12 Stories

MAKING A 'QUALITY' BATTERY SET—See page 55

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3D EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

Vol. 11. No. 263. October 2nd, 1937.

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F. J. CAMM'S

ALL-WAVE "CORONA" Four

CIRCUITS AND SETS 1932—1937

SEE PAGE 66

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. XI. No. 263. October 2nd, 1937.

ROUND *the* WORLD *of* WIRELESS

Television Set Sales

THE GENERAL ELECTRIC COMPANY announce that as a direct result of the publicity which television received at Radiolympia the sales of television receivers which they manufacture have been three times greater than any similar period since the television service began In the first week since the show ended the G.E.C. had received more enquiries regarding television apparatus than in the previous three months.

Radio and Fire Brigades

THE Coventry Fire Brigade, after three years of research, have now installed a portable wireless transmitter operating on a wavelength of 5.17 metres with an output of 1½ watts. The call-sign is G8YH, and the equipment is battery operated. The apparatus used on the fire-engines is of the portable type and a permanent installation is fitted at the headquarters of the brigade so that the station may keep in touch when the men are at a fire.

Marconi Prize

A SPECIAL prize of 100,000 lire is to be awarded for the most important discovery in the application of electromagnetic waves. This sum of money has been set aside by the "Cassa di Risparnico," of Turin, and the laying down of the conditions governing the award are to be left in the hands of the Academy of Italy.

Listeners in France

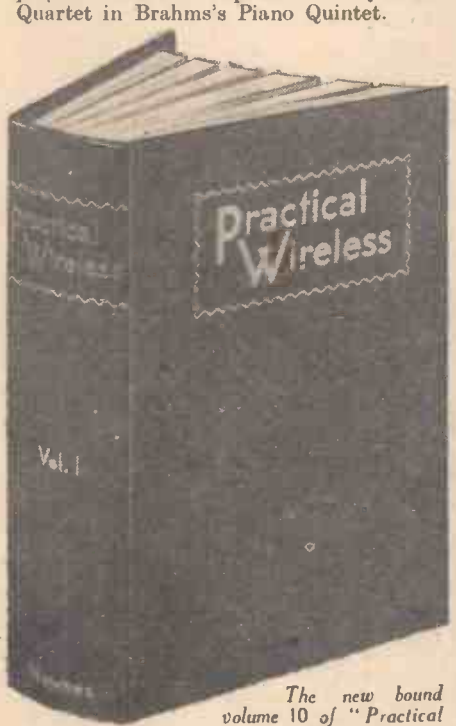
THE latest return of radio listeners in France shows a slight increase during the past few months. The latest figure gives the total number of listeners as 3,949,826, as compared with 3,926,902 on June 1st. It is hoped to pass the four million mark by the early autumn.

Japanese Educational Broadcasts

THE educational broadcasts in Japan are divided into three classes—a special kindergarten hour, an ordinary hour, and a higher education hour. Over 3,000 schools are now provided with receivers, and the talks and educational programmes now far outnumber the ordinary entertainment programmes in Japan.

Chamber Music

ON October 3rd (Regional) the Concert given by the South Place Sunday Concert Society will be broadcast from the Conway Hall, Red Lion Square. The Brosa String Quartet will play works by Mozart and Brahms; Richard Walthew (piano) will play Schumann's "Papillons" and join the Quartet in Brahms's Piano Quintet.



The new bound volume 10 of "Practical and Amateur Wireless" is uniform with the first volume here shown.

The series of "special recitals" is also being resumed, and during the week beginning October 3rd Max Rostal (violin) and Franz Osborn (piano), Margot Macgibbon (violin) and Frederick Jackson (piano) will play early violin sonatas and miscellaneous piano music by Mozart, in the National or Regional programme.

Concert Party Stars

"CONCERT Party Stars" is the title of a programme consisting of artists who have broadcast this season in Western Concert Parties. The programme will be heard on October 9th.

