or they can apply to hon. sec., Rowland C. E. Beardow (G3FT), 3, Geneva Gardens, Chadwell Heath, Essex.

THE EAST SURREY SHORT-WAVE CLUB

AT a meeting on July 7th Mr. Gunn (G8HP) related his experiences gathered from the recent Newfoundland Expedition, of which he was a member.

In what proved to be one of the most interesting lectures to date, Mr. Gunn told of the valuable experimental work which was carried out with the help of Newfoundland amateur transmitters.

The Junk Sale referred to in our last report realised £1 17s. 6d. towards club funds. On Thursday, July 21st, there will be a lecture on frequency measurement, commencing at 8 p.m. All local enthusiasts are welcome, at 111, Station Road, Redhill, or they

should get in touch with Leslie Knight (G5LK), hon. sec., 13a, Hatchlands Road, Redhill, Surrey.

CLAYESMORE RADIO CLUB

THIS club has only recently been formed and we still have but a handful of members. Although our membership is small, much useful work has been done in the past few weeks.

A complete P.A. system was rigged up by the club for the school speech day, and sports announcements were made with great success. The P.W. 12-watt amplifier constructed by R. L. Turney was used. Many receivers have been designed and constructed by members, including a very successful "all-waver." The members have also built two new club-rooms. Recently a visit was paid to the Dorchester Beam Wireless Station. Hon. Sec., A. M. K. Turney, Clayesmore School, Iwerne Minster, Blandford, Dorset.

THE SIMPLEST ALL-WAVER

(Continued from page 454)

remaining components can be as already described for the simplest short-waver. An ordinary broadcast choke should be included in series with the short-wave choke, or, alternatively, one of the all-wave type could be used. The short-wave coil described has only one range, but if the grid coil has two or three more turns added, and a tapping is taken after four turns from the grid end, it can be made to cover two ranges. As regards the switch, if the Bulgun component is used, a small wire must be soldered to the two rotating contacts so as to join them together, and another piece of wire fixed as a pigtail connection between the rotating contacts and terminal 5 on plate B (see Fig. 5), which is joined to earth.

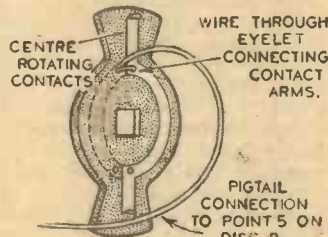


Fig. 5.—Modifying the switch.

The set has been described as a single-valve receiver, but it can be very easily converted into a two-valve receiver, using one of the methods described frequently in PRACTICAL AND AMATEUR WIRELESS. An excellent output stage with transformer coupling was described in the issue dated June 11th, 1938.

AN APPEAL

THE holiday season is here again. All those around you, and maybe you yourself, are packing your bags for an interval of rest and peace and enjoyment. You have been looking forward for weeks, months maybe, to your holiday. So have your family. The kiddies are dreaming of paddling, bathing and of those castles which they are going to build on the sand. But to other children, less fortunate, those castles are but castles in the air. Week after week, month after month, they have lived their poor, drab little lives. They do not complain. But they have their dreams as well. Some of them may have been lucky. They may have been chosen to go on holiday which PEARSON'S FRESH AIR FUND provides for thousands of the children of poorer London, through the generosity of our readers. But the Fund, alas, is not limitless, and many are left behind. Help is still needed—desperately—and I beg of you, those of you who can afford it, to send something, however small, immediately, to PEARSON'S FRESH AIR FUND, c/o THE EDITOR, C. A. PEARSON, LTD., TOWER HOUSE, SOUTHAMPTON STREET, STRAND, LONDON, W.C.2.

NEW!

D.C./A.C.

OUTPUT PENTODE

THE

COSSOR

402 Pen. A

INDIRECTLY HEATED



Designed for series running in A.C./D.C. receivers, the Cossor 402 Pen. A is an output pentode of the indirectly heated cathode type. It has been designed for maximum anode and screen voltages of 150 since, in general, greater voltage is not available in the receivers in which it is used. Its maximum anode dissipation is 10 watts—sufficient to give an undistorted output adequate for all domestic purposes.

Characteristics

Heater Voltage - - - 40
 Heater current (amps) - 0.2
 Max. Anode Voltage - 150
 Max. Screen Voltage - 150
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LETTERS FROM READERS

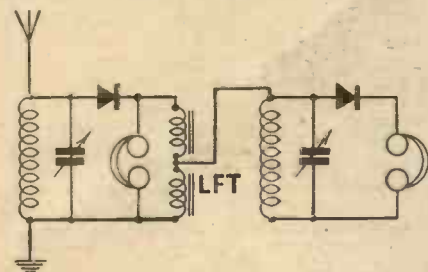
The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

Crystal Detectors

SIR,—I was interested in the article on experiments with crystal detectors published in the July 2nd issue.

I have done no experiments with a crystal during recent years, but some of my old experiments will no doubt prove of interest to other readers. I enclose a circuit for experimental use, in which you will see that it makes use of a double detection system.

There are many experiments which readers can carry out in this connection, and there is nothing to prevent three circuits being used if desired, but, of course, only one pair of 'phones are necessary.



Circuit diagram of a double crystal detector system mentioned in Mr. D'Arcy Ford's letter.

The circuits can be connected together by any kind of coupling, such as L.F. transformer, H.F. transformer, R.C. coupling, or resistance coupling without the capacity. With many forms of coupling a continuous earth line can be used. Two-gang or 3-gang condensers can be used, if desired, for single tuning control.

It would appear that "amplification" can be obtained with a crystal in certain circumstances. As stated in the article, if the aerial is connected to a tap down the coil, this will have the effect of improving the selectivity, but sensitivity will decrease. If, therefore, the circuit can be arranged so as to transfer the maximum signal strength with a minimum of circuit losses to the next tuned circuit, it would appear to be possible that in obtaining an increased selectivity by the use of two or three tuned circuits, the full signal strength can be maintained.

It would be interesting if readers would report the results they have obtained with different types of circuits.

The theoretical explanation of the matter is to be found in the new theory of detection. —D'ARCY FORD (Exeter).

S.W. Logs: Ideal Circuits

SIR,—I am writing to you in response to two notes which appeared in PRACTICAL AND AMATEUR WIRELESS for July 9th. The first matter is that referring to S.W. logs, upon which subject you invite readers to express their views. I must say that I am in agreement with Mr. E. J. Logan, that many short-wave listeners with a very

small collection of QSL cards (if they have one at all) would be able to submit very useful DX logs. What has somewhat disappointed me in the past, however, has been the publication of m/s logs containing 20 or so G stations, or 14 mc/s logs in which the bulk of the entries are European, North African, or common W'phone stations. Anyone with a tolerable receiver can, under fair conditions, easily obtain numerous stations in this category, but it takes a good receiver, coupled with a reliable aerial-and-earth system, and some experience, to pull in real low-power DX.

I would therefore suggest that you accept logs unaccompanied by veris, but that the following calls be deleted on 3.5, 7, 14 and 28 mc/s: all European, North African, VO, VE1-2, W1-4 and 8-9, and that details of apparatus used, etc., as suggested by Mr. Logan, be sent with logs. Then, again, more attention should be paid to the 7 and 3.5 mc/s bands, as DX on these bands is more difficult to obtain than on the higher frequency bands. Also, 1.7 mc/s and 56 mc/s logs serve a more useful scientific purpose than logs of the other bands. I think that by sending logs of only low-power DX, a really useful end can be attained.

The other point concerns the articles by "The Experimenters" on various people's ideal circuits. As they ask for other readers to send in their suggestions, I am taking them at their word. The remarks of Mr. F. Lawson were very interesting to me, as I share in some degree his dislike of superhets.

My ideal receiver would be a "straight" type, being a modification of a 2-v-2. The two R.F. tuning controls would be ganged and provided with slow motion, adequate band-spreading being fitted to the detector stage. Plug-in coils would be used so as to give maximum efficiency, while further to increase sensitivity and selectivity regeneration would be applied to the second R.F. valve and the detector, by means of separate reactor valves. Adjustable bias would be fitted to the R.F. section as a selectivity control. The A.F. stages would have to be capable of considerable amplification, because I should want to include some form of frequency-response filter to the final (or possibly the penultimate) stage, so as to give maximum selectivity on the amateur bands, on which part of the short-wave spectrum the receiver would be chiefly used. Push-pull output might have to be used to include this feature satisfactorily. The power supply would come from the mains, which would be carefully smoothed and filtered to reduce the noise-to-signal ratio, and a send-receive switch would be a useful accessory when I obtain (as I hope, eventually) my transmitting licence. Additional features would be A.V.C., an R-meter, 'phone-jack, separate tone controls

for bass and treble to reduce QRM, provision for various aerials, with the whole assembly mounted with a moving-coil loudspeaker and power pack in a steel cabinet.—H. OWEN (Newcastle).

SIR,—I have been a keen reader of your wonderful journal for a long time, but have never written to you regarding any of the subjects discussed in it each week. However, I read with deep interest Mr. Ernest J. Logan's letter of the 9th inst., and must comment on it.

May I say that I agree with Mr. Logan in every respect; my case is one which he writes about. I am a short-wave enthusiast but rarely collect QSLs; nevertheless I compile a log of every station.

I have gained a great deal from your short-wave logs, which were published until quite recently, and I think this is the case with every reader. Surely a space could be found for such a valuable contribution, if readers would make their logs short (not too short), describe their receivers and aerials as briefly as possible and, as Mr. Logan writes, keep to real DX.—F. WILLIAMS (Herne Hill).

SIR,—I heartily agree with your correspondent, Ernest J. Logan, in his plea for the return of the short-wave logs as formerly printed in the "Letters from Readers" section of your valuable paper. These were decidedly of very great interest and assistance not only to myself, but to all of my several radio friends who join in with my request to you to withdraw your ban on these logs. As your correspondent points out, logs of DX stations (verified) are practically useless, and serve no useful purpose at all, whereas an up-to-the-minute log of stations, with time of reception, etc., and details of receiver, antenna and so on, are invaluable to the keen enthusiast.—L. SINGLETARY (Wisbech).

CUT THIS OUT EACH WEEK

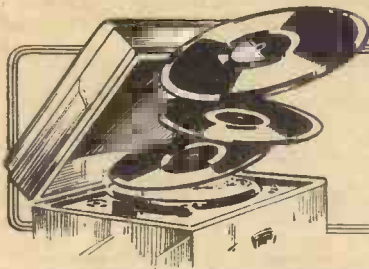
Do you know

- THAT small biasing cells are permissible in the grid circuit of amplifiers instead of other auto bias schemes.
- THAT standard plug-in coil formers may be used for ultra-short-wave work by cutting away all spare material.
- THAT an ordinary speaker may be used at a low-impedance extension point by disconnecting the input transformer.
- THAT condensers used for mains-aerial coupling should be capable of withstanding the mains voltage.
- THAT when mounting control knobs on high-voltage apparatus the grub screws should be recessed and wax filled.
- THAT friction between dissimilar metals can give rise to noises in a short-wave receiver, even when the metals are not included in the receiver.

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Impressions on the Wax

A REVIEW OF THE LATEST GRAMOPHONE RECORDS

H.M.V.

IT must be a difficult task to decide what music to use for each successive year's Tattoo at Aldershot. Yet the problem is always solved, and the first records, comprising purely musical items from the 1938 event, are now to be had. Extraordinary care was taken to secure really good records, and I learn that a special "recording parade" was called so that, should it be necessary, pieces could be repeated by the massed bands of nearly 1,000 performers, an option that could not be exercised during one of the public performances. The "big" piece for this year is Friedemann's "Slavonic Rhapsody"—*H.M.V. B 8755*. The other records are of marches—"Royal Review" and "Tudor Rose" (this last for combined bands and bugles); *H.M.V. B 8756*, and "Tournament" and "The Standard of St. George," *H.M.V. B 8757*.

Light Vocal

RADIO, films and stage share this month's artists in about equal proportions. Harry Richman, this season's attraction at Ciro's, sings "Sweetest Sweetheart of All" and "Weep and You Dance Alone," the latter from the film "Happy Returns," on *H.M.V. B 8760*. Revnell and West (the Two Cockney Kids) put some good Cockney humour into "A Trip to the Zoo" on *H.M.V. BD 566*. Max Miller's latest contributions are "I Bought a Horse" and "Does She Still Remember?" on *H.M.V. BD 563*. Dan Donovan sings "God Remembers Everything" and "Springtime in County Clare"—*H.M.V. BD 562*; and Al Bowly has recorded "Good night, Angel," from the film "Radio City Revels," coupled with "When the Organ Played 'Oh, Promise Me,'" on *H.M.V. BD 565*. A record that will create a lot of attention is Maxine Sullivan's "Swing" treatment of "Black Eyes," the Russian gipsy folk song, and "It was a Lover and his Lass" (words by Shakespeare, tune by Thomas Morley)—*H.M.V. B 8759*. Maxine is America's No. 1 swing singer, and these vocal treatments, in which body rhythm accompanies the singing, are now called "vocadances" in America. This is something quite new.

Light Orchestral

CALLENDER'S Senior Band have made an excellent record of Wood's Three Dale Dances. Very tuneful and well recorded—*H.M.V. BD 560*. Barnabas Von Gecky's Orchestra is one of the most popular light combinations in Central Europe to-day. Their latest medley is a medley of Paul Lincke's melodies on *H.M.V. B 8751*. Anton and the Paramount Theatre Orchestra, with Al Bollington at the organ, play a bright selection from "The Girl of the Golden West" on *H.M.V. BD 561*. Another famous cinema orchestra, the "Gaumont State," led by Alfred Van Dam, contributes two colourful pieces, "In the Sudan" and "Babylonian Nights"—*H.M.V. BD 564*.

Reginald Foort at the B.B.C. Theatre Organ combines talking with playing in his latest fantasy, "My Dream Garden," *H.M.V. BD 559*, while Reginald Forsythe and Arthur Young follow up their successful debut last month with "Tunes of To-day" No. 2, for two pianos, on *H.M.V. BD 567*.

Parlophone

LIGHT orchestral recordings are supplied by The Grand Symphony Orchestra with "Women of Vienna" (two parts) on *Parlophone R 2525*, and "Die Schonbrunner," coupled with "Aquarellen," is played by the Orchestra Mascotte on *Parlophone R 2528*.

Ronald Frankau, the popular stage and radio comedian, has made an amusing recording this month—"And they Lived Unhappily Ever After" and "Major Wimple and Lady Snurdge" on *Parlophone R 2527*. He is assisted by Monte Crick at the piano.

Leslie Hutchinson ("Hutch") has two new records this month—feature songs from the films. "So Little Time" and "My Heaven on Earth" (from the film, "Start Cheering")—*Parlophone F 1143*, and "Love Walked In," from the film, "Goldwyn Follies," coupled with "Weep and You Dance Alone," from the film, "Happy Returns," on *Parlophone F 1144*.

Variety

IVOR MORETON and Dave Kaye pound the ivories with drum and string bass accompaniment in a "Quick Step Medley" and a "Fox Trot Medley" on *Parlophone F 1142*. Reginald Foort's popular radio combination, "The Organ, the Dance Band and Me" have two records this month. "Meet Me Down in Sunset Valley," coupled with "In Santa Margherita," on *Parlophone F 1131*, and "The Down and Out Blues" and "Sunday in the Park" on *Parlophone F 1145*. Tessie O'Shea, the comedienne, with her banjulele and orchestra sings "He Never Slept a Wink all Night" and "Hymie and Amy" on *Parlophone F 1147*. Nat Gonella and his Georgians are to be heard on *Parlophone F 1132* playing "Somebody's Thinking Of You To-night" and "Oh! Ma-Ma," and on *Parlophone F 1135*, playing "Swingin' in the Corn" and "Who Stole the Jam?" In the second new "Rhythm Style" series we have Louis Armstrong's Original Washboard Beaters giving their version of "Candy Lips" with a "seat" chorus by Clarence Williams, and "Nobody but my Baby" on *Parlophone R 2531*. Also in this series is Frankie Trumbauer with Bex Beiderbecke and Ed. Lang (in their three-piece orchestra) playing "Wringin' and Twistin'" and "For No Reason at All" on *Parlophone R 2532*. Piano solos with drum accompaniment are played by Billy Thorburn—"Quick Step and Fox Trot Medleys"—*Parlophone F 1141* and Gerry Moore—"This Time It's Real" and "So Little Time"—*Parlophone F 1140*.

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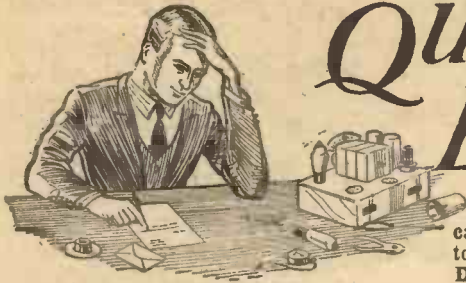
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Trickle Charger (6d.) .. Jan. 5, '35			
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AW457			
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The W.M. A.C. Short-wave Con-			
verter (1/-) ..			
WM403			



QUERIES and ENQUIRIES

denser (that is, with equal sections) or a special shaped condenser? In the former case, what would be the values of the padders to obtain the necessary tracking?"—D. R. E. (South Croydon).

THE problem cannot be solved without knowledge of the coils. Some inductance values are such that the required frequency is obtained with a special shaped oscillator section, and in other makes of coil padders are needed. In view of the fact that the average amateur finds trimming such a difficulty in a superhet, we think the special shaped condenser unit is to be preferred, as, provided the correct type of coil is used, this will automatically provide the required intermediate-frequency and will thus reduce the amount of adjustment needed on the trimmers.

Wire Data

"I am going to wind a transformer and propose to use some wire which I have by me. This is, I think, 24 gauge enamelled, and I should like to know its current carrying capacity so that I can decide upon its use for the particular job I have in hand."—H. I. A. (Boston).

THE rating of this wire is .38 amps. at 1,000 turns per square inch. The resistance per 1,000 yards is 63.16 ohms and the resistance per lb. is 14.366 ohms.

Speaker Modification

"I have an old model speaker with a 6-volt field winding. I should like to use this in my present set as it gives such good results. I had a battery set and used an accumulator for the field, but now I have converted the set to all-mains and should like to energise the field from the mains. Also, the transformer only has one input and as this may not match I should like to know whether I could fit an ordinary vari-ratio transformer to it."—F. D. (N.W.9).

THE speaker may be used with your new set and the best plan is to use a metal rectifier and transformer to supply the necessary voltage. You will probably find that the field was rated at 9 volts maximum and that an A4 rectifier will be suitable. This delivers 9 volts at 2 amps, and requires a transformer with an output of 14 volts to feed it. You could certainly remove the existing transformer and fit a multi-ratio component connected to the speech coil windings so that better matching may be obtained.

Speaker Extension

"I have used an extension speaker on my set but so far with disappointing results. The output is high resistance, and my speaker is low resistance, but to overcome this trouble I have bought a new matching transformer and have connected this to the output sockets. The volume is very poor on any tapping and I wonder if you can explain this, as I should like to get the thing to work properly."—K. L. (Perth).

WITHOUT more complete details it is not possible to give a definite reply, but if the speaker and transformer are in order the most likely cause of your trouble is to be found in the way you have made the connections. We assume that you have placed the transformer at some distance from the set—that is, close to the speaker. This may have resulted in loss of voltage on the output valve due to the long leads. On the other hand, if an output filter is employed this trouble would not arise, but then, if the transformer is placed close to the receiver, the long leads on the secondary side may have introduced trouble as they may have a greater resistance than the speaker. Attention to both of these points may enable you to overcome the trouble.

Superhet Circuit

"I am making a superhet receiver but am uncertain regarding the best method of tuning. Shall I use a straight-ganged con-

Reaction Circuit

"I find it difficult to obtain smooth reaction on my set which uses home-made coils for all waves and a built-up switch. On

RULES

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.
- (5) Grant interviews to querists.

A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

some circuits the reaction is quite good, but in others it is difficult to obtain oscillation, or alternatively it goes into oscillation too quickly. I believe you have published some time ago a modified reaction circuit designed to overcome this trouble, but I cannot trace it and wonder if you can give me the necessary details."—E. Y. T. (Chelmsford).

IF the reaction windings for each wave-band are not correctly selected, you will experience difficulty. The remedy is, of course, to wind each reaction section with the required number of turns and correctly spaced from the grid winding. However, if you wish to experiment with the modified circuit we presume you refer to that wherein a series variable resistance is included in the reaction circuit and this does enable various adjustments to be obtained. A value of 2,500 ohms may be recommended, and one end is joined to the anode, whilst the other end is joined to the reaction coil, which is joined to earth through the reaction condenser in the usual way.

Heater Leads

"I have noticed that in some commercial receivers the heater leads are twisted together throughout all the wiring, whilst in

others two separate leads are employed and run as far apart as possible. What is the merit of the latter system and why are the leads twisted in the former arrangement?"—H. T. A. (Torquay).

THE twisting of A.C. leads is to neutralise the field and keep down the risk of hum. It is true that in many cases the two leads may be run separately without introducing hum difficulties, but in most cases it is advisable to take the precaution of twisting them so that the field is reduced to a minimum. The leads should also be kept well clear of H.F. leads, and where they must pass they should do so at right angles and with as much separation as possible.