B.B.C. Midland Orchestra

REGINALD BURSTON will conduct the B.B.C. Midland Orchestra in a light popular concert on October 3rd, with John L. Lewis (tenor) as the vocalist. The concert will commence with the Oberon overture and, following a selection from "Pagliacci," John Lewis will sing two numbers of Novello's—"Love made the Song" and "Shine through my Dreams." After the suite, "In an old Cathedral Town," John Lewis will sing a group of songs and the programme will conclude with the orchestra playing a Potpourri of Ray Noble's up-to-date numbers. Ray Noble, who is one of our most successful modern rhythm composers, has recently left for America.

A Revue in Miniature

ON October 5th Martyn C. Webster is to compère another of these miniature revues, named "Follow On" because each item suggests the subject of the next. The artists taking part will be Dorothy Summers, Marjorie Westbury, John Bentley—a young Birmingham artist who has become a regular Midland broadcaster—Denis Folwell, of Leicester, who is also "'Arry" of "'Arry and Liza," and Jack Hill and Jane Minton at two pianos. Jack Hill, well known for his compositions in Midland musical broadcast shows, has already frequently contributed to "Follow On."

Western Salon

THIS programme will be broadcast from Dartmouth College by the English Singers Quartet from the Western Regional on October 15th. The Quartet have done much to popularise the essentially English art of vocal chamber music, and have toured Europe, Canada, the United States and the Far East. Next January they will again visit Canada and the United States. The members are Flora Mann, Lillian Berger, Norman Stone and Julian Were.

Binding Cases

KEEP your back numbers tidily, and facilitate reference to previous articles and receivers by obtaining a binding case and index. Binding Cases and Indexes for Volume 10 of PRACTICAL AND AMATEUR WIRELESS are now available. The binding case, complete with title page and index, costs 3s. 6d., and the index alone 7d. by post. Indexes are still available for Volumes 1 to 9, inclusive.

ROUND the WORLD of WIRELESS (Continued)

Philips New Factory

ACCORDING to a recent report construction will be commenced shortly on Messrs. Philips new factory to be erected on a 32-acre site at Blackburn. It is anticipated that fresh employment will be found for several hundred workpeople in Blackburn, and that the factory will be in full production by next spring.

"I was There"

THE tragic earthquake which occurred in Valparaiso in 1906 followed closely that at San Francisco, but its consequences were far more serious. In the case of the San Francisco earthquake, it was the ensuing fire which was the cause of most of the damage, but at Valparaiso 8,000 people were killed and 2,500 injured.

Mr. R. A. Blyth, who will describe for listeners the earthquake at Valparaiso, was an accountant in one of the big foreign banks in that city at the time it happened. Enormous damage was done to the bank where he was employed and his desk was actually smashed to atoms, but, fortunately for him, and indeed for the whole business community of the city, the earthquake happened in the evening when business houses had closed down. Otherwise the death-rate would have been even higher. This broadcast will be given in the National programme on October 12th.

Mr. W. T. Pratt, Engineer in Charge of Test in the "His Master's Voice" factories at Hayes, had the experience of listening to himself, when the talk which he gave recently on the testing of radio receivers was re-radiated in the Empire programme.

Black Dyke Mills Band

ONE of the most famous combinations in the brass band world, the Black Dyke Mills Band, which comes from Queensbury, Bradford, is to broadcast from the Northern Regional on October 3rd, under the baton of Arthur O. Pearce, who has been the Black Dyke's bandmaster for over twenty-five years. This band, which was founded in the middle of last century and has never been out of the top class in 80 years, recently gained third place at the Belle Vue (Manchester) championship contest, only seven marks behind the winners and only 13 less than the maximum marks.

INTERESTING and TOPICAL NEWS and NOTES

"Coming Events"

A FORECAST of West of England programmes for the next three months will be heard in "Coming Events" on October 1st. This programme is a kind of trailer, picking out for listeners the high spots. Each department presents its contribution in its own way, and uses the technique associated with that particular branch of broadcasting.