Replies in Brief

The following replies to queries are given in abbreviated form either because of non-compliance

with our rules, or because the point raised is not of general interest.

A. L. (Bridgend). H.F. transformers are explained in the book in question.

H. M. (Battersea). The blueprint in question is no longer available.

C. B. G. (Sussex). We do not recommend the modification of any of our published circuit designs.

F. S. (S.E.17). We cannot supply blueprints of commercial receivers and we understand that the blueprint in question is no longer available.

W. N. S. (Gorleston-on-Sea). We are unable to supply details of the S.T. receivers. These were originally published in a contemporary, which is no longer on sale.

J. E. (Ramsey). We can supply blueprints, but it is essential to state which model you have. We published two designs and both were in battery and mains types.

J. C. (Dublin). We are unable to trace the coils and unit mentioned by you.

T. M. (Uttoxeter). Your aerial and/or earth could be responsible for the trouble. Make certain that the valve is oscillating.

T. A. R. (Hebburn). We are unable to supply a blueprint for a set using the American valves mentioned.

J. J. C. (Chiswick). In order to avoid upsetting the working of the valves the best plan is to use a mains voltage bulb (10 watts) connected across the input. This will give a better light and will not affect the wiring.

R. E. P. (Lowestoft). The Hall Mark receiver should be suitable and we can supply blueprints for this in battery or mains types.

R. J. (Didcot). So far as we can trace the items are not now listed as standard. Write to Electradix Radios, whose advertisement appears in this issue.

J. H. (East Kilbride). It is impossible to help you from the brief details you give. Some further notes would be needed, together with a circuit diagram.

T. R. A. (Stoke-on-Trent). The point referred to was that the two cones must move out and back together, or in step. They should be joined across a small battery and carefully watched, and if it is found that one goes forward when the other goes backward the connections to one speaker should be reversed. We cannot trace any book on the subject referred to.

C. L. (Kettering). We understand that a book on the subject mentioned is obtainable from Percival Marshall.

J. F. (Limerick). The most recent series of articles will be found in the issues dated May 22nd, 1937, to July 3rd, 1937.

T. H. M. (Rugby). The aerial acts as the first tuned circuit and should consist of 75ft. of wire for the medium-wave winding and an additional 125ft. of wire joined in series as a loading coil for long waves. See the constructional article in the issue dated 9th July last.

S. M. (Glasgow). The tool may be obtained from E. Gray and Son, Ltd., 18-20, Clerkenwell Road, E.C.1.

G. W. (Bridlington). We suggest you study the article in our companion paper *Practical Mechanics* dated November, 1937, last.

E. W. (W.6). As the set is a commercial model it would be desirable to communicate with the makers, as the unit may be faulty.

A. S. (Male). The wire is quite in order. The larger capacity could be used, but would not be quite so efficient as the specified component.

F. H. P. (W.14). We suggest you select a receiver from our blueprint list and obtain the appropriate issue. In that will be found a list of components and full operating notes for the particular set, and you should not find it difficult to build.

The coupon on page iii of cover must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate. (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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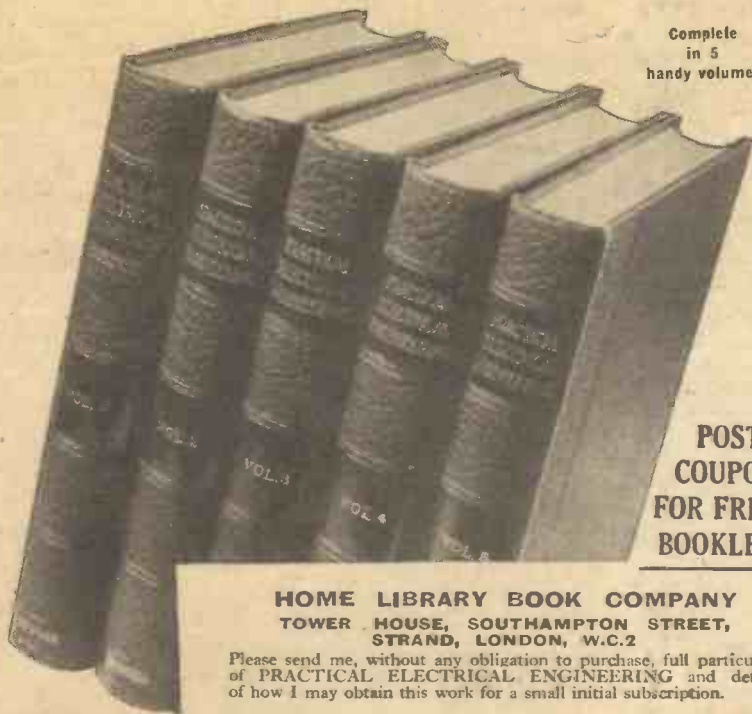
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Publication

Vol. 12. No. 306.
July 30th, 1938.

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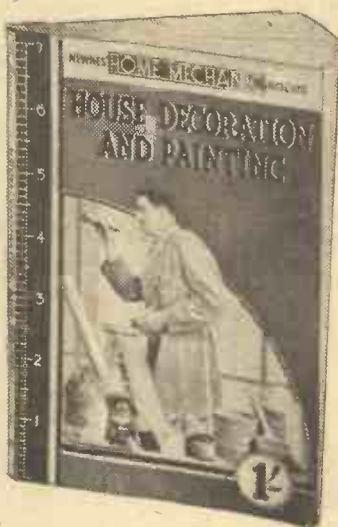
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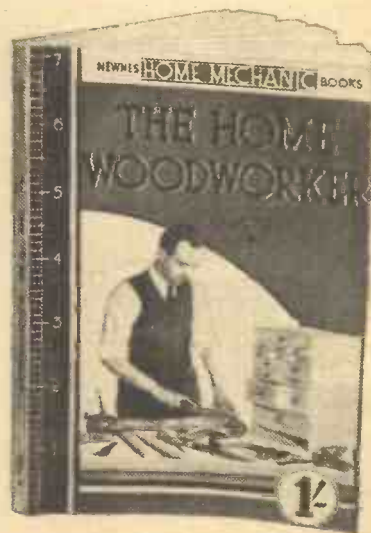
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AUTO RECORD CHANGERS—SEE PAGE 481



Practical and Amateur Wireless

Edited by F. J. CAMM

Technical Staff:

W. J. Delaney, H. J. Barton Chapple, Wh.Sch.,
B.Sc., A.M.I.E.E., Frank Preston.

VOL. XII. No. 306. July 30th, 1938.

ROUND *the* WORLD of WIRELESS

Testing Equipment

THE experimenter's workshop eventually becomes full of odd items which are used from time to time for experiments. A complete set of testing equipment may be acquired, but it is often found that a need arises for some special apparatus which has to be made up on the spot, and usually this is not dismantled but stored away in case it is needed again. Thus a rather motley collection eventually accumulates in spite of care in making and storing. One item which often proves valuable, but which normally does not appear in commercial lists, is a power unit delivering a mixed output—that is, A.C. or D.C. volts at various currents. There are dozens of uses for such an item, such as accumulator charging; testing valves (heaters and for anode current); testing condensers or resistors; breakdown tests for home-made components, and so on. In this issue we give the main details of such a unit, and although standard transformers may be unobtainable for such a device, it is a simple matter to make up a suitable component, using the data which we have previously published on the subject or taking the necessary material from our book "Coils, Chokes and Transformers."

Stratosphere Tests

WE have before mentioned the method of taking short-wave data by means of small pilot balloons which are sent into the stratosphere with a self-contained short-wave transmitter which sends out special signals. The balloon eventually bursts and the transmitter descends by parachute. The wavelength is 8.5 metres.

French Radio News

IN response to demands from the French press, the amount of news now broadcast from French stations has been considerably reduced. In place of the former one and a half hours, only twenty-one minutes, approximately, are now given.

Ships' Bands Broadcasts

THE dance bands which form part of the lighter side of the life on the larger liners are seldom heard by those who are unable to take a sea voyage. On July 29th, however, the band of the *Queen Mary* and a band composed of members of ships of the Canadian Pacific line will be heard in a broadcast from the Marine Club, Angmering-on-Sea. It is hoped that guests

from the stage and screen will come to the microphone during the show.

I.B.C. Chairman Honoured

CAPT. L. PLUGGE, M.P., chairman of the International Broadcasting Company, controller of the popular French commercial broadcasting station, was recently created a Chevalier of the Legion of Honour.

the B.B.C. Variety Orchestra, and the show will have an "all-Cockney" cast.

From a York Cinema Organ

EDWARD FARLEY, a popular cinema organist, will broadcast from the Regal, York, on August 3rd. Farley was a parish church organist in Kent at the age of thirteen, and at fourteen he had the privilege of playing the organ at Canterbury Cathedral under the guidance of the Cathedral organist, Dr. Palmer. His first cinema appointment was at Plymouth. Early this year he composed songs for the encouragement of the York City football team in their Cup battles. Farley composed "signature tunes for football clubs," dedicating the chorus to the home team each week.

Bank Holiday Sport

CRICKET, motor-cycle racing and baseball are to be covered in a special Northern outside broadcast programme on Bank Holiday Monday. From Old Trafford, Manchester, A. E. Lawton, former Derbyshire cricket captain, will give commentaries on the Lancashire v. Yorkshire game; Graham Walker, car and motor-cycle racing expert and a seasoned broadcaster, will describe the motor-cycle road races at Cadwell Park, Lincolnshire; and the county baseball match between Yorkshire and Lancashire will be the subject of commentaries by Alfred T. Grogan from Craven Park, Hull.

Novel Broadcasts

LISTENERS have heard many novel broadcasts brought to them by the Outside Broadcasts Department. Staff commentators go to the sea-bed in divers' suits, to the heavens in aeroplanes, and swing about on the end of fire-escapes to tell listeners what it feels like for an amateur to do these things. The department is now hoping to be in a position to place London's remarkable Ambulance Organisation on the radio map. The Outside Broadcasts Director might like to stage an accident in the busy quarters of London for the sake of realism, but listeners can doubtless envisage what would happen if such a thing occurred in Piccadilly and passers-by saw a B.B.C. commentator at work on a pseudo corpse. However, some means of conveying adequately the realism of the London Ambulance work will almost certainly be found.

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"A Ship in the Bay"

DAVID YATES-MASON, a young sailor in the R.N.V.R., recently returned from Malta, is the author of a hilarious nautical comedy, "A Ship in the Bay," which the B.B.C. are to broadcast twice during Navy Week—on August 2nd on the Regional wavelength, and on August 3rd on the National.

He has written an ingenious story about the inmates of the Girls' Holiday Home at Windybourne-on-Sea, who were pretty gloomy until H.M.S. *Enormous* dropped anchor in the bay. Then—well, it's a way they're said to have in the Navy; and producer Archie Campbell only hopes that no listeners will take the entertainment too seriously! Geoffrey Wright, who was at Cambridge with the author, has written the music. Charles Shadwell will conduct

ROUND the WORLD of WIRELESS (Continued)

Car Radio

ACCORDING to a recent estimate, the number of car radio installations in this country is between 40,000 and 50,000, or approximately 2½ per cent. of the cars on the road. In America, about 20 per cent. of their cars are radio-equipped.

Camp Fire Songs

MIDLAND listeners will hear part of the final sing-song of the Public Secondary Schools from their camp at the



A consignment of television receivers just leaving the Coscor factory at Highbury on their way to New York. This is proof of the ever-widening interest in television, and a fine tribute to the superiority of British receivers.

Hunting Butts Farm, Cheltenham, which over a thousand cadets from secondary schools throughout the country will be attending. A similar broadcast from their camp took place last year.

Lonely Wireless Operators

RADIO operators are often found in isolated outposts of the Empire, and the two telegraphists on Willis Island, in the Pacific, are no exception. This small island, 250 miles off the coast of Queensland, Australia, is the lonely home of the two operators, who are the only inhabitants of the island. They are stationed there by Amalgamated Wireless of Australasia, and their job is to transmit, at regular intervals from 6 a.m. to 9 p.m. daily, weather reports which are picked up at Townsville.

Altered Wavelengths

BORDEAUX - SUD - OUEST (France), which has been causing interference with the broadcasts of the Poste Parisien (Paris), has reduced its wavelength to 219.6 m. (1,366 kc/s), which is the channel used by the Paris Ile de France transmitter. Radio Agen, which had been using the wavelength adopted later by Radio 37 (Paris)—namely, 360.6 m. (832 kc/s), has now taken the former Bordeaux-Sud-Ouest channel, or 309.9 m. (968 kc/s).

Portsmouth Navy Week

THE Navy annually has a grand parade at Portsmouth during the summer, when it stages a Navy Week at Britain's

INTERESTING and TOPICAL NEWS and NOTES

premier naval base. Navy Week at Portsmouth this year is from July 24th to July 30th. Thomas Woodroffe is making arrangements at Portsmouth to broadcast a description of proceedings on the last day of Navy Week, July 30th. It is possible that

he will commentate from the bows of *H.M.S. Victory* between the hours of 4.40 to 5.0 and 6.45 to 7.0 p.m. Exact details will be published on this page next week.

Chamber Music

ON August 1st (Regional) Mark Hambourg will make one of his comparatively rare appearances at the microphone in a recital of works by Chopin, Albeniz, and Mendelssohn. Another well-known pianist, Frank Laffitte, will play the Piano Sonata by Paul Dukas, on August 3rd (National), and on the same day (National) Maurice Vinden will broadcast for the first time from the organ in the Concert Hall, Broadcasting House, a work by Karg-Elert, entitled "Music for Organ."

Scarborough Night's Entertainment

SOME of Scarborough's popular evening entertainments will be visited in a forty-five minute microphone tour to be broadcast on August 5th in the Northern Programme. Victor Smythe is arranging this outside broadcast feature, which will be called "Scarborough Night's Entertainment."

Australian Short-wave Transmission Schedules (August, 1938)

VK2ME (Sydney) 31.28m.: Sundays: Sydney Time 3 p.m.-5 p.m. (05.00-07.00 G.M.T.), 7.30 p.m.-11.30 p.m. (09.30-13.30 G.M.T.); Mondays: 1.30 a.m.-3.30 a.m. 15.30-17.30 G.M.T.).

VK3ME (Melbourne) 31.5m.: Nightly Monday to Saturday (inclusive): Melbourne Time 7 p.m.-10 p.m. (09.00-12.00 G.M.T.).

VK6ME (Perth) 31.28m.: Nightly Monday to Saturday (inclusive) Perth Time 7 p.m.-9 p.m. (11.00-13.00 G.M.T.).

Bank Holiday at Weston

A COMPOSITE entertainment feature of Bank Holiday programmes from Weston-super-Mare has been devised by Leslie Bridgmont, and on August 1st Regional and West of England listeners will visit: "The Summer Revellers," a concert party presented by George Hay and Gordon Lane at Grove Park Pavilion; the Winter Gardens Pavilion, for dancing to Al Lever and his Band, with Doreen Dene; and the Knightstone Pavilion, to hear a Seaside Revue presented by Caspar Middleton.

Studio Variety

DAVID PORTER will produce a variety programme from the Manchester studios on August 1st. Among the artists taking part will be Douglas Maynard (boy xylophonist), Mira B. Johnson (actress-entertainer), Culley and Gofton (the Yorkshire comedians), Mag and Alice (the Lancashire "vamps," who have previously broadcast several sketches), and Roland Powell's Variety Orchestra.

Variety from Bristol

A VARIETY programme from the stage of the Hippodrome, Bristol, in the West of England and Regional programmes, on August 5th, will include: Renée Houston and Donald Stewart; Billy Russell, "On behalf of the Working Classes"; Harry Welchman, "The Popular Musical Comedy Star"; and Arthur Pond, "The Scandal-monger."

SOLVE THIS!

PROBLEM No. 306

Smith took his receiver out of the cabinet to give it an annual overhaul. He carefully dusted it, being careful not to disturb any wiring, removed the valves, and carefully cleaned the legs and cleaned all connecting leads joined to the rear terminals. He replaced these as they were, put the set back in the cabinet, and switched on, but could not obtain any signals. The local was very faintly audible at one spot on the dial, but even the reaction control would not bring it up to listening volume. What was wrong? Three books will be awarded for the first three correct solutions opened. Envelopes must be addressed to The Editor, PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 306 in the top left-hand corner and must be posted to reach This office not later than the first post on Tuesday, August 2nd, 1938.

Solution to Problem No. 305

Atkinson need not have scrapped his meter as he could have extended its range by shunting it with a small variable resistance. This would have been a valuable addition as it would have formed a "zero setting" control. The following three readers successfully solved Problem No. 304, and books have accordingly being forwarded to them: L. Harrison, 117, Shakespeare Avenue, Stonebridge, N.W.10. G. F. Hopper, Ye Old Studio, Invergordon, Ross-shire. W. H. Maskett, 27, Longhurst Road, Lewisham, S.E.

TONE CONTROL CIRCUITS

Some of the Simpler Forms of Tone Control are here Explained, with Suitable Values

THE average receiver when first built up fails to give the type of reproduction desired. As a result, practically every modern receiver contains a tone control, and apart from the value of this device to modify the balance of reproduction it often proves of use in removing background noises when a long-distance station is being received. The pentode output valve, the Class B stage, and the Q.P.P.

components between the anode and earth as shown in Fig. 2.

Q.P.P. Stages

The Q.P.P. arrangement utilises either a double pentode or two separate pentodes in a push-pull circuit and accordingly a similar type of tone corrector may be employed. This should be joined across the two anodes, which is, of course, across the output circuit, as shown in Fig. 3. The resistor may be fixed or variable. In some cases it may be found that it is desirable to connect a fixed condenser permanently

principle is shown in Fig. 6, where it is used in conjunction with the standard resistance-capacity circuit. Suitable values

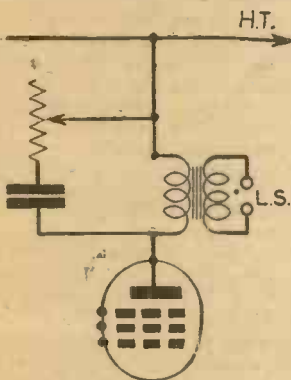


Fig. 1 (left).—This is the standard tone control employed with a pentode or tetrode output stage.

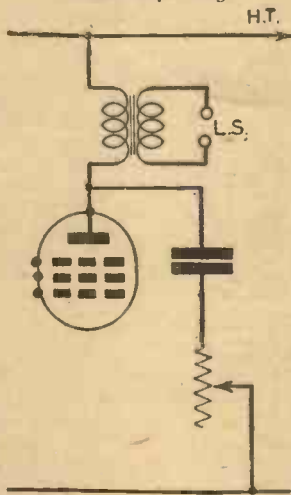


Fig. 2 (right).—In this alternative pentode tone-control circuit, the same principle is incorporated.

arrangement all need some form of tone correction in order to give a pleasing tone to the reproduction, and many criticisms of these circuits are due to the fact that the tone control is omitted. Dealing first with the pentode, it may be stated that this gives over-emphasis to the higher notes, with the result that the tone sounds too shrill. Consequently we need a high-note cut-off to balance the reproduction, but as certain types of orchestral music need more cut-off than speech, for instance, the control should be variable so that it may be adjusted according to the item being received. The usual tone control for this

across this type of output stage and use the tone control arrangement already referred to as an addition. In Fig. 4, therefore, we show this arrangement, and values suitable for the pentode tone corrector may be stated to be as follows. For the fixed condenser some value between .001 and .05 mfd. is generally suitable, and for the resistor from 20,000 to 100,000 ohms. The shunt condenser in Fig. 4 should not generally be greater than .001 mfd.

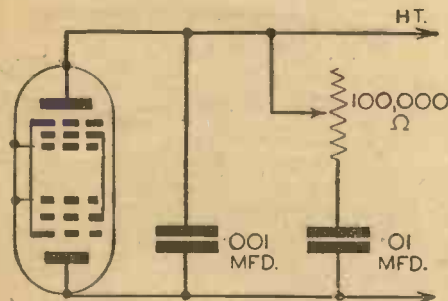


Fig. 4.—In this tone control circuit, a fixed corrector is included, in addition to the variable.

type of valve is shown in Fig. 1, and it will be seen to consist merely of a fixed condenser in series with a variable resistance, both being joined across the output circuit. In this connection it should be remembered that the H.T. positive side of the speaker or output transformer is at earth potential in relation to the anode, and accordingly it is quite in order to join the tone control

Fig. 3 (below).—A Q.P.P. or double pentode stage needs a similar tone control arrangement. In all of these circuits the condenser may have a value up to .05 mfd., and the variable resistor may have a maximum value of 100,000 ohms.

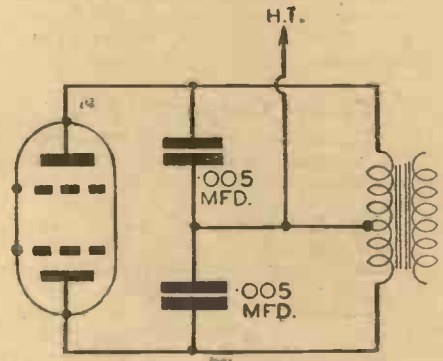
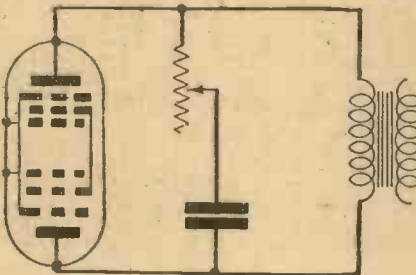


Fig. 5.—The Class B tone control arrangement in its simplest form.

will depend upon the valve and the R.C. components, and again, up to .05 mfd. and up to 100,000 ohms are generally suitable. A more comprehensive arrangement for use in this stage is seen in Fig. 7, where, in addition to the usual resistance and condenser a fixed condenser is permanently joined between anode and earth. This follows on the lines of Fig. 4, and a suitable value for the additional condenser is .005 mfd.