"Music-hall"

WHILE John Sharman, B.B.C. Variety producer, has been basking, on holiday, in the sun at Las Palmas and Teneriffe, Variety Booking Department has been engaging the artists he chose before he left, to take part in "Music-hall" which he will produce in the Regional programme on October 2nd.

Among them are Bennett and Williams — "Two Jovial Boys with their Phono-fiddles"; Jenny Howard (the Comedy Girl) assisted by Percy King; Mr. Bob and Mr. Snob (Michael North at the piano and Davy Burnaby); and Ethel Revnell and Grace West ("The Two Oddments").

The B.B.C. Variety Orchestra will be conducted by Charles Shadwell.

"After Dinner"

CHARLIE KUNZ will be the guest artist to appear in "After Dinner," the North's cabaret show on September 27th, which was referred to in these notes last week. This will be the fourth edition of "After Dinner."

"The Peaslake Crash"

LANCE SIEVEKING has created, from J. E. Gurdon's story "The Peaslake Crash," an amusing aerial drama. Briefly the story is based on the action of a millionaire, Mr. Peaslake, who, while inspecting an aeroplane landed in his park by his ward's fiancé, is carried up into the air involuntarily by the machine starting up on its own. The aeroplane, a new type, is on test flight and carries a lot of petrol. The millionaire, knowing nothing of aeronautics, is borne away into the blue. This broadcast, which was given in the Regional programme on September 28th, will be repeated in the National programme on September 30th.

Variety from Swindon

IN the "Theatres of Variety" feature, a programme will be broadcast from the stage of the Empire Theatre, Swindon, on October 6th.

One of the new Ekco model 98 all-wave superhets for A.C. and batteries, with spin-wheel tuning and built-in controls. These receivers tune to the television sound wavelength, and are priced at 15½ gns. (A.C.) and 13 gns. for the battery model.

SOLVE THIS!

PROBLEM No. 263.

Signals from Burten's receiver became very weak, and it was found that the speaker field winding and rectifier were overheated. What was the fault? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 263 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, October 4th, 1937.

Solution to Problem No. 262.

An excessive voltage drop occurred across the speaker field winding, and therefore the voltage applied to the valve anodes was too low.

The following three readers successfully solved Problem No. 261, and books are accordingly being forwarded to them: A. Barrett, 58, Frederick Street, Waddesdon, Bucks.; W. J. Herbert, 126, Gelli Road, Gelli, Rhondda, Glam; W. Devonshire, 5, Manship Road, Mitcham, Surrey.

Making a "Quality" Battery Receiver

"The Experimenters" Show What Can Be Done in this Direction, Point Out the Difficulties, and Give a Number of Helpful Suggestions

by The Experimenters

AMONG our recent correspondence has been a number of letters from readers who wish to build a local-station battery set for "quality" reproduction. A letter to the editor, in a similar strain, was published in the issue dated September 25th, and no doubt most of you read it.

The first difficulty is to decide just what is implied by "quality" reproduction, for, after all, it is only a comparative term. Moreover, if you are to obtain reproduction which approaches fairly near to perfection, you must be prepared to spend not a little money. When dealing with a battery-operated receiver the difficulty is still more acute, since there are important limitations to the H.T. voltage and current that can be economically obtained. In the case of an A.C. mains receiver, an extra 50 mA is of little consequence, and you can obtain 500 volts just as easily as you can obtain 200 volts.