Bass Control

All of the circuits so far described merely control the high notes, or in other words the brilliance, but a circuit of great interest is seen in Fig. 8, which is the arrangement employed in an H.M.V. receiver. In this provision is made for bass attenuation,

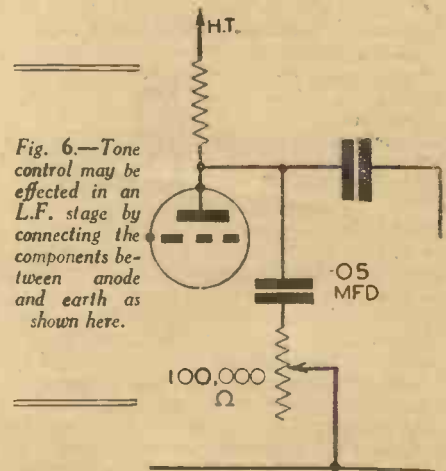


Fig. 6.—Tone control may be effected in an L.F. stage by connecting the components between anode and earth as shown here.

Class B Stage

In the Class B circuit such a comprehensive tone control is not needed and generally the tone is sufficiently well balanced if a fixed condenser shunts each anode. A value of .001 mfd. up to .005 mfd. will generally be found satisfactory, and they should be placed as shown in Fig. 5. The use of resistors on the input side is sometimes recommended with the Class B arrangement, but generally speaking if the L.F. circuits are properly designed a condenser filter alone is adequate.

Control in L.F. Stages

An argument is often put forward that tone control should be effected before maximum amplification has taken place and many modern receivers are accordingly being provided with a tone control across the first L.F. stage. This usually takes the form of a condenser and resistance arrangement (similar to that used in the pentode circuit), joined between the anode of the L.F. valve and earth. The general

brilliance attenuation and, in addition, a fixed tone corrector is employed. As will be seen, the bass attenuator consists of a fixed resistor and condenser in series between the anode of the penultimate

(Continued overleaf)

(Continued from previous page)

stage and earth, and shunted across these two components is a variable resistor. This is a bass control, and as its name implies, it controls the degree of bass attenuation. The brilliance attenuation is effected by a fixed condenser and resistor across the grid circuit of the output valve, and the resistor is of the variable type to effect the degree of brilliance attenuation desired.

The fixed tone corrector in this circuit is a fixed condenser and resistor coupled between the grid and anode of the output valve. The separate circuits are indicated by varying line thickness in Fig. 8, and the values used by H.M.V. are given.

Tone Control Components

In addition to the usual arrangements shown, it is possible to employ chokes and other components in special circuits, and in this connection it should be remembered that in the Bulgin range of components is a special tone control choke consisting of a tapped winding with a total inductance of 3 henries. This inductance naturally varies according to the current flowing

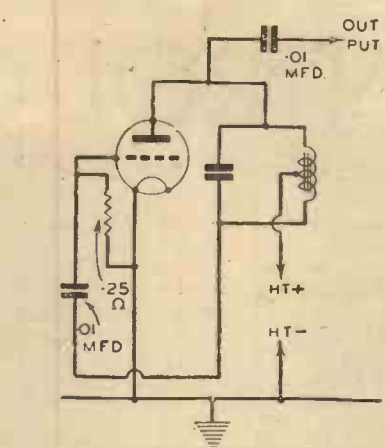


Fig. 9.—The Bulgin tone control choke and a suitable circuit.

been provided to give inductance values of 0.5, 1, 1.5, 2 and 2.5 henries, and the resonant frequency of the choke with various values of condenser are shown in the following table:

Capacity. Mfd.	Frequency. Cycles.
0.1	500
0.07	600
0.052	700
0.04	800
0.031	900
0.025	1,000
0.011	1,500
0.0063	2,000
0.0041	2,500
0.0028	3,000
0.0021	3,500
0.0016	4,000
0.00125	4,500
0.001	5,000

Suitable circuit arrangements are shown in Figs. 9 and 10, and it should be noted that when the condenser is in parallel with the choke the circuit is of the rejector type, and when it is in series with the choke the circuit is of the acceptor type. For the benefit of those to whom these terms are not clear it may be explained that a rejector circuit provides maximum voltage at the resonant frequency, whilst the acceptor gives minimum voltage at the resonant frequency. Thus to eliminate needle scratch, for instance, an acceptor circuit would be

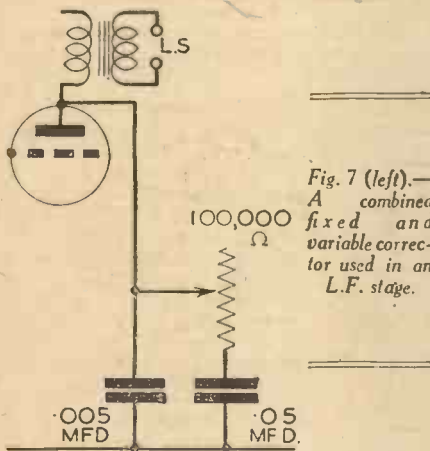


Fig. 7 (left).—A combined fixed and variable corrector used in an L.F. stage.

through it, and to preserve the maximum value it should be so arranged in circuit that no D.C. flows. This may easily be done by using the normal filter circuit arrangement. In this choke tappings have

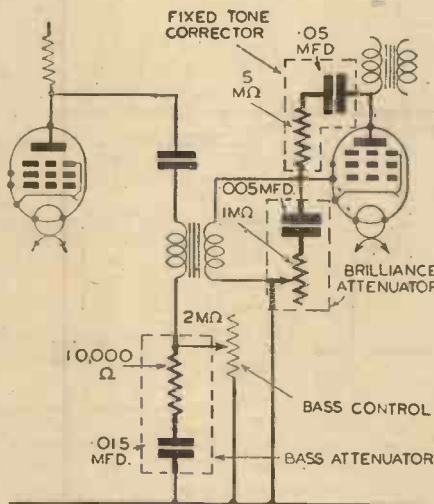


Fig. 8.—A comprehensive bass and treble control circuit as used in an H.M.V. receiver.

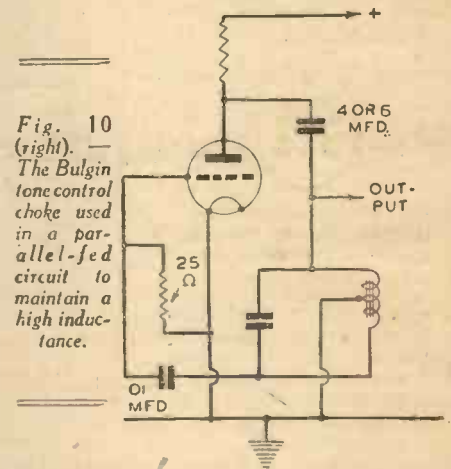


Fig. 10 (right).—The Bulgin tone control choke used in a parallel-fed circuit to maintain a high inductance.

needed, and 4,000 cycles is generally regarded as the frequency of needle and surface noise, which means that an acceptor circuit made up from the complete choke winding and a .0016 mfd. condenser would be needed.

P.A. Equipment for Devonport Navy Week

THE Marconiphone Company inform us that they are carrying out the entire amplification for Navy Week at Devonport. This is probably the largest P.A. installation at any Navy Week, and despite the actual Navy Week work in Devonport Dockyard, Marconiphone are carrying out the entire amplification for the Tattoo at the Royal Marine Barracks, Plymouth, during the same week. As short-wave work is employed on the radio side, the Marconiphone Company is supplying two of its standard short-wave radio receivers with automatic volume control for use in the control ship of the fleet air arm.

This year the display is even more ambitious than in previous years, necessitating an increased amount of Marconi equipment. The work has been placed with the Marconiphone Company principally on account of the success with which they carried out their first installation last year, which received the highest praise from all sections of Navy Week Control. The Marconi engineers started installing on

ITEMS OF INTEREST

July 21st, ready for a dress rehearsal by the 28th, and the first day of Navy Week on July 30th, running through to August 6th.

Owing to the exceptional success of last year's display, it is anticipated that the attendance will be very considerably more this year, and the Naval Authorities have accordingly made adequate provision in this direction, especially by the extension of traffic control with additional Marconi loudspeakers.

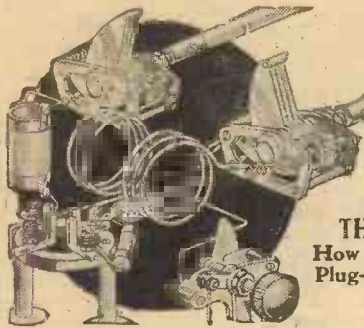
New Aeroplane Landing System

WE are informed that the Bureau of Air Commerce, U.S. Department of Commerce, has awarded the contract for the design, manufacture, and installation of its new aeroplane instrument landing system to the International Telephone Development Company of New York, a subsidiary of the International Telephone and Telegraph Corporation. The system will be installed at Municipal Airport,

Indianapolis, Indiana, for use by the commercial transport lines.

The equipment includes a trailer carrying main and spare localiser beam transmitters with means to connect to fixed localiser antennas at four points. There will also be a trailer bearing main and spare glide path beam transmitters with an antenna. Also four sets of "marker" beacons, each consisting of an outer marker two miles from the field, and an inner marker near the boundary of the landing field. Equipment will also be provided for the airport control tower for remote control of the various transmitters, and for visual automatic alarm in the case of trouble in any part of the system. The localiser beam establishes for the aircraft the direct line to the airport runway, the glide path beam provides the exact line of descent to the runway, the outer marker establishes the beginning of the glide path, and the inner marker signals that the runway has been reached.

RADIO EXHIBITION
 AUGUST 24th to SEPTEMBER 3rd.
 OUR STAND No. 9



Short Wave Section

THE EXPERIMENTER'S SHORT-WAVE THREE
 How to Modify this Receiver to Employ Modern 6-pin Plug-in Coils. Blueprint No. P.W. 30A Shows the Wiring for this Receiver.

IN 1933 we described a simple short-wave three utilising an S.G., detector and triode output valve, with a type of 6-pin coil which was then popular. Unfortunately, this particular type of coil is not now readily available, and readers who are anxious to make up this receiver will find it simpler to employ the modern 6-pin type of coil. This may be obtained from several firms such as B.T.S., Eddystone, Raymart, etc. The receiver is baseboard-built, and the condensers are mounted on mounting brackets. As these brackets are not now supplied in the original pattern, the type 1007 Eddystone brackets are quite suitable and, furthermore, have the advantage that they may be adjusted for any desired height from 2½ in. to 3 ⅝ in.

Universal Wavelength Range

Although every component is specially chosen to be "just right" for the function it has to perform, the set can be built for no more than sixty shillings. Again, despite the fact that the set was designed as an ideal short-waver, it can be used with almost equal efficiency on the broadcast wavebands. Unlike most short-wave sets, it will cover a range of from 260 to 510 metres, or from 1,000 to 2,000 metres, with a single coil. Needless to say, its range of reception on short waves is literally world-wide, and on the higher wavebands it is capable of bringing in some thirty-odd European stations. In all cases, loud-speaker reproduction, to say the least, is very good. Tuning is almost as easy as with a one-knob family receiver, and even the beginner need have no fears in this respect.

The aerial circuit is untuned, a ¼ megohm resistance providing aperiodic coupling. This obviates the necessity for a second tuning control, which would make tuning tricky. A metallised, screened-grid valve is used for the first stage, the metal coating acting as a screen between grid and anode circuits. Its screening-grid receives high tension from a separate tapping, and is by-passed to earth through a .1 mfd. non-inductive condenser. Coupling between the S.G. and detector stages is by means of a high-frequency transformer with tuned secondary. A reaction winding is also included on the transformer, and the degree of feed-back is controlled by a .0002 mfd. reaction condenser.

The tuning condenser has a maximum capacity of only .00015 mfd., but, thanks to its very low minimum, will cover a very wide range of frequencies. This is very evident by the fact, previously mentioned, that it will cover either broadcast range with a single coil. Both grid-leak and condenser have more or less usual values, but these components were chosen to match the detector valve (a Cossor 210 det. metallised). It was found afterwards, however, that they were almost equally well suited to the Cossor 210 L.F., and that is why alternative valves are specified. It was found quite unnecessary to use a po-

tentiometer in conjunction with the grid-leak, because perfect reaction control proved possible by taking the leak to low-tension positive. A special "All-wave" H.F. choke is used in the detector anode circuit because it is required to cover both long and short waves. The L.F. valve receives its input through a resistance-fed transformer, and a ¼ megohm stopping-resistance is included in its grid circuit. A portion of the anode resistance is used in conjunction with a 2-mfd. condenser to decouple the detector anode circuit. The last valve is of the high amplification power-valve type, capable of giving good speaker signals even on small inputs. A .002 mfd. fixed condenser is joined between its anode and earth to keep high-frequency currents out of the loudspeaker leads.

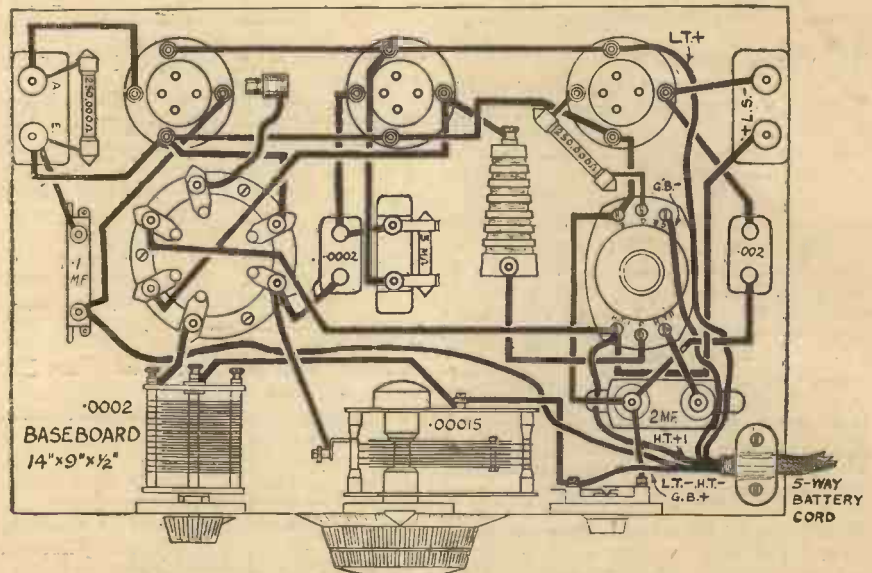
plan. Keep all wires short to ensure maximum rigidity and take them from point to point by the straightest path. The anode connector is attached to a short length of flex connected to terminal 4 of the coil mounting base. Both resistances are attached directly to terminals by their own connecting leads. A 5-way cord assembly is used for connecting up to the batteries, and its end is secured to the baseboard by means of a small brass stirrup, or anchor, to prevent the wires from being pulled loose.

It will be noticed that although the cord assembly has only five wires it has seven connecting terminal points; this is explained by the fact that plugs "L.T.—," "H.T.—," and "G.B.+" are all attached to the same lead. The latter, by the way, is connected to one terminal of the on-off switch.

Coils

The 6-pin coils specified are obtainable in all sizes, but the following, given along with the tuning ranges they cover with the .00015 mfd. tuning condenser, are most useful since they cover the wavebands in constant service:

Type.	Wavelength Range.
LB	12 to 26 metres.
Y	22 to 47 metres.
G	260 to 510 metres.
GY	1,000 to 2,000 metres.



Wiring plan of the short-wave set. This is a reproduction of the full-size Blueprint

Assembling the Components

It will be found best to commence by attaching the brackets and then fixing the condensers and switch to them. Before mounting the tuning condenser a dial pointer must be made and secured under the mounting nut. The pointer is made from a piece of thin brass or copper-strip. If copper or soft brass is chosen it can easily be cut with a pair of strong scissors. Next mount the valveholders and terminal blocks, but before screwing down the other components lay them all on the baseboard, insert valves and a coil, and carefully arrange them so that there is ample clearance.

Easy Wiring

The wiring is extremely straightforward, and you should try to duplicate that of the original set by carefully studying the Full-size Blueprint or the wiring

Battery Voltages

For the valves specified the high-tension battery should have a voltage of not less than 100 for best results, although the set will certainly function with a voltage lower than this. Plug "H.T.+1" should be taken to the highest tapping and "H.T.+2" to the 66-volt tapping. The correct grid bias for 100 volts H.T. is 3 volts. This might be increased to 4½ volts with an H.T. voltage of 120.

Using the Set

When first trying the set on short waves it is advisable to employ 'phones unless you have already had a fair amount of experience with short-wave reception. We advise this because, although not difficult, tuning is exceptionally sharp, and you might tune straight past a station if using a speaker. Once the knack of accurate tuning is acquired all reception can be carried out

(Continued overleaf)

SHORT-WAVE SECTION

(Continued from previous page)

on the speaker if preferred. The method of operation, after inserting a suitable coil for the waveband required, is as follows: Switch on and set both reaction and tuning condensers at minimum capacity (vanes right out of mesh). Turn the left-hand (reaction) knob slowly until a "breathing" or "rushing" sound is heard, indicating that oscillation has just set in. Now rotate the tuning dial as slowly as possible by means of the vernier knob, at the same time increasing the reaction setting if necessary, to keep the set just on the point of oscillation. During all tuning operations the reaction control must be so adjusted that the set is just in the oscillating condition for it is then most sensitive. More, or less, reaction will appreciably reduce sensitivity, especially to weak signals.

As the tuning dial is turned squeaks or whistles will be heard. Probably the first will be a morse station, and can be recognised by the "chirping" sound. When you come to a telephony station a steady whistle will be heard at first, but as the dial is slowly turned the whistle will rise in pitch, disappear for an instant and then return. Go back to the silent

COMPONENTS REQUIRED FOR THE "EXPERIMENTER'S SHORT-WAVE THREE."

- 1 Baseboard, 14in. by 9in. by $\frac{1}{2}$ in.
- 1 .00015 mfd. variable condenser with slow-motion drive (Jackson Bros.).
- 1 .0002 mfd. reaction condenser (Jackson Bros. "Midget").
- 1 Filament switch.
- 3 Mounting brackets (Eddystone).
- 3 S.W. valveholders (Eddystone).
- 2 250,000 ohm metallised resistances (1 watt).
- 1 1.1 mfd. non-inductive condenser (T.C.C.).
- 1 6-pin coil base (Eddystone).
- 1 Set (Eddystone) 6-pin coils.
- 1 .0002 mfd. fixed condenser (T.C.C.).
- 1 3-megohm grid-leak.
- 1 Grid-leak holder.
- 1 All-wave H.F. choke (Eddystone).
- 1 L.F. coupling unit.
- 1 2 mfd. condenser (T.C.C.).
- 1 .002 mfd. fixed condenser (T.C.C.).
- 2 Terminal blocks; 1 marked "A" and "E," and 1 "L.S."
- 1 5-way battery cord with wander plugs and spades marked "H.T.—," "L.T.—," "G.B.—," "H.T.+1," "H.T.+2," "L.T.+", and "G.B.+" (Belling-Lee).
- 1 Safety anode connector (Belling-Lee).
- 3 Valves; 1 215 S.G. metallised; 1 210 Det. metallised—or 1 210 L.F.; 1 220 P.A. (Cossor).
- 1 100-volt high-tension battery (Exide).
- 1 9-volt grid-bias battery (Exide).

point between the whistles and reduce the reaction setting very slightly. By careful final adjustment of the tuning knob the telephony should be heard clearly. Remember that telephony cannot be received clearly whilst the set is oscillating, but that oscillation is necessary for the reception of morse.

Broadcast Reception

When listening on the broadcast bands tuning will be found to be particularly easy, but selectivity will not be a strong feature due to the fact that only a single tuning circuit is employed. Nevertheless, whilst testing the receiver we found it to be noticeably more selective than the average non-S.G. set. Another very good point is that even if the set is allowed to oscillate it will not cause interference to neighbours because the oscillations cannot get past the S.G. valve into the aerial circuit.

Now you can go straight ahead and make the "Experimenter's Short-wave Three" with every confidence of success. We shall be pleased to hear of the results you obtain, and in case of any difficulty, great or small, our Free Advice Bureau is at your service.

Leaves from a Short-wave Log

The Paris Interval Signal

IN order to facilitate identification the French short-wave transmitter *Radio Mondial* (late *Paris Colonial*) programmes now open with a few bars of the National anthem, *La Marseillaise*.

Bulgaria on Higher Wavelength

LA Sofia (Bulgaria), previously on 20.04 m. (14.97 mc/s), is now working on 35.44 m. (8.465 mc/s) with a slightly increased output. The call is *Radio Sofia* given by a woman announcer. Address: Radio Sofia, 19, Moskovska St., Sofia (Bulgaria).