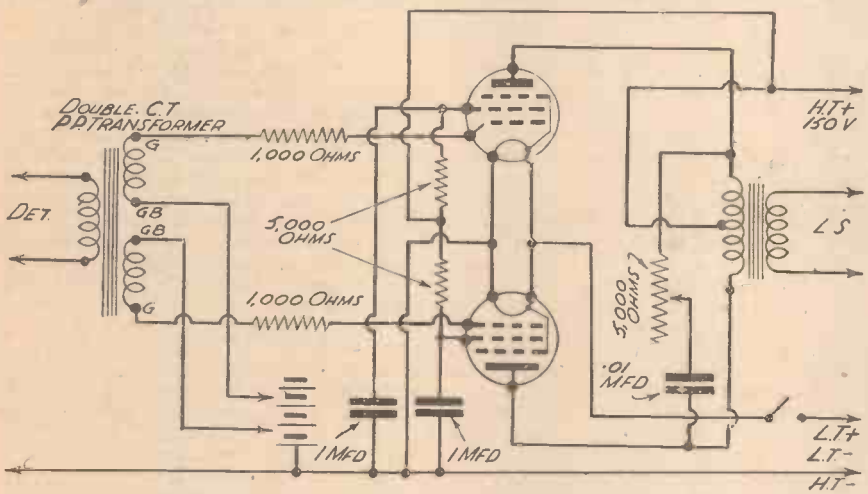


Fig. 1.—A useful type of push-pull amplifier circuit, which is about the best that the builder of a "quality" battery set can adopt.

Expense

This all brings us back to the question of whether or not a "quality" battery set is a possibility, or at least whether it is an economical possibility. Frankly, we believe that it is not possible to build a real "quality" set for battery operation unless you are prepared to spend a large amount of money, or otherwise to operate it from a mains supply source. In the latter event the position is considerably simplified, but we cannot imagine why anybody who has a mains supply available should wish to make a battery-operated set.

We know that something is wrong with our reasoning on this matter—or, at least, it appears that something must be wrong—because hundreds of readers who have a mains supply tell us that they do really and truly want to build a battery set. And if we are in the minority, we are prepared to submit to stronger forces. The correspondent whose letter was printed a fortnight ago suggested that the first-class set that he wanted should be operated from an eliminator or a Milnes H.T. unit, in conjunction with the D.C. mains. We think that he ought also to have mentiond the use of an H.T. accumulator, because that can be charged quite easily from a D.C. supply.

In our honest opinion, even D.C. users would be better advised to build a D.C. or universal receiver for operation directly from the mains. It would be cheaper initially and in running. Still, if a really good battery set is still demanded, we are here to "deliver the goods."

How Many Milliwatts?

When you come to consider the question of a complete receiver circuit, it is nearly always better to take the main parts of it in turn. For example, you decide on the type of L.F. output, then on the kind of detector or second detector that will be used, and then on the pre-detector circuits. If you are out for quality—and we still use that word in a comparative sense, because real quality with a battery set is not quite attainable in our opinion—you must have a maximum undistorted output of not less than two watts. That might sound a lot, but it isn't. In fact, it is the minimum for any receiver for which a claim for really good reproduction can honestly be made. (Yes, we are awaiting quite a lot of brickbats, but we can hurl them back.) You must remember that the *maximum* undistorted output is obtained for only about one per cent. of the total "playing" time of the receiver. You must also bear in mind that normal musical passages, and normal speech, will only produce an output of about one-third of the maximum available. And for true reproduction the softest passages should produce an output of only a fraction of one per cent. of that available on the loudest passages.

Push-pull

However, we must not be led away from our subject into a more abstract discussion. To ensure a maximum undistorted output of two watts from a battery set, we are practically compelled to use a pair of pentodes in push-pull. Some reader might say that Class B or Q.P.P. is more economical, but we do not honestly believe that, in practice, either of these systems produces "quality" such as a builder of a local-station "quality" set wants. We mustn't pursue that argument, though, or we shall never get down to practical matters in this article.