Afternoon Broadcasts from Denmark

FOR experimental purposes test transmissions are being carried out on most afternoons by Skamlebaek (Denmark) on 19.78 m. (15.165 mc/s), between G.M.T. 13.00-18.30, with the new 5-kilowatt station OZH. For this purpose a relay of the Copenhagen main programme is being taken.

And from Siam

ON 15.77 m. (19.02 mc/s) the 5-kilowatt Saladeng (Bangkok) transmitter HS8PJ is also well heard on Mondays between G.M.T. 13.00-15.00. The interval signal consists of 3 chimes (ascending scale), *soh-doh-me-doh-me-soh*. Address for reports: Station HS8PJ, Government Posts and Telegraphs (Radio Technical Section), Saladeng, Bangkok, Siam.

Columbia System's Summer Schedule

W2XE, Wayne (N.J.), the short-wave outlet of the Columbia Broadcasting System of America, advertises the following short-wave schedule of broadcasts beamed on Europe: From Monday to Friday inclusive, G.M.T. 12.30-15.00 on 16.89 m. (17.76 mc/s); 18.00-23.00 on 19.646 m. (15.27 mc/s) on Saturdays from 13.00-18.00 on 17.76 mc/s, and from 19.30-23.00 on 15.27 mc/s. On Sundays a transmission is made from G.M.T. 13.00-18.00

on 13.94 m. (21.52 mc/s), and from 19.30-23.00 on 15.27 mc/s.

British India on 31-metre Band

DELHI, VUD2, on 31.28 m. (9.59 mc/s), can be logged daily between G.M.T. 07.00-09.00, and from 14.30-17.00; VIB2, Bombay, on 31.41 m. (9.55 mc/s), is also on the ether between G.M.T. 06.00-08.30, and from 14.00-15.30. Both these stations are now rated at 10 kilowatts, and under favourable conditions provide strong signals in the British Isles.

Morse Transmissions of Far East War News

DAILY at G.M.T. 15.00, a morse transmission in the English language is put out by Japan through JUP, a 20-kilowatt station at Tokio-Oyama working on 22.96 m. (13.065 mc/s). According to the wording it would appear to be a bulletin expressly destined to British passengers travelling on Japanese ships.

Radio Canada

THIS is the call now given by VE9HX, on 48.92 m. (6.13 mc/s) relaying the medium-wave station CHNS, in Halifax (Nova Scotia). The programme opens with the Canadian national song: "O Canada," and all announcements are made in both French and English. The full call is: *This is station VE9HX, a station located in the Lord Nelson Hotel, Halifax, associated with the "Halifax Herald" and the "Halifax Mail," two of Canada's great newspapers.* The programme closes down towards G.M.T. 03.00 with the playing of *God Save the King*. Address: Radio station VE9HX, P.O. Box, 998, Halifax, Nova Scotia.

NOW READY!

WIRELESS COILS, CHOKES AND TRANSFORMERS, AND HOW TO MAKE THEM.

Edited by F. J. Camm.

2/6, or 2/10 by post from Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

RESONANT SCANNING

ONE very great difficulty associated with all forms of mechanical scanners used for analysing or reconstituting television pictures is that of driving the member which gives the line scanning. With high-definition television the speeds required are considerably in excess of any which were employed in low-definition days. Although the moving member may be quite small and light in weight, there is a fair consumption of power, and questions of synchronism become of importance. This last-named was evident with the Scopony equipment during the course of their recent big-screen demonstrations. Picture brightness was of a very high order, but at times there was a loss of synchronism. A small high-speed mirror polygon provides the line scanning, this working in conjunction with a large low-speed mirror-drum for the picture frames. Naturally, these parts have inertia, and are not capable of responding suddenly to any timing variations that may be present in the vision signal radiated by the B.B.C. Whenever there is a slight inaccuracy of control by the B.B.C., therefore, the mechanically reproduced picture can become completely scrambled if the timing change is excessive, while on other occasions a vertical shift takes place or there is a horizontal quiver. We understand, however, that the apparatus at Alexandra Palace has been modified to prevent loss of synch. pulses, and that the trouble is only experienced at the moment on outside broadcasts. The portable apparatus employed has not yet reached the same high standard as the permanent installation at the Alexandra Palace and eventually, therefore, this trouble should not be experienced. With electrical scanning, of course, these discrepancies are not evident, since the beam of electrons is inertialess. Several schemes have been tried for mechanical scanners, and one of the most recent is that suggested in America. In this case the fullest advantage is taken of the principle of resonance, and full details of this device were given in the Television Section of our issue dated July 16th, 1938. We also believe that experiments are being carried out in this country with another mechanical system.

ON YOUR WAVELENGTH



Licences for June

THE General Post Office has estimated that the licences issued in June showed an increase of 4,000 over the previous month, the actual figures being 28,500 compared with 24,874. Thus, June has followed the tradition of 1937, where there was a similar increase, although this year the increase is higher. The total number of licences in force is 8,638,300, of which 50,300 are issued free to the blind. England and Wales account for 7,738,000 paid and 44,000 free; Scotland 735,000 paid and 5,400 free, and Northern Ireland 115,000 paid and 900 free.

The New Director

AT the moment of writing the new Director has not been appointed to the B.B.C., and I am wondering what is causing the delay. I do hope that petty jealousies are not being introduced into the selection. I am not one of those who subscribe to the belief that any individual possesses heaven-sent gifts for such a job. I expect there are thousands of people who could run the job quite successfully, although two difficulties arise—the first to find the right man, and the second to attract the right man. I am prepared to admit that I may be adopting an obtuse point of view, but I genuinely believe that with broadcasting as with every other similar job, a good horse makes a good jockey. I cannot believe that any individual is a demigod, heaven-sent for a particular task. Unfortunately, it is very true that a popular job which brings you into the limelight of publicity may cause the public to endow you with qualities you do not possess. It is true that the B.B.C. is an efficient organisation. It is a matter of opinion whether it might not be a more efficient organisation if someone else directed the job. Do not let us therefore be forgetful of the fact that there are as good fish in the sea as are caught, and that the B.B.C. is not likely to tumble about our ears because at the moment it is without a director. It is sufficient to indicate that the B.B.C. is running its same placid course as it did when it had a director. You may argue that it is organised so well that it is able to do so. If that is so, the argument

By Thermion

seems to be that the need for a director is gone. If a selection has not been made by the time that you read these notes, I hope that the individuals charged with finding a new director will bear in mind the tonic effect of promoting someone from the staff of the B.B.C. Those who have loyally served it have a right to consider that the opportunity is there for them eventually to reach the director's chair, in just the same way as any private in the Army is taught that a Field-Marshal's baton reposes in every private's knapsack. Above all, do not let us think that any individual is endowed with supernatural organising ability. If you can have as head of a Ministry an individual who knows nothing of that Ministry (and we have plenty of examples of this in the present Government), it surely can be a not too difficult job to direct the fortunes of the B.B.C. which, after all, is only an enlarged version of a seaside pierrot troupe. It exists to entertain; not to domineer nor to dominate, but to serve the public that foots the bill. The job of Director of the B.B.C., in my humble submission, is one which can be filled without much difficulty. There are plenty of able people about.

Television at Radiolympia

THE B.B.C. tell me that special television programmes will be radiated daily from Radiolympia, by arrangement with the Radio Manufacturers' Association, from August 24th to September 3rd inclusive. For this purpose the R.M.A. is erecting in the National Hall a large television studio, with glass walls which will enable visitors to see television programmes in production on the studio floor.

The two principal programmes, for which the R.M.A. has booked the

artists, will be "Cabaret Cruise" and "Queue for Song," produced respectively by Harry Pringle and Reginald Smith, of the B.B.C. television staff. The setting for the "Cabaret Cruises" is the deck of a cruising liner, and the talented "passengers" will include Steve Geray and Magda Kun, the comedy cabaret artists; Ernest Shannon, the impressionist; the Five Lai Founs, a family of oriental jugglers; Walsh and Barker, the popular American duettists; and Reine Paulet and Trudi Binar, the Continental cabaret stars. The ship's "captain" will be Commander A. B. Campbell, who will compère the show.

"Queue for Song" will feature Douglas Byng, the popular comedian, and the cast will include Queenie Leonard, Jackie Billings and Diana Chase, Graham Payn, and Edward Cooper.

"Picture Page," television's weekly topical magazine, will be produced in its entirety at Radiolympia on August 25th and September 1st. Fashion parades will be included daily.

"Come and be Televised!"

EACH morning visitors to Radiolympia will be invited to face the television cameras so that their friends can see them on demonstration receivers in different parts of the Exhibition.

For the first time, two mobile television units will be in use during the Exhibition period. One will be installed at Olympia to relay the programmes thence to Alexandra Palace for re-transmission, and the other will be operating first at the Kennington Oval for the final Test Match, and later at the Zoo to provide two half-hour animal programmes daily.

The Radiolympia transmissions will, I understand, supplement the normal programmes, which will be radiated from Alexandra Palace for half an hour in the afternoon and one hour in the evening; regular viewers will also be able to pick up the Exhibition transmissions, although these will be to some extent repetitive.

Between five and six hours of television programmes will be transmitted daily.

The Australian War Memorial

THE great Australian War Memorial was the last of the British War Memorials to be unveiled in France. The previous ones have been: Menin Gate, at Ypres; the Royal Air Force Memorial at Arras, and the Giant Memorial at Thiépval; the Canadian Memorial at Vimy; and lastly, the Australian Memorial. All the amplification at the opening ceremony of the speeches and also the band relay was undertaken by the Marconiphone Company exclusively.

The following microphones were provided. Firstly, the gold and silver Marconi microphone, reserved exclusively for the use of His Majesty; a special Marconi microphone for the use of the French President, M. Lebrun; a microphone for the High Commissioner of Australia; and further microphones for the Dedicating Bishops and for band relay.

A special set of amplifiers was constructed for this occasion, and as mains were not available, arrangements were made with Messrs. Exide to provide accumulators which were transported from England. The whole installation was under the control of Marconi technicians working in close co-operation with the British and French broadcasting authorities.

The apparatus was taken over in a Marconiphone van by means of the ferry to France and thence by road to Villers-Brettonneux on July 18th, and it returned by the same route on July 23rd, the day after the ceremony.

Marconiphone apparatus has, therefore, been used at all the big War Memorials, with the exception of the Canadian Memorial, which was carried out by a French public address company.

The Children's Hour

FOR the benefit of those who did not hear Mr. Derek McCulloch broadcast in the Children's Hour on his return to the B.B.C., the following is the text of his speech:

"Hullo, children—everywhere.

"And in that greeting I must include all the parents, older relatives, guardians and friends who joined with my own listeners in sending me such extremely friendly messages of sympathy. I can only say that the thousands of letters which reached me proved to be half my cure—the rest was achieved by the surgeons and those who nursed me.

"It is fourteen weeks and a day since I last broadcast, and now I have only come to the microphone to say that, although I am sound in wind—if not yet in limb—I cannot yet awhile begin permanent broadcasting again.

Notes from the Test Bench

Frequency Drift

COMPLAINTS which are often received concerning the shifting of wavelengths on the short waves are often traced to unsuitable operating conditions in the receiver. The majority of commercial broadcast stations use special control devices which ensure that the wavelength or frequency is kept perfectly constant. In the receiver, however, the conditions generally are not so reliable and it is often found that listeners endeavour to tune in a station on the short waves immediately after switching on. With a mains set particularly, the initial period during which heaters are attaining maximum temperature gives rise to various effects, among which is that of varying tuning. In a superhet, the function of the frequency changer is dependent upon the emission and thus the correct tuning point cannot be accurately adjusted until the valves have properly warmed up. Slight variations in resistance values may also be observed due to the voltage drop through them varying with the current flowing, which is in turn dependent upon the temperature of the valve.

A.V.C. Action

WHEN testing a receiver fitted with A.V.C. it is generally essential first to disconnect this circuit whilst tests and adjustments are made. The compensating action of the circuit generally renders it difficult to ascertain the effect of some adjustments especially to trimming, and therefore one of the first steps in testing a set of this type is to break the A.V.C. circuit. The simplest way of doing this is to fit a shorting switch in parallel with the main filter circuit. The A.V.C. line must not, of course, be disconnected as this will leave coils which are fed from the A.V.C. line "in the air."

All-wave Chokes

THE normal reaction choke may be used for H.F. coupling in some circuits, but in an all-wave set it may prove ineffective on the short-wave ranges. This difficulty may be overcome by connecting a short-wave choke in series with it, and often for reaction this scheme may be adopted. As an alternative, of course, an all-wave type of choke should be employed, and this consists usually of a "tapered" winding, more or less on the lines of a short-wave choke on each side of a standard broadcast choke. Experiments with reaction and coupling circuits in all-wave sets may therefore take the form of adjustments in regard to the degree of taper or the balance of the windings on each side of the main section of this component.

"I am back in my office each day, but I go home in time to listen to our own programmes, and I am afraid it will not be until the last week in September, or the first week in October, that I shall be able to rejoin the others in the studio here. They have carried on so well for me that I know you will go on listening to, and, I hope, enjoying our programmes.

"It will not be long before we are a united family again, and I can assure you that I am very much looking forward to that great day.

"In the meantime—thank you all for your kindness and sympathy—and now we all want to forget I ever had that accident.

"Good-bye, children, everywhere!"

Mysterious Power!

I WAS, er . . . well, surprised to read in the Sunday paper of an invention no larger than a watch, which when exposed to sunlight will develop electrical power sufficient to drive cars, light houses, charge batteries, operate refrigerators and so on, without effort or running cost. The device is called the Helio-Electric Generating Cell, and it is claimed to produce power from light. It is of the size and thickness of a pocket watch, and it is claimed that a number of them wired together will illuminate a house, or run a car. It operates without coils or other electrical mechanisms. One side of the cell, which is enclosed in a bakelite casing, is a thin glass disc, covered with a secret compound which the inventor says converts light into direct current. He says that there is no practical limit to the amount of power that can be produced without cost or mechanism. The Sunday newspaper tells me that by placing these cells on the windscreen, or roof of their cars, motorists can keep their batteries charged throughout the day.

Now, judging entirely from this newspaper report there does not seem to be anything new in this device, for we all know the effect which can be produced by means of selenium, or selenium salts. Although the National Physical Laboratory states that they have tested the device, and it registered on their meter, they say that its possibilities have yet to be discovered. I await developments with great interest, for I can do with one of these devices on each wheel of my car, and, apart from that, it may be useful for charging my wireless accumulators. I rang up the Exide Company to inquire what they were going to do with all the batteries they are making for wireless sets, but they seemed quite unperturbed at the introduction of this device.

Automatic Record Changers

Further Details of the Manner in which Popular Changers Work are Given this week

THIS very brief account of the changing cycle has only covered the main features and there are innumerable details which, however, belong more properly to an instructional manual than to the pages of PRACTICAL AND AMATEUR WIRELESS. Sufficient has been said, however, to give an indication of the methods by which mechanical sequences can be achieved.

Prominent among other automatic

Garrard Company is delightfully simple in operation and is shown in Fig. 7. The records are supported, partly by an ingenious bent spindle which fits into a slot in the centre of the turntable, but which does not rotate, and partly by a bracket seen on the left. The arms of this bracket are fitted with two little pegs, and in order

the record falls downward on to the turntable.

The Collaro Mechanism

Another mechanism which depends upon a somewhat similar "notched spindle" is that recently introduced by Messrs. Collaro Ltd. This is shown in Fig. 11, and, unlike the mechanism already described, it will be observed that it is capable of playing a batch of records of mixed sizes. The records may be mixed in any order and the pick-up is automatically dropped into the correct position and biased into the first groove according to the size of the record just dropped.

A second mechanism made by Messrs. Collaro Ltd. is not strictly similar to those already described, since it is not intended for the automatic playing of a pile of records, but it deserves mention on account of its unique features. It is an automatic gramophone, but it plays single records only. To play a record, it is only necessary to push the record gently into a slot. The mechanism then draws the record right in, plays it automatically, and then pushes it partly out of the slot again. The mechanism which is shown in Fig. 9 is entirely automatic and it plays either 9-in., 10-in., or 12-in. records in any order without any pre-setting or manipulation. The construction is such that the records are treated even more gently than is possible by hand—which is certainly not true of some of the changing mechanisms.

Before drawing this survey to a close, a very brief account must be given of the Autotrope, an automatic record changer invented by John Hopwood. This is perhaps the most remarkable mechanism of its type yet produced, for it is not



Fig. 8.—The Garrard Automatic Record Changer. The records are carried by the three pillars, a quick angular movement of which causes the bottom record to fall on to the turntable.

mechanisms which can now be purchased by home constructors of radio-gramophones are two made by the Garrard Engineering Company. The first is shown in Fig. 8, and it will be seen that the records are carried on three standards, the top of each of which is fitted with a special knife-edged blade known as the separator blade, the function of which is to isolate the bottom record of the pile during the dropping motion. The three standards are connected together by a link arrangement underneath the motor board and are controlled by a special form of cam. At the correct instant, the standards make a quick angular movement, the knife edges separate the bottom record from the rest of the pile, the bottom record is dropped on to the turntable, and the standards return to their normal position.

This mechanism is controlled by a very ingenious cam, which, unfortunately, defies description in brief and simple language. It is unusual, however, in that it combines all the essential movements in a single cam by means of employing both a traversing and a radial contour to the cam face.

The Garrard Mechanism

The second mechanism made by the

to drop a record the bracket is caused to kick inwards, with the result that the bottom record is moved very slightly to the right. The bent spindle in the centre is not a plain one, as might be imagined from the photograph, but is notched as shown in Fig. 6. When the bottom record is given a slight kick to the right, its central hole passes over the shoulder of the spindle and

Fig. 10.—The Autotrope, an automatic record-changer de luxe which is capable of playing a series of 33 records which may be of any sizes and in any order. This mechanism has the unique feature that it plays both sides of the records without attention.

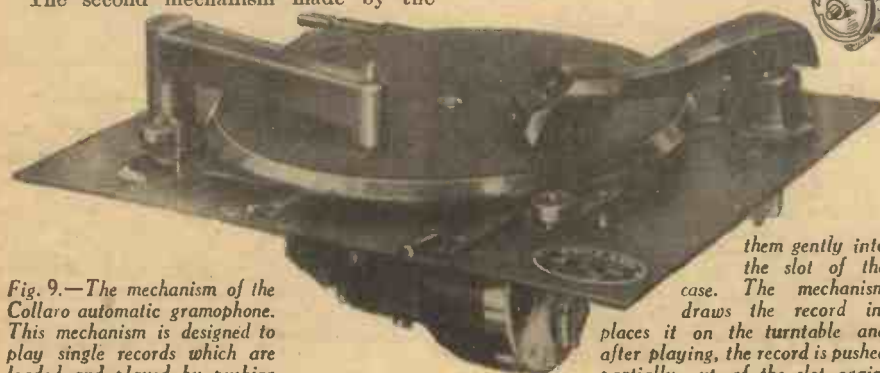
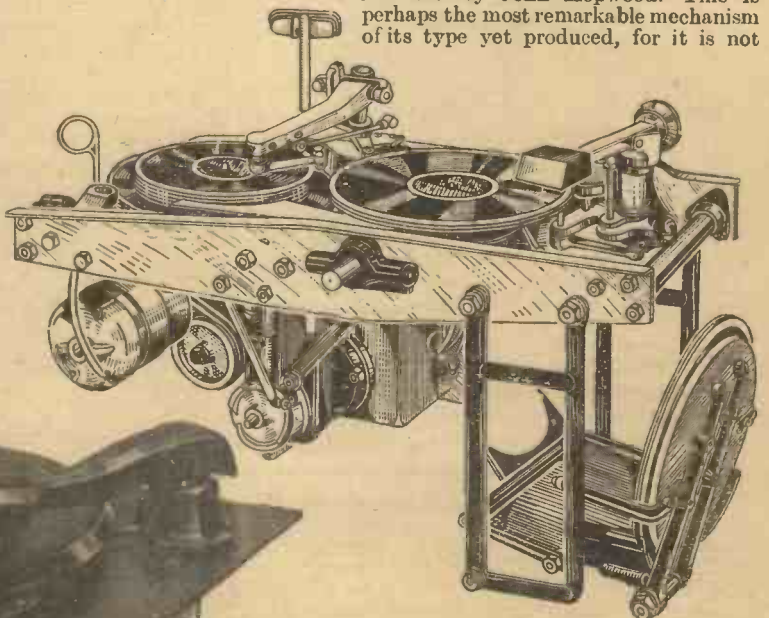


Fig. 9.—The mechanism of the Collaro automatic gramophone. This mechanism is designed to play single records which are loaded and played by pushing

them gently into the slot of the case. The mechanism draws the record in, places it on the turntable and after playing, the record is pushed partially out of the slot again.

only capable of playing a series of no less than thirty-three records which may be of mixed sizes in any order, but, unlike any other automatic mechanism, it can play both sides of a record.

(Continued overleaf)

(Continued from previous page)

Separate Motors Employed

The mechanism is, of course, very complicated, and separate motors are employed for record playing and record changing, but the construction is such that the records are treated very gently and they are never in sliding contact with any part of the mechanism.

The records are taken from a magazine to the turntable by a traverse arm which engages with the central hole of the record, whilst the turning over of a record is performed by a pair of levers which hold the record gently by the edges. After playing, the record is delivered on its edge on to rubber buffers in the rejection chamber and it is then pushed on one side by delicate fingers.

As may well be imagined, such a comprehensive mechanism can only be sold at a luxury price. But there are always those who will pay a high price for the best, and if capacity and capability are the standards of comparison, then the Autotrope is certainly the doyen of automatic gramophones.

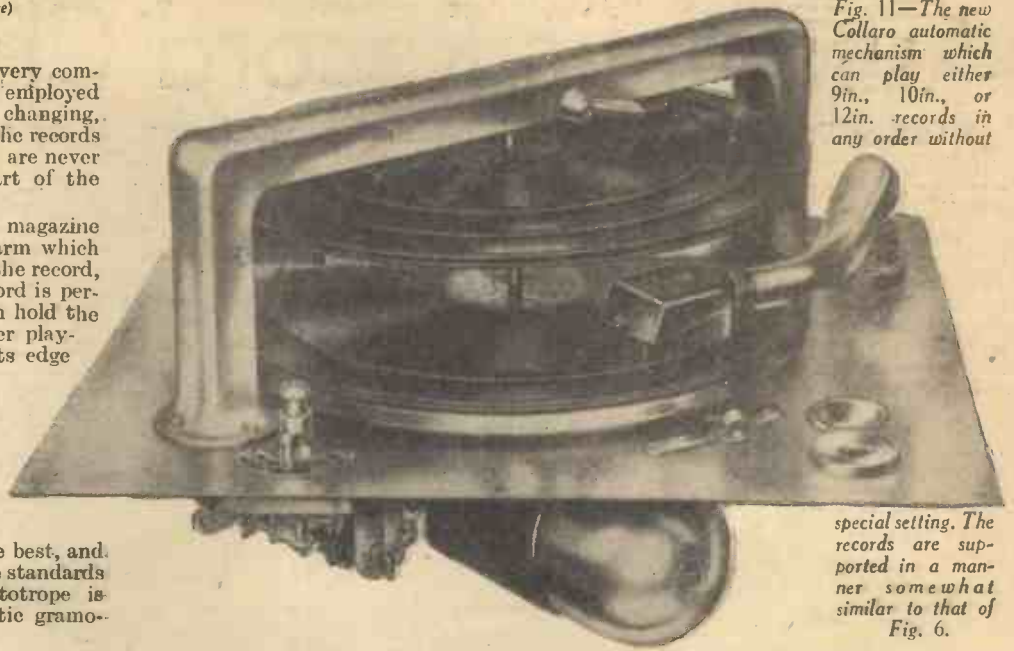


Fig. 11—The new Collaro automatic mechanism which can play either 9in., 10in., or 12in. records in any order without

special setting. The records are supported in a manner somewhat similar to that of Fig. 6.

IMPORTANT BROADCASTS OF THE WEEK

NATIONAL (261.1 m. and 1,500 m.)

Wednesday, July 27th.—Dear Love, a musical comedy.

Thursday, July 28th.—Concert Party programme.

Friday, July 29th.—The Mighty Adam, a musical play by Denis Constanduros.

Saturday, July 30th.—Commentaries on Portsmouth Navy Week.

REGIONAL (342.1 m.)

Wednesday, July 27th.—The Elephant, an anthology from the writings of the past two thousand years.

Thursday, July 28th.—Dear Love, a musical comedy.

Friday, July 29th.—The Two Mauretians, a sound picture of the lives of two ships.

Saturday, July 30th.—Saturday Night Sing-song.

MIDLAND (297.2 m.)

Wednesday, July 27th.—Speedway Racing at the Hall Green Stadium, Birmingham.

Thursday, July 28th.—Dear Love, a musical comedy.

Friday, July 29th.—A Symphony Concert.

Saturday, July 30th.—Instrumental concert.

WEST OF ENGLAND (285.7 m.)

Wednesday, July 27th.—The Elephant, an anthology arranged from the writings of the past two thousand years.

Thursday, July 28th.—Folk Song Almanack: Summer, a Talk.

Friday, July 29th.—How to Look at Bank Holiday: a talk.

Saturday, July 30th.—Band programme.

WELSH (373.1 m.)

Wednesday, July 27th.—Juvenile Orchestral concert.

Thursday, July 28th.—Y 'Steddod Hynod Hon (A Welsh light programme).

Friday, July 29th.—Concert Party Memories.

Saturday, July 30th.—Summer Sport: A review of Saturday's sport in Wales.

NORTHERN (449.1 m.)

Wednesday, July 27th.—Gonged! A general Knowledge Bee for Motorists: Men v. Women.

Thursday, July 28th.—Little Women, dramatised for the radio from the novel by Louisa M. Alcott.

Friday, July 29th.—Music and Memories: Dance Band programme.

Saturday, July 30th.—The Northern Muse: A Festival of Northern dialect poetry and song—2, Northumberland and Durham.

SCOTTISH (391.1 m.)

Wednesday, July 27th.—Concert Party programme, from the Barrfields Pavilion, Largs.

Thursday, July 28th.—An organ recital from Glasgow Cathedral.

Friday, July 29th.—Scottish Dance Music.

Saturday, July 30th.—Exhibition on Parade (2nd Edition): A revue of floodlight and fancy.

NORTHERN IRELAND (307.1 m.)

Wednesday, July 27th.—Ceilidhe Band programme.

Thursday, July 28th.—Orchestral concert.

Friday, July 29th.—An organ recital from St. Gomball's Parish Church, Bangor, County Down.

Saturday, July 30th.—Orchestral programme from the Orpheus Restaurant, Belfast.

EUROPEAN SWIMMING CHAMPIONSHIPS

A TELEVISION BROADCAST

AN international aquatic contest will be televised for the first time on August 8th, when the B.B.C.'s mobile television unit comes into action at the Wembley Swimming Pool to show the European Swimming Championships each afternoon till August 13th. More than twenty-eight nations will be represented and competitors will have come from France, Ireland, Poland, Italy, Greece, Turkey and many other countries. For the first time six swimmers from Iceland are competing.

Baritone Recital

ROY HENDERSON, the well-known baritone, will give a programme of famous love songs from the Midland transmitter on August 6th. He will sing songs by eight composers, including Schubert, Grieg, Tchaikovsky and Morley.

Harry Gordon Again

HARRY GORDON, of Inversnecky, and his company will broadcast from the Beach Pavilion, Aberdeen, on August 5th.

TOPICAL NOTES

Esperanto Broadcasts

A PART from the regular Esperanto broadcasts from the Czech stations in Prague, Brno and Moravska Ostrava, the international language is now being used for special short-wave transmissions to America.

Talk "On Visitors"

ON August 2nd, Walter Barnes, sixty-three years a deep-sea fisherman of Brixham, Devon, will give a talk "On Visitors," and besides including his views on them, he will proffer some advice to those who are filling West Country seaside resorts at this time of year. Listeners will remember the story of "The Life of Walter Barnes," which was broadcast as a feature programme on January 10th.

A PAGE OF PRACTICAL HINTS

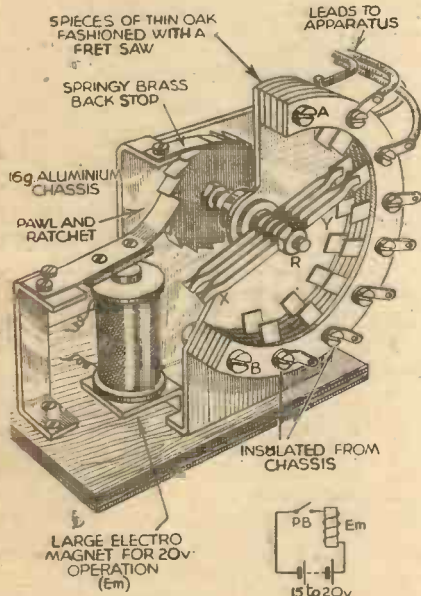
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

A Novel Selector Mechanism

I HAVE been experimenting in automatic station selection and the appended sketches illustrate a mechanism which embodies the principle of the automatic telephone selector. The basis of the action is simply the step-by-step short-circuit of pairs of contacts; thus by the parallel pre-set condenser method of station alteration, the wiper contacts are free to perform other functions, and in my case a number of the contacts are connected to



A novel switching arrangement for automatic station selection.

relays of home construction, these switching over from medium to long waves, and also the gramophone. The construction is self-explanatory, but there are one or two points which require clarifying.

The wiper contacts are made from strips of phosphor bronze, these being securely aligned on an old condenser rotor with separating washers. The ratchet wheel was fashioned by filing the teeth in a disc of ebonite, this ratchet then being locked to the wiper rotor-shaft with two nuts. By rewinding the bobbin of a coil of wire with 30 S.W.G. enam. wire, the saturation voltage was as high as 20 volts, and a good margin was obtained so that the pawl easily slipped over the teeth on energisation, its restoration operating the ratchet and consequently the wipers "X, Y."

The selection of stations in my case is done by coding the number of presses made to the push-button to bring both "X" and "Y" to step to the required contacts. The leads shown "To Apparatus" are taken to fixed condensers and pre-sets, also the relays for medium and long-wave switching. The clamping bolts "A" and "B" are 2BA, whilst the contact clamping

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-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor, "PRACTICAL AND AMATEUR WIRELESS," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Put your name and address on every item. Please note that every notion sent in must be original. Mark envelopes "Radio Wrinkles." DO NOT enclose Queries with your wrinkles.

SPECIAL NOTICE

All wrinkles in future must be accompanied by the coupon cut from page 496.

bolts are 4BA with ebonite bushing for insulation.—E. R. WESTERN (Newport, I of W.).

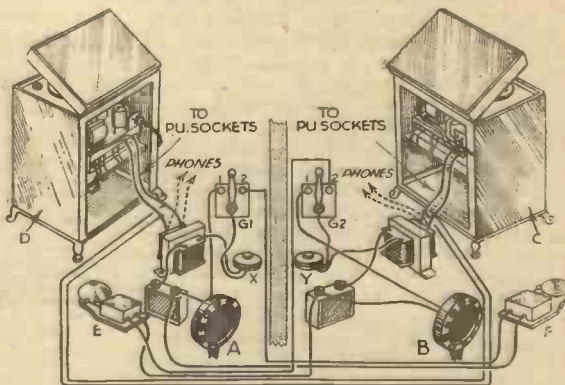
Scheme for a House Telephone

BEING in possession of two radio receivers having pick-up provision, I decided to fit a telephone between the two rooms in which these sets were installed.

The procedure used with the arrangement illustrated is as follows:

The person who wishes to converse, say, A, turns the switch G1 to position "2," and presses X which consists of a push-button. This completes the circuit and the bell F rings. B then turns switch G2 to position "1," presses Y and speaks. Thus the two microphone batteries are also used to work the bells. B's voice is then reproduced in D, which is the speaker incorporated with the amplifier at A. If no amplifier is used, 'phones should be employed instead of the speaker. A then turns G1 to position "1," presses the mike button X, and speaks, communication thereby being established.

The point in having the push-buttons X and Y is that when the persons have finished talking, and perhaps left the room, there is not a wasteful consumption of electricity through the microphone transformer.—R. W. DADSON (Golders Green).

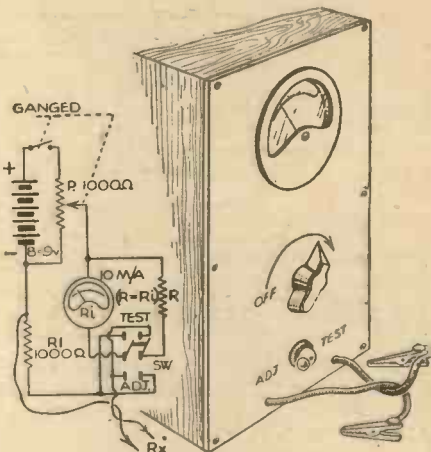


A simple telephone arrangement for communication between two rooms of a house.

A Direct-reading Ohmmeter

USING a voltmeter and milliammeter with a battery and applying Ohm's Law a resistance can be directly measured, but that necessitates the use

of two meters. That is why I devised this simple ohmmeter where all the work is done in a single instrument. The procedure is as follows: Connect the unknown resistance to Rx terminals, throw SW to "Adjust" position, and move P slowly



Circuit diagram and front panel of a simple direct-reading ohmmeter.

from OFF until a decimal reading in the meter (0.1 mA or 1.10) is reached, then throw SW to "Test" position and note the reading. Supposing it is 3.5, if we had before 0.1 mA, $R = 3.5 \times 10,000 = 35,000$ ohms. For 1 mA multiply by 1,000, and so on.

NEWNES' TELEVISION AND SHORT-WAVE HANDBOOK

3/6, or 4/- by post from GEORGE NEWNES, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

For small values of resistances, subtract the internal resistance of the meter from the value obtained. Always when measuring start moving P from the OFF side. The range is up to 90,000 ohms for a 9-v. battery. Of course, the range can be extended, increasing the voltage of "B"; if we make it, say, 36 volts, then we can measure up to 360,000 ohms and R will then be 4,000 ohms. Other values will be in proportion.—A. FIRMINER (Strood).

THE keen experimenter and the serviceman often find a need for a voltage supply which at the moment may not easily be obtained. Rough hook-ups from accumulators, mains transformers and rectifiers may be employed, but there is always a risk when such schemes are adopted that an accident may occur due to a short-circuit or overload, and, furthermore, meters should be included in order that an accurate knowledge of the voltage being employed may be obtained. The cover illustration this week shows a unit which was built for a specific purpose and the general ideas may appeal to experimenters and others to whom the use of various voltages from time to time becomes necessary. The general principles only are given as it may be desirable to modify the outputs which we used to suit some specific

THE VERSATILE

A Useful Unit Delivering High and Low Voltages

being connected with the wrong polarity. It will be seen from the circuit that when the unit is switched on all outputs are "live," but no damage will occur to the metal rectifiers if they are "unloaded," but this only applies when the half-wave or bridge connected rectifiers are employed.

Construction

A metal box should be employed in which to mount the parts and adequate ventilation must be provided. This may be carried out by perforating the bottom of the cabinet and fitting it with small

upon theappings on the winding, and by using a transformer with a lin. square section core (No. 4 stampings) the simple turns ratio of 4 per volt enables an easy calculation to decide upon the turns and tapping points.

The A.4 metal rectifier used for the low-voltage D.C. supply delivers an output dependent upon the A.C. input, and at approximately 5.5 volts it delivers 2 volts; at 7.5 the output is 4 volts, at 9 volts the output is 6 volts, and at 14 volts it delivers just over 8 volts. These ratings are, of course, only approximate and depend upon the load. By using a variable resistor on the output side (such as the baseboard mounting 5-ohm type similar to that used in our Argon charger recently) the output may be adjusted exactly to any given voltage in this range.

Modifications

The high-voltage output in the example was rated at 200 volts 100 mA and a cardboard case electrolytic condenser was employed for smoothing, together with a

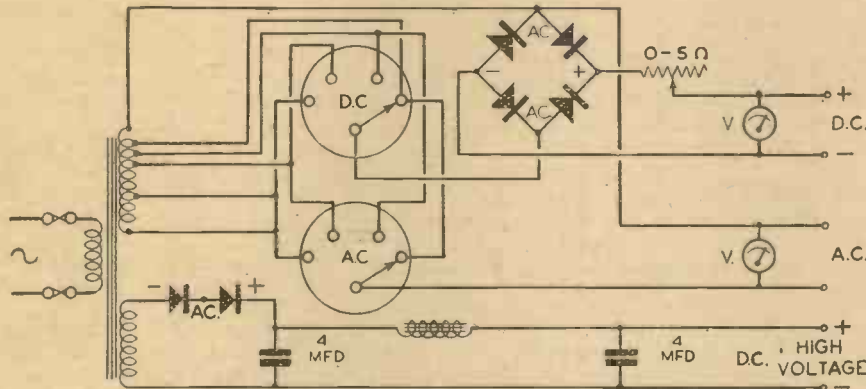


Fig. 1.—Theoretical circuit of the Power Unit.

purpose. As desired there are D.C. or A.C. voltages from 2 to 9 at a current up to 3 amps. In addition, a high-voltage direct current supply of 100 mA at up to 200 volts is also available. The main features will first be described, and then suggestions will be made showing how these outputs may be modified as desired.

The Circuit

The arrangement employed is shown in Fig. 1 from which it will be seen that a mains transformer is employed on the input side, with a fused input connector. One of the secondary windings is designed to deliver a maximum voltage of 14 and the wire selected was capable of delivering just over 3 amps. The second winding on the output side is designed for a standard H.T.17 metal rectifier, rated to deliver 200 volts at 100 mA in a half-wave circuit. Two multi-contact selector switches are employed on the low-voltage outputs so that the appropriate voltages may be selected, but the high-voltage output is not varied in any way in the unit. The switches employed were surplus items taken from a junk box, but suitable substitutes may be obtained in the Ferranti, Bulgin or Electradix range, and the only point to be watched is that the contact is well made, in view of the high currents which may be carried.

In accordance with the makers' recommendations, a series resistance is included in the L.T. D.C. supply so that when this is employed for accumulator charging no damage will occur to the rectifier in the event of the accumulator

feet so that it stands off the table, or by obtaining an old metal box and cutting and bending louvres in the sides. The safety fuse connection should not be omitted in order to safeguard the transformer and rectifiers. An on/off switch was not included in the model so that there was no risk of leaving it in circuit for unduly long periods. The plug was used in conjunction with a socket near the bench so that it could be switched off and on conveniently. Large insulated terminals (Belling-Lee) were mounted, and the

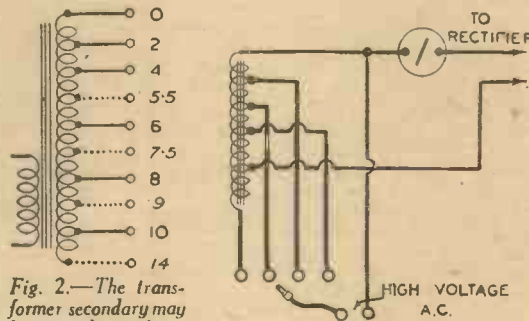


Fig. 2.—The transformer secondary may be tapped, as shown here, to provide equal A.C. and D.C. outputs.

Fig. 4.—For high A.C. voltages,appings may be provided as shown in this illustration.

meters are standard D.C. and A.C. amp meters which may be obtained from Bulgin, Ferranti or Electradix. They should, of course, be selected to read the outputs delivered by the rectifier and low-voltage secondary winding. This latter is tapped and theappings are joined to both selector switches. Thus, on the A.C. low-voltage terminals the output is dependent

TELEVISION

Television in Flats

IT is interesting to note that the provision of a television service to tenants in modern blocks of flats is extending considerably, both in new buildings which are being erected, and also in those which have been in use for some time, and to which the addition of television has given an added luxury to those living in these residences. Several different schemes are available, but undoubtedly the most popular is that by which the owner of a set can have a choice of the television service when signals are being radiated, or ordinary broadcast sound programmes. In other words, in any suite of rooms the tenant has the equivalent of an all-wave radio and television set fed direct from an aerial. All the monitoring equipment and distribution amplifiers for this purpose are as a rule accommodated in a small building on the roof, close to which is generally positioned a high mast terminating in a dipole aerial, with or without reflectors, according to the extent of the received signal, or the level of extraneous electrical interference. Actual distribution is carried out by the usual type of television cable having a single centre conductor and a protected screened metal braiding. Each set coupled to systems of this nature can be either of a very elaborate nature or quite unpretentious, but the operation is always very simple in character.

Progress in Colour

SINCE his return from the I.R.E. world radio convention held in Sydney, Australia, in April of this year, Mr. Baird has continued his researches into the realm

POWER UNIT

A.C. or D.C. Supplies at
By W. J. DELANEY

small 50 henry choke. In order to modify the arrangement so far described the following points should be noted. On the A.C. low-voltage side any desired tappings may be provided, and the only limitation will be the particular type of switch which is obtained (that is, the number of tapping points which may be used) and the accommodation provided on the transformer. The gauge of wire should be selected to carry the current which may be required—at maximum. For the D.C. low-voltage output the rectifier may be selected from the Westinghouse range—provided that it is of a type suitable for use with a tapped transformer. All the models are not so suited, and the table at the end of this article gives the models, the A.C. input required, and the approximate D.C. output, with the approximate value of series resistance needed.

By selecting the rectifier to more or less match the A.C. outputs required the same tappings may serve for both outputs, but if this will not exactly work out in any particular case the transformer wind-

ing will have to be tapped for both the A.C. and the required D.C. outputs, and when winding it care will have to be taken

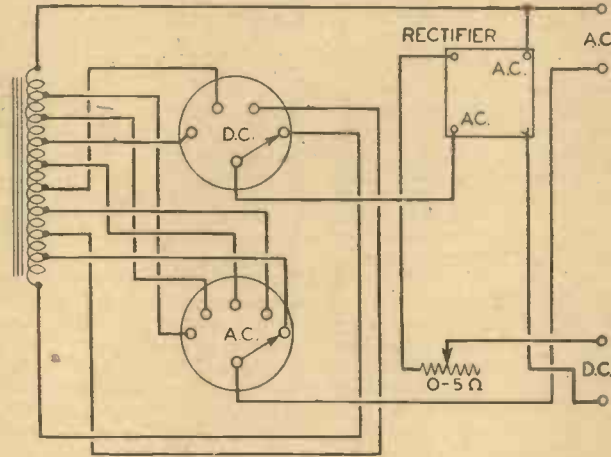


Fig. 3.—How to arrange two selector switches for equal A.C. and D.C. outputs as in Fig. 2.

to mark the leading-out wires so that no confusion exists. For instance, if A.C. outputs of 2, 4, 6, 8 and 10 volts are needed,

provides shadow backcloths so that scenery is changed by simply pressing a switch. The greatest value of the idea will be for those productions which do not demand real props such as chairs, tables, etc. Movement in the background will be possible, while greater depth to the scene will be given, and there will also be a complete absence of noise.

Small Pictures

IT seems certain that in order to meet the demand for lower-priced television sets which has been expressed in some quarters, there will be several receiver models marketed this autumn having small picture limits when compared with those now on sale. Whether any attempt will be made to match the three-inch diameter tube receiver brought out recently in the United States is doubtful, as this seems little more than a toy. On the other hand, six-inch and seven-inch tubes may be found, together with quite a large percentage of nine-inch. How the public will react to the thought of continual viewing of pictures having such small dimensions is still a matter of conjecture, but since this is the only way known at present whereby cheaper sets can be manufactured there is, of course, no alternative. One thing is certain, and that is that with the R.M.A. making such a determined effort to turn Radiolympia into Visiolympia would-be purchasers will have an excellent opportunity of judging set performance in comfort, although naturally there is nothing to equal a demonstration in the home to give a true angle on the value of the entertainment provided, and the ease of operation of the set. Every dealer has proved this to his own satisfaction, and in many cases they have gone so far as to waive any nominal charge for installation when there has been a good chance of a sale materialising.

and the D.C. output is to be 2, 4, 6 and 8, the secondary winding will have to be tapped in ten places so that the outputs from the secondary will be 2, 4, 5.5, 6, 7.5, 8, 9, 10 and 14 volts (See Fig. 2).

H.T. Outputs

The high-voltage output may be designed to provide any standard receiver with high-tension and thus may be wired to include voltage dropping resistances, and if necessary, decoupling components. As only half-wave rectification is employed the smoothing may not be adequate for some types of receiver, but if a rectifier is to be used which has to be connected on the voltage-doubler circuit an on/off switch should be added on the input side to the rectifier so that the A.C. supply to it may be cut off when the high-voltage output is not required (see Fig. 5). Where the unit is to be used merely as a test panel, for the application of high voltages to various pieces of apparatus—such, for instance, as may be required for breakdown or insulation tests—the secondary winding which delivers the high-voltage output may be tapped and connected to separate terminals as in the case of the L.T. A.C. winding. As a safety measure in this connection, however, it would be preferable to employ a series of sockets of the insulated type to make the necessary connection by means of an insulated plug.

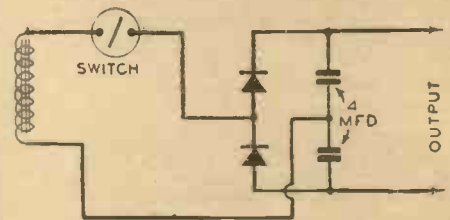


Fig. 5.—If a voltage-doubler unit is employed, a separate switch must be used as shown here.

LOW-VOLTAGE RECTIFIERS

Model	Current Amps	Output Volts	Resistance Ohms	A.C. Input Volts
L.T.4	1	2	1.75	7.5
		4		9
		6		11
L.T.5	1	6	1.7	15
		10		18
		12		22
L.T.10	2	6	0.25	14
		10		17
		12		20
L.T.11	4	2	0.25	6
		4		8
		6		11
A.4	2	2	0.25	5.5
		4		7.5
		6		9
		8		14

THE BEST WEEKLY FOR CYCLISTS
THE CYCLIST
2d. Every Wednesday.

PROGRESS

of colour television, a big-screen demonstration of which was given by him at the Dominion Theatre just prior to his departure. He is convinced that apart from the more obvious uses in ordinary television broadcasts whereby the pictures will be enhanced enormously in value if seen in their natural colouring, the commercial applications should be of a very wide nature. Of late there has been renewed activity in regard to the combination of the telephone and television, and it is felt that the value of this will be extended to a considerable degree if colour is added. As an aid to business transactions this is certainly true, and while continued effort should be directed to improvements in monochromatic pictures, as we know them to-day, it is hoped that, side by side with this, colour working will progress until it is ready to play its part in the whole scheme of development.

Back Projection Revived

IN one of the studios destroyed by fire at the Crystal Palace about twenty months ago the Baird Company had made provision for combining the back projection of scenic effects on to a translucent screen with ordinary studio acting. This extended enormously the scope of the background effects which could be embodied in any play or performance produced before the screen, and saved a considerable proportion of scenic costs which would have been necessary if props had been employed. It is now learned that a device based on somewhat similar principles is to be introduced shortly at Alexandra Palace. The invention boasts of the name Penumbroscope, and, briefly, it is an electrical device which

NEWS FROM THE TRADE

Electradix Meter Movement

ELECTRADIX RADIOS can supply a neat meter movement in skeleton form which will prove very useful to the experimenter. This consists of a moving-iron unit having a full scale deflection of 8 mA, the resistance being approximately 970 ohms. As supplied by Electradix these are complete with a small plain slotted paper scale lin. in length, providing a needle radius space 2in. square. The instrument is supplied, complete with a 2in. square of mica and an aluminium lamp bracket for illumination purpose, at 3s. 9d. post free. The meter may be used as a tuning unit or for any similar purpose where the flow of a direct current is needed for recording purposes. The instrument is well made and should prove of interest to the keen amateur.

Portable Television Aerial

FOR the use of servicemen and others who need a temporary television aerial, a neat device is now available from the television section of the Marconiphone Company. This aerial has been developed by E.M.I. Service Company and consists of a bamboo mast in three interlocking sections. The longest of these is 9ft. 6in., and when erected a total height of about 30ft. is obtained. A cross member bolts to the top of the pole and a dipole aerial and reflector are attached to these. When packed for travelling the total weight is about 30lb., and the total length of feeder provided is 100ft. Plug and socket connections are provided for the attachment of the feeder. The reflector may be removed if it is desired to test the efficiency of this accessory on location. The price is £6 10s., carriage paid.

New Valve Tester

A NEW tester of the indicating class is now available from Taylor Electrical Instruments, of 77A, Queen Victoria Street, E.C.4. This has an index control showing Good, Weak, Bad or Doubtful, and enables all types of valve to be tested. It is designed for A.C. mains operation, and there are altogether five rotary switches and four push-button switches, in addition to the main on/off control. The switches select the pin connections and circuit needed, and 12 holders are provided on the panel, of which two are designed for the octal type of valve. The instrument is supplied for bench mounting at 8½ guineas, counter mounting at 9 guineas, or portable type, in a leather case with a separate compartment for tools, also at 9 guineas.

New Pifco Meter

PROVINCIAL INCANDESCENT FITTINGS CO. announce a new junior type meter. This is of the double-reading type showing 0 to 12 and 0 to 120 volts, and is mounted in a neat black bakelite watch-type case. The price is 2s. 11d.

Television Aerial Amplifier

BAIRD TELEVISION have now developed and can supply a special amplifier for the supply of a number of television receivers from a common aerial system. The amplifier is of the rack type and designed primarily for redistributing signals at 41.55 and 45 megacycles, although it may

be used for the distribution of medium-wave broadcast signals. Tuning adjustments and monitoring are unnecessary, although periodic inspection is desirable and jacks are provided at important points so that the necessary working checks may be made.

Waterproof Portable Carrier

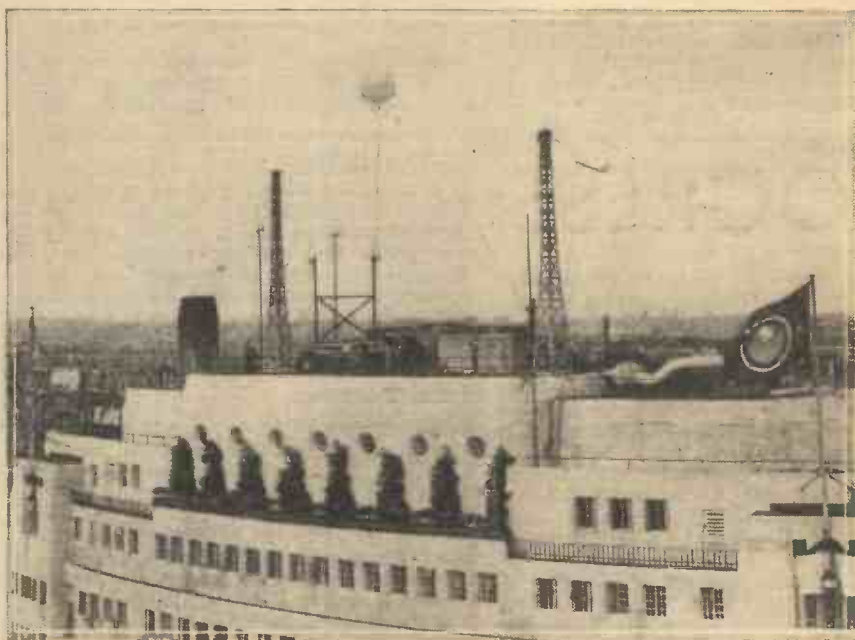
THE carrying of a portable during wet weather may lead to all kinds of difficulties, and obviously some weather-proofing device is called for in such circumstances. If the portable is totally enclosed with waterproof material there is a risk of damage due to the condensation which often takes place inside a waterproof, and an interesting proofed carrier for the H.M.V. Portable Receiver (Model 681) has now been produced by Dessamac, Ltd. This has a special flap at the top through which the handle of the portable may protrude, but the bottom of the carrier is not totally enclosed, and thus adequate ventilation is provided and risk of condensation thereby avoided. The price is 3s.

Anti-static Aerials

MESSRS. A. H. HUNT, LTD., announce two new anti-static aerials. The first, known as the A.S. Major, combines an "L" type and a di-pole, in which 60ft. of standard 7/22 aerial wire, 50ft. of dual screened down-lead and a 3ft. lead for connection to the receiver are provided. The assembly includes an aerial and a receiver transformer. To enable the aerial to be used as an ordinary di-pole or L type a link is provided on the aerial transformer. This assembly costs 50s. The second is the A.S. Minor, and incorporates an ordinary di-pole with 30ft. sections of 7/22, a 50ft. twisted down-lead, a set coupler and a 3ft. twisted lead to the set. This outfit costs 22s. 6d.

Mullard American Valves

MULLARD announce a new range of American valves to be known as the Mullard-Amerty range. These will be fitted with the standard American octal base and bear the same type numbers as the original American patterns. At the moment there are eight models available, the 6A8G, 6K7G, 6Q7G, 6F6G, 25A6G, 5Y3G, 5U4G, and 25Z6G. Prices range from 10s. 6d. to 15s., according to type. Further details, with types to be added, will be given at a later date.



Many people have been puzzled recently to see a balloon rising slowly and majestically above Broadcasting House. It is being used by B.B.C. engineers experimenting in connection with short-wave reception tests.

T.C.C. Condensers

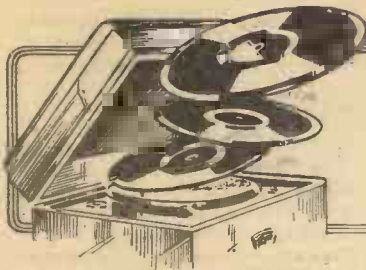
TWO new types of Midget Electrolytic condenser have been produced by T.C.C., and these are of the type having surge-limiting characteristics. The first is a tubular model in a bakelised case 2½in. long and 15/16in. in diameter. Wire ends are provided. The second model is known as the Minor type, and is in a waxed carton measuring 2½in. by 1½in. by ¾in. The condensers are rated for 400 volts working and the surge-limiting rating is 600 volts. When used as a reservoir condenser following a rectifier they will safely pass a ripple current up to 100 milliamps. These condensers are, at the moment, only available in a capacity of 8 mfd. and prices have not yet been announced. Other sizes and combinations will be released shortly.

THE WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA

By F. J. CAMM : 6th Edition
(Editor of "Practical and Amateur Wireless") : 5/- Net

Wireless Construction, Terms, and Definitions explained and illustrated in concise, clear language

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Impressions on the Wax

A REVIEW OF THE LATEST GRAMOPHONE RECORDS

Decca
THIS month the Decca Company presents the first recording of Dvorak's "Serenade in E. for Strings," played by The Boyd Neel String Orchestra. The records, Decca X 214-7, are sold in an album accompanied by a specially written descriptive leaflet by Alan Frank.

The solo piano records by Dr. G. Shaw, the music educationist, personally known to thousands of school teachers and school children in the United Kingdom, are intended mainly for use in the hundreds of schools that ban percussion bands. But the music recorded is of wide interest (some of the short pieces have never been recorded before) and on that account they are recommended—Decca K 879 to K 883.

Josephine Bradley and her Ballroom Orchestra have made an excellent record for dancers on Decca F 6698. On one side is a slow fox-trot, "Please be Kind," and on the reverse is a quick step, "The Gipsy in My Soul."

Decca F 6695 and Decca F 6696 are two attractive records by Maurice Winnick and His Sweet Music playing four of the best tunes of the moment.

Donald Thorne at the organ of the Granada, Clapham Junction, introduces "Hit Parade No. 7" on Decca F 6701, whilst Tessie O'Shea, the well-known radio comedienne, has made a humorous recording of "Thirty Thirsty Throats" and "You're Getting Old" on Decca F 6705.

Brunswick

BING CROSBY has chosen "When the Organ Played 'O Promise Me,'" with Eddie Dunstedter at the organ, coupled with "Sail Along Silvery Moon" with Lani McIntire and his Hawaiians for his latest recording on Brunswick O 2604. By the way, the tune "When the Organ Played 'O Promise Me'" is bound to be the rage at all the popular holiday resorts.

That interesting combination, "The Ink Spots," have recorded "Oh! Red" and "That Cat is High" on Brunswick O 2606, whilst Ella Fitzgerald and her Savoy Eight play "It's Wonderful" and "I Was Doing All Right" from the film "The Golden Follies" on Brunswick O 2605. Both choruses are sung by Ella Fitzgerald.

Rex

REGINALD DIXON introduces "Dixon Hits No. 22" on Rex 9319, in which he includes the popular "Lambeth Walk" among other hits of the moment. Brian Lawrance makes a vocal record this month singing two good tunes, "You Got the Best of the Bargain" and "My Heaven on Earth," from the film "Start Cheering," Rex 9323, whilst four popular dance tunes of the moment are played by Billy Cotton and his Band on Rex 9320-1.

H.M.V.

TOMMY DORSEY and his Orchestra give a swing version of Mendelssohn's "Spring Song" as a fox-trot, coupled with "Shine On, Harvest Moon" on H.M.V. B 8752. Benny Goodman's Orchestra contributes "Rosetta" and "I want to be Happy"—H.M.V. B 8753, and there are two first-class performances of a "jam" session in "Crazy Rhythm" and "Honeysuckle Rose," by Coleman Hawkins and his all-star "Jam" Band on H.M.V. B 8754.

Roy Fox plays "I fall in Love with You Every Day" and "How'd ja like to Love Me," both from the film "Swing Teacher Swing"—H.M.V. BD 5371, also "Sunday in the Park" and "Shadows on the Moon" on H.M.V. BD 5369. Jack Harris and his Orchestra have recorded "Please be Kind" and "When the Organ played 'O Promise Me'"—H.M.V. BD 5373; "Love Walked In" and "Love is Here to Stay"—some of the last of Gershwin's music from the film "Goldwyn Follies"—H.M.V. BD 5375.

Fats Waller makes a splendid job of "My Very Good Friend the Milkman" and "Black Raspberry Jam" in which he sings as well as plays—H.M.V. BD 5376. Dan Donovan sings the vocal refrain in his orchestra's rendering of "Rose of Tralee" and "Tis I Myself—H.M.V. BD 5372, while Teddy Foster and his Kings of Swing play "Ole King Cole" with vocal refrain by Teddy Foster, and "Swanee" (without vocal)—H.M.V. 5301.

Finally, for "correct tempo" fans, Henry Jacques and his Orchestra play "Take a Tip from the Tulip" (quick step) and "You Got the Best of the Bargain" (waltz), both without vocal refrain, on H.M.V. BD 5370.

Instrumental

THE piano is again to the fore. Artur Schnabel shows that Bach means as much to him as Beethoven. He plays the "Toccatina in C minor," a most unusual work, written, it is worth noting, for the clavier. It consists of a Prelude (Adagio) and two Fugues on the same theme—H.M.V. DA 1613-4.

The London Symphony Orchestra, under Eugene Goossens, play Rimsky-Korsakov's delightful ballet suite "Le Coq d'Or" (The Golden Cockerel). The suite was adapted from the opera by Tchaikovsky, and tells the story of an astrologer who, having caught a golden cockerel, enchants it, and uses it as a means to gain possession of the "Daughter of the Air." It is, of course, one of the established favourites of the Russian Ballet, and the name of Eugene Goossens brings to mind great days of the Diaghilev seasons, when Goossens was one of the conductors—H.M.V. C 3013-5.

The Boston Promenade Orchestra play The Dance of the Automaton, Waltz and Czardas from Delibes' ballet "Coppelia" on H.M.V. C 3012. To these tripping melodies one visualises toe-dancing, and gaudy ballet skirts.

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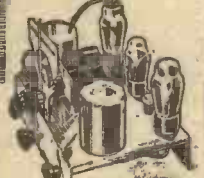
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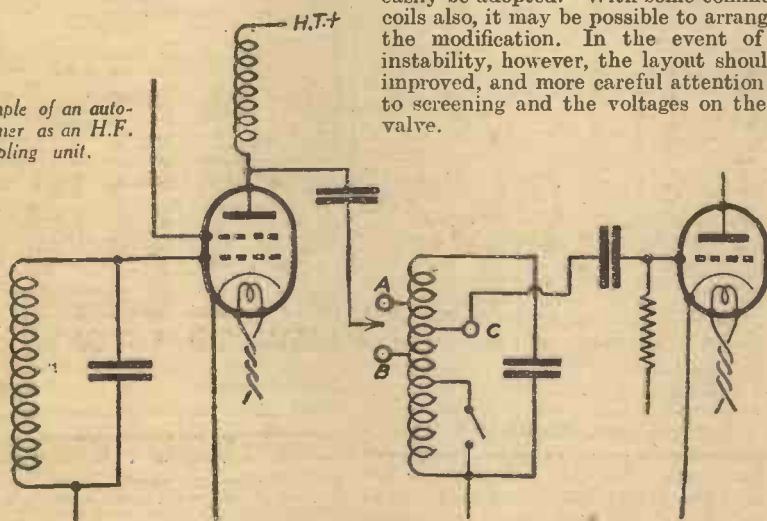
B.L.D.L.C. The British Long-Distance Listeners' Club

Frame Aerial Switching

AS portable receivers are popular at the moment we have received quite a number of queries recently regarding the frame aerial. This seems to present considerable mystery to many members, although it is quite a simple matter. The frame takes the place of the first tuned circuit and therefore must cover the normal wavebands when tuned with a standard .0005 mfd. condenser. The efficiency is dependent upon a number of factors, one of the most important of which is its size. The sides of the frame support should not be

properly designed and wired, and then to obtain the benefits of an improved layout and coil characteristics, a transfer tapping may be provided. The accompanying illustration shows such an arrangement and solves the problem of M. E. S., of Highbury. It will be seen that the anode coupling condenser is connected to a change-over switch, whilst in addition the grid condenser is joined to a tapping on the coil. The transformer effect which is obtained by the anode tapping will result in quite a considerable increase in efficiency, and with home-made coils this arrangement may easily be adopted. With some commercial coils also, it may be possible to arrange for the modification. In the event of any instability, however, the layout should be improved, and more careful attention paid to screening and the voltages on the first valve.

An example of an auto-transformer as an H.F. coupling unit.



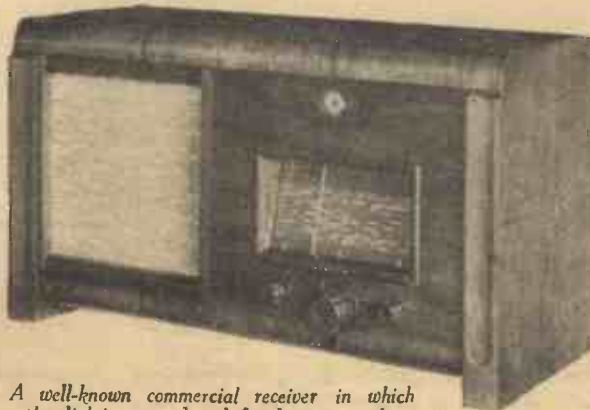
less than 12in. in length, and for the medium waves the turns should be spaced. Litz wire should be employed and the spacing may be up to $\frac{1}{4}$ in. between turns. If a tap is required for any reason this may be provided on both medium and long waves, and the transfer tap may be combined with the wavechange switch. The long-wave winding may be wound with turns touching and practically any type of wire will be found suitable.

Valve Damping

THE efficiency of a coil is dependent upon several factors, and many members may have noticed that when a coil is heavily damped, such as when joined direct to an aerial or when connected to an ordinary leaky-grid detector valve, the efficiency falls off. There are many ways of removing this damping, and apart from the use of a separate coupling winding, the use of tapping points is one of the most effective. When using a parallel-tuned-grid coupling between an H.F. and detector stage the damping very often "holds down" the set and prevents instability. Maximum amplification is not then obtained. To obtain greater amplification the set must be

Dial Improvements

THE tuning dial can be made a most effective part of a complete receiver and modern commercial dials are now taking on some novel appearances. Apart from the side lighting effects with coloured bulbs for various wavelengths, the constructor can introduce many other interesting schemes. For instance, the dial may be placed at an angle and floodlit from above, with a weaker light than is behind the dial. A mirror may be used, for instance, and made to reflect a travelling pointer; the station names or wavelength scale may be moved with the wave-change switch, and thus present a dark dial with the figures or names showing through as illuminated



A well-known commercial receiver in which the dial is recessed and fitted at an angle.

areas. Some ingenious schemes may be thought out round this part of the complete receiver, and there is ample scope for individual ingenuity in this direction.

Short-wave Crystal Sets

A MEMBER has asked why crystal sets for the short waves are not more generally employed. This is rather a delicate point, as theoretically a crystal imposes such a heavy damping on a circuit that it will not enable reception to be obtained on the short waves. In practice, however, some members appear to have had most promising results and one or two reports have been received concerning the apparatus and results. There are crystal arrangements which do not impose the heavy damping, and others in which it is possible to vary the effect. It is difficult to tap coils when the very short waves are concerned and all kinds of complications can be introduced. It would be interesting, however, to know whether any reader has succeeded in getting down below 20 metres with a receiver built round the ordinary crystal detector and what results have been obtained. Obviously, the insensitivity of the crystal limits the use of this type of receiver, but in view of the power of some of the short-wave stations quite good results should be obtained if a reliable crystal circuit could be devised and followed by adequate L.F. amplification.

Amplifier Design

A MEMBER wishes to build an A.C. mains amplifier having the minimum number of valves and delivering an output of at least 15 watts. He asks how to arrange such a design and for the principal considerations. This is not a difficult matter, provided that push-pull is employed and a maximum H.T. of 500 volts at 160 mA should be provided. A three-stage resistance-capacity coupled arrangement should be adopted, and by using a valve as a phase-reverser a total of 5 valves plus rectifier would be needed. This would enable a single medium gain valve to follow the mike, and the next valve could be fed from a volume control circuit to enable the output to be adjusted with any type of speech or record, if a pick-up is employed. The next valve would be the phase-reverser and the two push-pull valves would then follow. Two P27/500's in the Tungram range would be very suitable for this arrangement, and an input mixing circuit could be arranged so that mikes and pick-ups could be connected and mixed as desired. By using transformer coupling one valve could be saved, but the R.C. arrangement will give better quality when properly designed and will reduce the risk of distortion due to overloading. The layout would also be simplified and risk of interaction between the transformer and the mains section would be removed.

WIRELESS COILS, CHOKES AND TRANSFORMERS, AND HOW TO MAKE THEM.

Edited by F. J. CAMM.

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Practical Television

July 30th, 1938. Vol. 3. No. 111.

Big-screen Television

IN PRACTICAL AND AMATEUR WIRELESS dated July 4th an article appeared describing the Baird television equipment as installed at the Tatler Theatre, London. This apparatus has been in regular use for demonstrations to private audiences, and in its normal commercial form has given no trouble at all. One outside broadcast of special merit was the Trooping of the Colour and this provided pictures of extreme clarity and definition. The accompanying illustration will convey to the reader just how this appeared in the Tatler Theatre itself. It is well known that there are considerable difficulties to be encountered in photographing an actual television picture because of the nature of its formation from an intensity modulated fast moving spot. For example, with the screen size used, namely 8ft. by 6ft., the spot during each picture line trace travels from left to right at an approximate speed of 41,420 miles per hour. In spite of this almost incredible rate the illustration reveals considerable detail and gives an excellent impression of how an audience can be entertained with a picture of this size and brightness. As will be observed, the cathode-ray tube projector receivers are in duplicate; a few seats from the first rows in the centre of the stalls having been removed to give accommodation space. Should the necessity arise it is a simple matter to fade over from one machine to the other. The three main controls for the operator, namely, picture contrast, picture brightness and cathode current, are plainly visible, while above these are two small monitor instruments to act as a check on the working conditions. The accompanying sound is furnished from the two loudspeakers flanking the screen on either side, and when not in use the television screen can be lowered so as to give place to the cinema's own picture screen. This installation—the first of its kind—shows how unobtrusive is the equipment and there is little doubt that in time apparatus of a similar nature will become commonplace in modern cinemas.

A Television Telephone Extension

EVER since 1929 when the first crude two-way television telephone was demonstrated between two booths a few yards away at the Berlin Radio Exhibition, the Germans have displayed a remarkable keenness for the development of this particular aspect of television. There is no doubt at all that in this particular field they lead the world, and it seems certain that in the near future the whole plan which has been schemed by the Post Office will become a commercially successful system. As indicative of the initiative with which this work has been undertaken, a few days ago the extension to Munich of the visual telephone cables, which already link Berlin with Leipzig and Nuremberg, was declared open. It is to become available to the public immediately, and although there is a 200-mile separation between the

present cable extremities, the cost for a three-minute call is only 4.8 marks. This has been made possible because the coaxial cable used for this work is to serve the additional purpose of accommodating 200 ordinary telephone calls when not in use for television. When the Berlin Leipzig service was opened the television images were far from perfect, but the infra-red ray scanning system has been improved considerably, and the faces have therefore lost the "beard" effect which characterised

tinuity at both ends of the line. The rapid make and break is brought about by the frame synchronising pulses injected into the picture signal, and electronically the receiver and transmitter become inactive and active alternately, at a speed dependent entirely upon the rate of frame scanning. Even if there is a trace of flicker present in the picture because of the half rate of synthesising and reproduction, this will in no way be troublesome for visio telephony purposes, and whenever desired it is an easy matter to switch the original circuit over to one-way working at the original frame speed. The idea, if successful, should bring about a considerable saving in cable costs, and since this represents a very major part of any network of this type, it seems certain that it will be applied practically.

Metal C.R. Tubes

WHEN valves were needed capable of dissipating more and more power without becoming bulky in size, metal ones were developed, and it seems likely



Showing how the "Trooping of the Colour" picture was reproduced as a big-screen result in the Tatler Cinema, using a Baird projector.

the early efforts. It is stated that Hamburg, Frankfurt-on-Main, Cologne and even Vienna are to be brought into the system eventually, and it is a matter for regret that although this country stands supreme in the matter of providing a regular radio television service for viewers, no material attempt has been made to emulate Germany on the question of long-distance television transmission over cables.

An American Suggestion

ON the other hand, although America admits that it is lagging behind in television generally, a very novel suggestion has been made by Zworykin of the R.C.A. for use in connection with two-way television services. Only one line is to link the transmitter and receiver, and simultaneous viewing is to be secured by making the receiver tube inoperative while the scanning camera is working, and vice versa. Assuming, therefore, that a 50-frame picture was scheduled the changeover would be effected 25 times per second, and this would be sufficient to give picture con-

that similar reasoning will be applied to cathode-ray tube technique. Projection type C.R. tubes, especially for big-screen working, must of necessity dissipate a lot of power in order to achieve the bright pictures essential for comfortable viewing, while even the normal type tube has the disadvantage that its glass structure makes it liable to fracture. It is now being proposed, therefore, to make the main envelope of metal, and to fuse to this a glass screen end by means of an airtight seal. The ordinary electrode assembly can be sealed into a glass pinch at the neck end of the tube in the ordinary way, and the outer metal wall provides a very efficient screen from the disturbing influence of stray electrical influences which may inadvertently be close to the tube, and prevent the formation of a regular line and frame scan. This stronger metal structure also functions as an anode and serves as an efficient media for the collection of the secondary electrons which are always emitted from the front screen during the course of its bombard-

(Continued on next page)

PRACTICAL TELEVISION

(Continued from previous page)

ment by the main tracing stream of electrons. If this was not done, then it is obvious that the screen itself would eventually acquire a negative charge of such a magnitude that it would dispel or disperse the main electron beam, and prevent the actual television picture from being traced out in a correct manner. Perhaps the ultimate development will be demountable cathode-ray tubes for projection work; these, of course, being applicable to theatre installations and not for the smaller size pictures required for domestic viewing.

Special Screens

THE brightness problems of cinema and theatre television installations are engaging the earnest attention of all branches of research linked up with this section of television's development. Not the least of these is the screen itself, for it is well known that a considerable percentage of available light can be lost unless the screen is of the right type. Conversely, screens of a special character can improve very materially any picture which is projected on to them from a remote source. It has been suggested in some quarters that a good form of screen would be one in which there was a measure of persistence of illumination. Some time ago a special type of television projection system was described in which a patented crystal screen was used as the modulating device itself at the projector. It was stated that one advantage of this idea was that the screen was so treated that there was a relatively

long lapse of time, generally of the same duration as a picture frame period, before each screen element had its positive charge restored in order to cut off the beam light, and so begin the process all over again. As far as the eye was concerned, therefore, it gave the impression of a form of light integration, and the apparent picture brilliancy observed increased very materially over that obtained when each element gave a spot intensity almost instantaneously. As in some other types of screens, notably the Baird bank of lamps, it is the well-known principle of persistence of illumination supplementing persistence of vision. This has the effect of reducing flicker even for a low frame speed as well as increasing apparent overall picture brilliance. If something of the same principle can be developed for the large remote television picture screens themselves, then a big step forward would be made in this work.

Looking Ahead

WHILE the constructional work now in progress at Alexandra Palace to provide additional studio accommodation and a central control room is being undertaken, producers, engineers and artists are rather cramped for space, and this has been noticeable with some of the productions included in recent programmes. This is only temporary, however, and a marked improvement should manifest itself in the early autumn, especially as at the same period a complete new outside broadcast outfit is due for delivery. The whole scheme will provide greater rehearsal facilities, for at present whenever an

outside broadcast is taking place rehearsals have to stop because of the single control room. Coincident with these improvements is raised the important point of a second television station at either Birmingham or Manchester. The laying of the coaxial cable from London to the latter city is almost complete, while the section to Birmingham has already been in partial use. The extension to Newcastle has been ordered, so there is no material reason why the Government should not take a bold step and meet the ever growing provincial demand for television facilities. It would remove at once one of the reasons why the sales of television receivers have not been so extensive as originally anticipated and consolidate public confidence.

Still looking ahead, a suggestion has been put forward whereby television will be able to provide accurate time at any period of the day. Time signals are now radiated by the B.B.C. at definite periods of the day via ordinary broadcasting channels, while the telephone can be dialled for "the girl with the golden voice" to give the exact time at any period of the day. When the television service becomes of a much wider character, however, it is suggested that a clock maintained accurately according to Greenwich Mean Time should be televised continuously on a wavelength reserved specially for this service. Then, by switching on the television set the correct time would be shown at any period of the day. Whether there would be space in the ether to put such an idea into practice is not yet known, but the idea is certainly quite practical.

More Projection Schemes

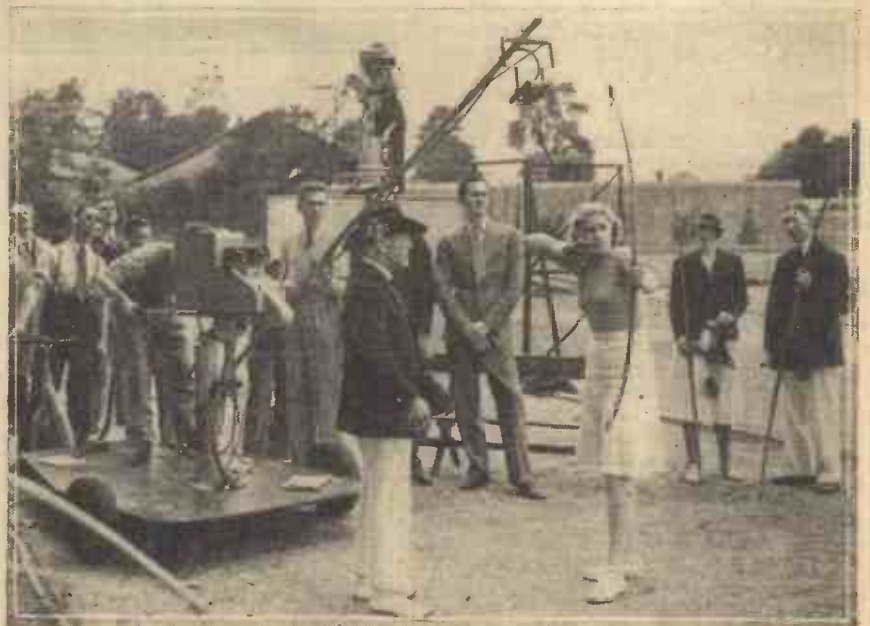
TO meet the brightness problems associated with projected television pictures several schemes have been suggested, and some of these show marked promise. Bearing in mind the fact that with a cathode-ray tube the maximum picture brilliancy is on the surface of the fluorescent screen which meets the bombardment from the electronic stream, advantage is taken of this factor in some of the projection tubes which have been tried. For this purpose the screen is a separate plate assembly mounted inside the glass envelope so that it is at an angle to the electrode system instead of being in a plane normal to the electron beam. This is a similar construction to the Iconoscope, but due to the form taken certain electrical compensations have to be made to enable the picture to be free from distortion. Since the top of the screen is farther from the electrode assembly than the bottom, standard scanning arrangements would produce a trapezium-shaped area. This is corrected by bringing about a linear increase in line scan amplitude as the frame scan progresses from top to bottom, or vice versa. Again, this same absence of normal beam impingement to the screen brings about a lack of uniformity in electrical focus, and this has to be corrected by focusing coil current changes throughout the whole period of the scan. As an alternative to pictures produced by fluorescent light in a cathode-ray tube, screens have been produced which rely on incandescent light for picture formation. The usual fluorescent screen is replaced by a metal one having an exceedingly fine thickness, and the bombardment of the electron stream brings about an incandescent glow of great brilliancy. In this case compensation has to be made for any thermal lag, and also for traces of distortion arising from expansion and contraction brought about by the heat generated through the electron

TELEVIEWS

bombardment. Which device will prove the ideal solution for big-screen working is still a matter for conjecture, but it is certain that organised research has within the last year or so brought an entirely new light on the problems to be solved.

Combining Controls

THE earlier types of television receivers placed on the market were conspicuous for the number of controls which were available for adjustment. The tendency now is to place the bulk of the controls out of sight, leaving only those which depend for position on individual taste. As a rule, the engineer on installation prescribes the others according to the degree found necessary from conditions of site, etc.



Owners of television sets who are sports lovers recently had an entertaining week when a series of sports demonstrations were televised from Roehampton. Here is the announcer, Miss Jasmine Bligh, trying her hand at archery.

FELIX MENDELSSOHN

A BRIEF BIOGRAPHY

EVERYTHING has happened to Felix Mendelssohn. Few young men in their early twenties have contrived to pack so much varied interest into a few years. The show has been his oyster and by sheer persistence he's prized pearls in plenty from it.

Many of you may know Felix Mendelssohn as a song writer, band leader, concert organiser, manager to many well-known Radio celebrities, and journalist. All these positions he still fulfils, although during the last year he has been making great headway as a band leader. He is recording exclusively for Decca records, directs his band on five commercial programmes, and is, during the months of July and August, making stage appearances with his orchestra and guest artists. On Friday, June 10th, he made his first appearance over the B.B.C. airways, al-



A recent camera study of Felix Mendelssohn.

though he has already over 250 broadcasts to his credit from his Continental broadcasting.

He was educated at the City of London School and he sang in the same choir as Ernest Lough who hit the front pages on the top notes of Mendelssohn's "Hear My Prayer." Coincidence hunters should note that fact, for it is quite true that the Felix of this day and age is descended on his father's side from the great Mendelssohn of "Spring Song" fame—after whom he was named—though what the Mendelssohn would think of his descendant's excursions into "boop-a-doop" and "vo-de-o" will fortunately remain a mystery.

Descended on his mother's side from Richard Warner, a famous theatrical agent, it is obvious that Felix has show-business in his blood.

In short, he is a Jack-of-all-trades.

For his recent broadcast there were fourteen musicians in his orchestra, supported by twelve of England's leading vocalists who took part in the programme entitled "Crooners' Corner." This broadcast was of considerable interest.

RADIO CLUBS & SOCIETIES

Club Reports should not exceed 200 words in length and should be received First Post each Monday morning for publication in the following week's issue.

RADIO, PHYSICAL AND TELEVISION SOCIETY

DURING the summer months the above society does not hold any indoor meetings of importance. At the final meeting of the 1937-38 session Mr. J. G. Hobbs lectured upon "Single Sideband Suppressor Systems." A 2.5 metre field-day was held recently in the Dorking district, and proved extremely successful. It was well attended, and it is intended to hold at least one more field-day before the end of the summer. The Committee is now busy preparing next session's programme, and it is hoped that before indoor meetings recommence one or two visits to places of scientific interest can be arranged.

New members will be very welcome next session, and further particulars may be obtained from the hon. secretary, 72A, North End Road, West Kensington, London, W.14.

SLADE RADIO

READERS are invited to attend any of the following meetings, to be held during the summer quarter. July 28th.—"Radio in the Army," by Mr. G. L. Symonds.

August 11th.—Demonstration and practical discussion of commercial and other test apparatus. Members having representative test gear please bring it with them.

August 21st.—Direction Finding Test.

August 25th.—Open night; feature to be arranged.

September 8th.—Lecture on "AVO" service equipment, by Mr. S. Wilkins.

September 22nd.—"Round the World of Radio Telephony." Lantern lecture by the G.P.O.

September 24th-25th.—Midnight Direction Finding Test.

Morse practice class at 8 p.m. sharp each club-room evening.

The Slade Radio Society, founded in 1927, provides Midland amateurs of all grades with a centre for co-operation and mutual advancement. The programme is designed to cater for all, and includes competitive direction-finding events in the spring and summer. If you are keen on radio you will enjoy the companionship offered by the "Slade."

Entrance fee 2s. 6d.; annual subscription 10s.; club badge 1s. Hon. secretary, G. C. Simmonds, 33, Rabone Lane, Smethwick.

SLOUGH AND DISTRICT SHORT-WAVE CLUB

AT the meeting held on July 5th, the first business before the meeting was the election of a new secretary. There were no volunteers, and after some discussion, Mr. White agreed to carry on for some time, and Mr. K. Sly volunteered to assist him. Owing to the extremely small attendance the talk by Mr. E. Sly on "The Superhet Receiver" was postponed.

Mr. White proposed that in future meetings should be timed to start at 7.30, and that this time should be rigidly adhered to. It was also decided that a set of rules should be drawn up by the secretary and brought up at the next meeting for discussion. The usual Morse practice was held.

The next meeting will be held on August 2nd, when a complete transmitter will be demonstrated by 2DDG. Hon. secretary, J. H. White, 20; Chalvey Road East, Slough, Bucks.

DOLLIS HILL RADIO COMMUNICATION SOCIETY

IN the absence of a lecturer on July 12th, G6OV gave a demonstration, and allowed members to operate his new communication receiver. He also explained his experiments with a device employing a selenium cell for measuring the R.F. output of a transmitter, and the many uses to which this could be put. This was followed by a very interesting discussion, led by one of the members, on receivers and transmitters installed and used in mobile W/T stations. Meetings are held fortnightly at 8.15 p.m. at Braintcroft Schools, Warren Road, Cricklewood, N.W.2, and further particulars may be obtained from the hon. secretary, Mr. E. Eldridge, 79, Oxgate Gardens, Cricklewood, N.W.2.

BOOTLE AND DISTRICT AMATEUR TRANSMITTING SOCIETY

THIS newly formed society now hold their meetings each Tuesday evening at their temporary rooms at 368, Stanley Road, Bootle, Liverpool, 20. Interested persons in the district should write to the secretary, Mr. C. E. Cunliffe, 368, Stanley Road, Bootle, Liverpool, 20, for full particulars and membership application forms.

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PROGRAMME NOTES

Launch of the New *Mauretania*

LISTENERS to the National programme on July 28th will hear the new *Mauretania* go down the slipways from a shipyard at Birkenhead into the wide mouth of the Mersey. Lady Bates, wife of Sir Percy Bates, Chairman of the Cunard-White Star Company, will launch the liner. A commentary on the proceedings will be broadcast by Richard North. It should be a spectacular launch, for the river at Birkenhead is so wide opposite the slipways that no break chains will be used as the boat slides down to the water. The new liner, 33,000 tons, is the biggest ever built in an English shipyard. This new ship bears the honoured name of the great Cunarder, now broken up, which was launched early in the century, and held the blue riband of the Atlantic for twenty years.

"Gonged!"

SURPRISE items will form part of a new general knowledge bee—for motorists this time—which the North Region has arranged. The element of surprise will be introduced not only in the questions and answers, but in the selection of the competitors. Four men and four women will be opposed as two teams in this feature, which, fittingly enough, is called "Gonged!", and until an hour or two before the broadcast itself the fourth member of each side will be unknown—that is, neither listeners nor producer nor the broadcasters themselves will know who will fill the two places. On the afternoon of July 27th the producer of the programme will drive out to bring back to the studios a man and a woman motorist. People encountered on the roads will be approached, and the two who are invited to broadcast and who accept will have had no previous warning or contact with the B.B.C. producer whatever. It is hoped that a "speed cop" and a taxi-driver will be members of the men's team; and that a woman "learner" and a very experienced woman driver will be in the other four.

The Midnight Sun

TRANSLATED and adapted for the microphone by Lance Sieveking, this play is an amusing comedy from the French of Théo Fleischman. Subtitled "Beware of Poets," it is described as a comedy with a sting. A sting it certainly has, but one not so much unpleasant as refreshing and astringent.

In the small village of Plus Rien resides a young poet, the despair of his honest peasant parents. One of his fancies is

expressed so convincingly that soon not only his parents but the whole village is convinced that on a certain never-to-be-forgotten night the sun arose, the birds began to sing, and, in fact, the whole of ordered Nature went awry. The village of Plus Rein is promptly seized upon by the Press as a first-class "story," and by financial promoters for reasons less innocent. It seems possible, indeed, that this small hamlet may be the cause of a national upheaval of no mean proportions. But finally the poet's supporters drop away from him and the village sinks back to its usual humdrum tranquillity. This broadcast will be given in the National programme on August 5th.



In the microphone room at Alexandra Palace. Sound plays as important a part in the television broadcast as vision. The assistant is here seen manipulating the microphone on a boom, keeping it well out of range of the camera, but following the speech of every performer.

Christopher Columbus

THAT America might never have been discovered by Christopher Columbus had he not tricked his crew is demonstrated by Tim Healey, a retired officer of the Royal Navy, now living in South Africa, in the first of "Three Plays of the Sea," which Howard Rose is to produce for the microphone.

In Cape Town Healey is in charge of "Young Ideas," South Africa's equivalent of the B.B.C. Children's Hour.

The first play, "Christopher Columbus, His First Voyage of Discovery," to be broadcast on July 29th in the National programme, gives a vivid picture of the opposition that the explorer had to overcome before he realised his dream of travelling west to reach those lands that men had hitherto believed lay to the east.

B.B.C. PROMENADE CONCERTS

WE note from the prospectus, which gives the full programmes of the forthcoming Promenade Concerts—which will be conducted by Sir Henry J. Wood in the Queen's Hall, beginning on August 6th—that the general scheme will be as in previous years. That is to say, Monday nights will, as usual, be devoted to Wagner, and Fridays to Beethoven; Tuesdays will be shared by one or two composers; Wednesdays will again be devoted to Bach and Brahms alternating; and Thursdays and most Saturdays will be miscellaneous. A feature of Thursday evenings, however, will be the inclusion of important symphonic works, such as the new Symphonies of George Dyson and E. J. Moeran, the "Pastoral" Symphony of Vaughan Williams, the Symphonic Variations for Pianoforte and Orchestra of Arnold Bax, and the first performance of Benjamin Britten's new Pianoforte Concerto.

The one-composer evenings will be as follows:—Tchaikovsky (2), Mozart (1), Sibelius (2), Handel (1) and Rachmaninoff (1); while there will be one concert devoted to Schubert-Schumann, and two to Mozart-Haydn.

New Works

New Works by British composers will include:—"Suite from the ballet 'Horoscope'" by Constant Lambert (first performance); Piano Concerto by Benjamin Britten (first performance); Suite No. 2 "Façade" by William Walton (first performance); "Overture" for unaccompanied chorus, by Anthony Lewis (first performance).

Other British composers represented are:—Gustav Holst, Eugene Goossens, Balfour Gardiner, Elgar, Joseph Holbrooke, John Ireland, Coleridge Taylor, Frank Bridge, Frederic d'Erlanger, Delius, Arthur Benjamin, Eric Fogg, Granville Bantock, E. J. Moeran, George Dyson, Percy Grainger, Berners, Vaughan Williams, Arnold Bax, Stamford, Parry, Ethel Smyth, Gordon Jacob, Landon Ronald, Hurlstone and Butterworth.

There will be three foreign novelties:—"Allegro Symphonique" by Marcel Poot (first performance in London); "Rhapsodie Flamande" by Albert Roussel (first concert performance in England); and "Suite Provençale" by Darius Milhaud (first concert performance in England).

Artists making their first appearance at the "Proms" are:—

Pianoforte: Lance Dossor, Benjamin Britten, Walter Rummel, Elena Glazounov, Michael Hambourg, Moura Lympany, Alec Rowley and Edgar Moy, Lili Kraus and Reginald Paul.

Violin: Alfredo Campoli.

Cello: Emanuel Feuermann.

Vocalists: Nan Maryska, Mary Bonin, Dorothy Clark, Tom Williams and Edward Reach.

The B.B.C. Symphony Orchestra of ninety players will be led by Paul Beard, and the organist and accompanist will be Berkeley Mason.

Especial interest attaches to this season because Sir Henry J. Wood, who has conducted the "Proms" regularly since 1895, celebrates this year the fiftieth anniversary of his first public appearance as a conductor. This event will be commemorated by a Henry Wood Jubilee Concert in the Albert Hall on October 5th, which will be given with the collaboration of the leading London Orchestras and Choirs, with Rachmaninoff as soloist.

LETTERS FROM READERS

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

A Small Portable

SIR,—I note the great interest taken by your readers in portable models for short-wave listening. In view of this I append a few particulars of a portable set I have recently constructed for use when cycling.

In building this set my first item was, of course, cost, but after sorting out some spare parts I had only a few extras to buy. As compactness was required, I decided on a 3-valver, using a Class B and H.F. pentode valves. After completing the set I cycled out to the high spots in the open country for test and was highly satisfied with the results. All the usual European and a few high-power American stations were received with good headphone volume.

Here are a few constructional details: The cabinet was built to suit a Pertvix 70-volt plus $1\frac{1}{2}$ v. G.B. battery, size $6\frac{1}{2}$ ins. by 5 ins. by $1\frac{1}{2}$ ins. and a small 3-volt bell battery. The panel (9 ins. by 5 ins.) and the chassis (4 ins. wide and 4 ins. deep) are of aluminium, and the cabinet when completed measures 9 ins. by 5 ins. by 7 ins. It is made of $\frac{1}{4}$ in. ply wood and covered with rexine, and is fitted with a clasp and bracket at the rear to fit the cycle lamp bracket.

Owing to the confined space the coils were wound on old valve bases, and these, in conjunction with the .00002 tuner, offered easy tuning on the crowded bands.

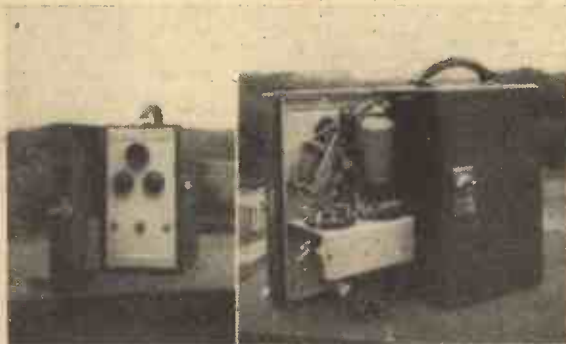
S.W. Logs

SIR,—It is with regret that I read your note, stating that logs will not be published unless accompanied by veris.

I have greatly missed the logs, which have not been published for the last few weeks, as they have been of great help. Hoping that they will soon appear in print again.—G. JACKSON (Rottingdean).

SIR,—We should like to support Mr. E. J. Logan's remarks concerning the publication of reader's logs.

We were reading some of the older numbers recently and examining the logs



Two views of Mr. Kenneth Scott's small portable.

therein, when we agreed that it was a pity that you do not publish them now.

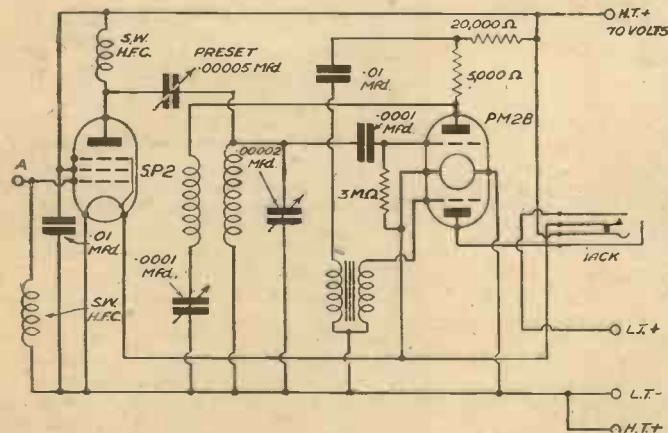
Mr. Logan is quite right. If we had to send our QSL cards up, the logs would be at least six weeks old. Then again, we have to be prepared for disappointment in a great many cases, even from some of the very DX stations, as they do not QSL even when a reply coupon is enclosed.

By the way, we should be pleased to hear from any reader who has a QSL from either VS1AT or VU2BG.

Personally, I heard the former station on Sunday, June 26th last, QSO'ing with GM6RG, at 17.17 G.M.T., at R5-6

QA 3-5, and I heard VU2BG on 5/7/38, at 23.08 G.M.T. Both were heard on your Simplest 2-valver with another valve, transformer coupled. The antennae is an expanding one, pulled out 15 ft. (indoors), and 25 ft. high, running from N.E. to S.W. Reports have been despatched.

I also have cards from LU1UA (no coupon enclosed) and VE2HP.—C. J. HINE, R. HINE, S.W. PEARSON (Moreton-in-Marsh, Glos.).



Theoretical circuit diagram of the small portable set described in Mr. Kenneth Scott's letter.

Logging Round the World Flyers

SIR,—Whilst searching for Sydney, Australia, on 31.28 m. during the morning of July 12th, I was fortunate enough to pick up a broadcast from Hughes, the American flyer, and Berlin. Apparently [Hughes' call is KHRH, and at 7.45 he was 200 miles from Moscow. The station faded out until 8 a.m., Central European time, then the Berlin announcer recalled KHRH, which after some delay came through very weak. Hughes said that all the time he had been in contact with the Moscow ground staff on the flying field and conditions were O.K. After wishing Hughes and the crew of the Lockheed 'plane good luck on their trip, Berlin closed down.

My set is a commercial radiogram which I use with about fifty feet of aerial wire, running under the gutter pipe of my house. I find this aerial very effective, as I have logged quite a number of short-wave stations since using it.—HARRY BRADLEY (Rothwell, near Leeds).

Station VQ4KTB

SIR,—I have just received from VQ4KTB a QSL card after waiting five months for it, also with the two cards (one for the TX) there was a four-page letter and about a dozen photos of his shack, etc. He wishes me to state that owing to pressure of business he has been unable to answer reports from listeners yet, but they will all receive their cards within the next 15 or 20 days. He says he receives about 300 reports a month, so I think he has got a very good excuse for being behind. Hoping this will be of interest to other readers.—G. BAYNES (Margate).

CUT THIS OUT EACH WEEK

Do you know

- THAT interaction between unscreened inductive components can generally be avoided by mounting them so that the windings are at right angles.
- THAT it is advisable to connect a high-voltage test condenser in the aerial lead of a D.C. or Universal mains set, in addition to that usually included in the earth lead.
- THAT tests for oscillation in a valve are simply carried out by touching the grid terminal. A "pop" indicates oscillation.
- THAT hum in a radiogram may often be cured by screening the pick-up lead which is connected to the grid.
- THAT the above cure does not always function but is the first to be tried.
- THAT care should be taken when making connection to the auxiliary grid of an H.F. pentode valve of the indirectly-heated type.

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 name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Owing to the rapid progress in the design of wireless apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

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By F. J. CAMM

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QUERIES and ENQUIRIES

The dial should be of the thin metal type with fine markings running right to the edge. A hair-line pointer should then be fixed to the panel and almost touch the edge of the dial. In this way you can divide a degree marking quite accurately. Alternatively, you can use a small scale above the dial, divided into ten, and thus obtain even more accurate adjustments. A dial of the former type will now be found in the Eddystone range.

A Novel Pulsator

"I was interested in the device recently published under this title, but wonder if there is anywhere where I could get hold of a small, cheap pick-up unit. I am in the unfortunate position of not having such a thing spare and do not want to buy a complete unit and dismantle it."—F. J. (Bromley).

RULES

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.
 - (5) Grant interviews to querists.
- A stamped addressed envelope must be enclosed for the reply. All sketches and drawings which are sent to us should bear the name and address of the sender.

Requests for Blueprints must not be enclosed with queries as they are dealt with by a separate department.

Send your queries to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. The Coupon must be enclosed with every query.

MESSRS. ELECTRADIX RADIOS can supply a small unit and buzzer for your purpose. The plain buzzer with the special moving iron unit may be mounted so that the buzzer armature strikes its needle on the rebound. There is no need to interfere with the buzzer contacts and the special unit may be mounted so that it may be fed forward by the screw until the needle just touches the armature. The buzzer units are 9d. each and the special pick-up substitutes are 2s. 6d.

Mains Connection

"I am just having a radio-gram installed and the only mains point which I can get at has three pins. I am told that one of these is an earth point. Could I use this for an earth connection to the set or will it give rise to interference? Also, will this point be powerful enough for the radio-gram? I suppose it is in order to leave the switch on and only switch off on the radio-gram?"—C. E. (Gosport).

WIRELESS CONSTRUCTOR'S ENCYCLOPÆDIA

5/- or 5/6 by post from
George Newnes, Ltd., Tower House, Southampton St.,
Strand, London, W.C.2.

THE earth point on the switch is a sound earth connection, but in some cases may give rise to hum interference. The best plan, therefore, is to try it in your particular case and see if it works satisfactorily. The point should be quite suitable from a power rating point of view, provided that the receiver is not a super model. So long as the flex connecting the set to the mains socket is not unduly long it is safe to leave the mains switch on and control the set by its own on/off switch.

A.C.-D.C. Valve Connections

"I am going to make up a modified version of your Universal Hall-Mark receiver and should be glad if you could tell me the best arrangement for the heater wiring. I understand that there is a correct arrangement of the order of the heaters and therefore wish to adopt this."—L. W. (N.9).

THE correct plan is to connect the mains input to the barretter, then to the rectifier. Following this should be a fuse lamp which may be used, if desired, as a dial light. It must, of course, be suitable for the heater current. Next should come the H.F. valves, then the output valve and L.F. valve, and finally, the detector. The latter is actually the most important, and the H.F. and L.F. valves may, if desired, be interchanged in the heater wiring. In a superhet, for instance, the I.F. stages should follow the fuse, then the output valve, next the frequency changer and then the second detector.

Megacycles and Kilocycles

"I have noted recently in your short-wave log that you give a station as so many meters and then a figure followed by mc. This is apparently megacycles, but I am not clear regarding this measurement and should be glad if you could explain briefly what it is."—M. L. (York).

THE wavelength is measured in metres and is the distance from the crest of one wave to the crest of the next. The time or periodicity of the waves is measured in seconds and the number of waves or oscillations is thus the frequency. For all normal wavelengths this is measured in kilocycles, or thousands of cycles. Thus 60 metres is 5,000 kilocycles. A megacycle is a million cycles and therefore 1,000 kilocycles is equal to 1 megacycle.

Oscillator Circuit

"I am building a short-wave set but cannot make up my mind what type of oscillator to use. It seems that there are dozens of different arrangements and I cannot find the merits of the various circuit designs. What do you consider as the best scheme for simple building and certain operation?"—H. R. (Gloucester).

WE assume that you refer to the separate oscillator used in the frequency-changing stage, and in that case the circuit may be an electron-coupled oscillator, or a modified Hartley circuit. A reaction coil in anode or cathode circuit may be used, but for freedom from frequency drift and general stability the electron-coupled circuit is preferable. A triode, or an H.F. pentode with anode and screening grid strapped may be used, the latter having given best results in the circuits which we have tried.

Wiring a Receiver

"I am just starting to construct my own sets after reading the various articles in your paper. I am not clear about one thing. What do you recommend as the best way of wiring a set—that is, what material? I should like to follow carefully what I am doing and be able to trace out circuits from time to time."—H. R. T. (Hove).

ALTHOUGH coloured insulated connecting wires are readily obtainable, and other forms of connecting wire which are insulated, the most satisfactory scheme in your case is to use ordinary bare tinned copper wire with insulated sleeving of various colours. The wire should be preferably gauge 18 or 20, and the ordinary small diameter sleeving should be used. If you obtain a set of colours, say, red for positive leads, black for negative, yellow for H.F., and so on, you can follow a circuit by referring to the wiring, and any alterations which you subsequently may wish to make are easily arranged for. The coloured sleeving adds to the neatness of the finished receiver and also prevents short-circuits.

Earth Couplings

"With reference to the recent articles which have appeared in your paper regarding earth couplings, I have been informed that an ordinary metal chassis is not a safeguard against interference. A friend tells me that interaction may be introduced, due to common couplings arising through the chassis, and I should like to know whether you can confirm or deny this."—H. M. (Canterbury).

ALTHOUGH the chassis may be earthed there is sometimes a possibility that inductive components may be so arranged that their fields are connected via the chassis. A case in point is sometimes found in the superhet, where two I.F. transformers mounted in the usual way will interact. A case of this nature was recently experienced and the instability was not cured until the two transformers were mounted on small distance pieces so that they were in. above the chassis. The bottoms of the screening cans were closed by a separate small piece of aluminium cut slightly larger than the screens. When they were mounted in the usual way on the chassis the set failed to function properly, and this probably explains the point you refer to.

Accurate Readings

"I have built a small wavemeter, but find it very difficult to arrive at really accurate settings. I have an old pattern slow-motion dial which drives exceedingly slowly, but the pointer does not seem to be thin enough to see between the markings. Is there any dial on the market at a reasonable price which you could recommend for my purpose?"—A. E. (Bristol).

THE best plan for really accurate "degree-splitting" readings is to use a moving dial and a fixed pointer.

The coupon on page 496 must be attached to every query.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word. Words in black face and/or capitals are charged double this rate (minimum charge 3/- per paragraph). Display lines are charged at 6/- per line. All advertisements must be prepaid. All communications should be addressed to the Advertisement Manager, "Practical and Amateur Wireless," Tower House, Southampton Street, Strand, London, W.C.2.

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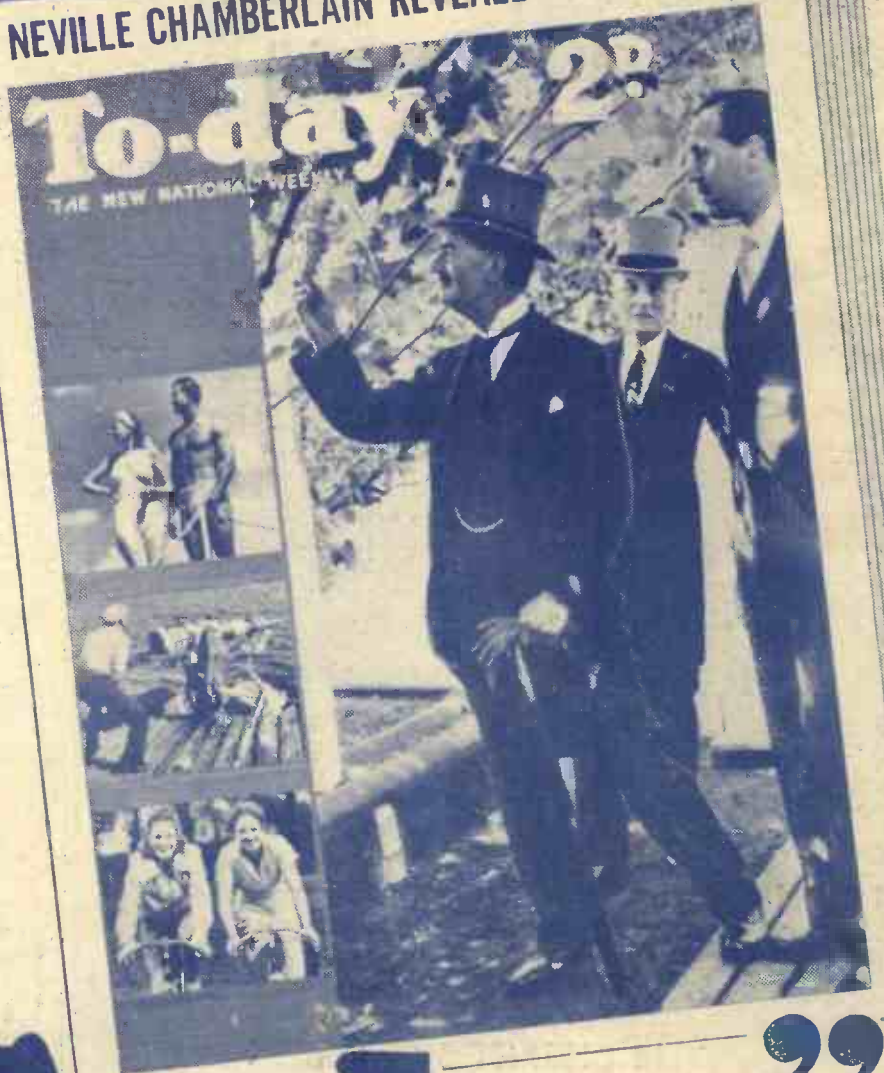
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