Now, if you are to get two watts undistorted, each of the pentodes must have a rated maximum output of getting on for one watt. It is generally agreed, by the way, that the output of two valves in

(Continued overleaf)

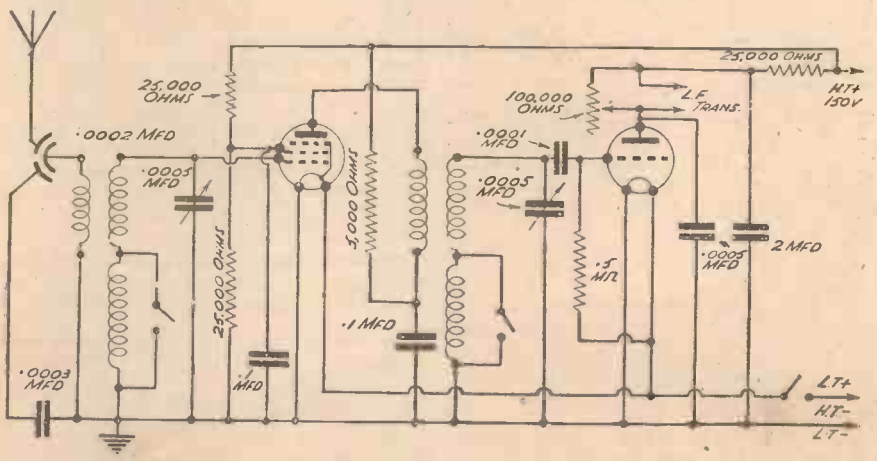


Fig. 2.—This simple H.F.-detector circuit cannot well be bettered for local station reception.

MAKING A "QUALITY" BATTERY RECEIVER

(Continued from previous page).

push-pull is two-and-a-half times that of a single valve. There are several good and fairly economical battery pentodes that have a rated maximum output of one watt; among these are the Cossor 220 P.T., the Cossor 230 P.T., and the Hivac Z.220. Remember, though, that the maximum rated output is obtained only when the anode voltage applied to the valves is 150; this means that the H.T. voltage must be about 170 to allow for the voltage-drop across the primary of the output transformer. If you cut down the total H.T. voltage to about 150, the output per valve will fall to about 800 milliwatts, and thus the output for the push-pull stage will be almost exactly two watts. Cut the voltage down to 120 and the total output will be no more than one-and-a-half watts, if so much.

Anode Current

Anyhow, suppose that we are agreed on using a couple of valves such as these, their total anode-current requirements at 170 volts H.T. will be at least 34 mA. Add to this another 10 mA for the H.F. and detector stages and you have the grand total of 44 mA. To supply this you must have either an H.T. accumulator (the Milnes unit is actually an accumulator) of the largest capacity if economy is being studied, or otherwise a good eliminator.

A circuit such as that shown in Fig. 1 is perfectly satisfactory, and we can take this as being suitable for most requirements. It is a normal push-pull amplifier, employing a push-pull transformer with double centre-tapped secondary. In other words, the secondary is in two separate halves, so that each valve can be biased separately if necessary. The transformer may have any ratio up to 1 : 5, but 1 : 3.5 is probably most suitable. Grid decoupling is used in the interests of stability, and both screening grids are decoupled from the main H.T. supply. To curtail any over-emphasis of the higher frequencies, a tone-control consisting of a fixed .01-mfd. condenser and a 5,000-ohm variable resistance is connected across the output—between the two anodes. The output transformer can be built into the set, or might be that fitted to the P.M. moving-coil speaker. As will be seen, the circuit is straightforward, and need involve no complications in construction. Assuming the use of about 170 volts for H.T., the grid bias should be approximately 9 volts for the 220 P.T., 15 for the 230 P.T., and 6 for the Z.220. If other valves are used, the G.B. should be as advised by the makers. In the conditions mentioned, the total H.T. current for the valves referred to will be about 46, 34 and 44, respectively. The P.T.230 is most economical of H.T., but requires an extra .1 amp. for L.T.

Triodes

There are still many who are rather prejudiced against pentodes, but battery triodes generally have an output of more than 450 milliwatts. However, if triodes are preferred, you can obtain an output in excess of one watt by replacing the pentodes by a pair of 230 X.P., or similar valves. These require a similar total H.T. current; for example, the Cossor 230 X.P. takes 22 mA at 150 volts H.T. and 18 volts G.B., while the Hivac P.X. 230 requires 17.5 mA at 150 volts and 15 volts.

If "super" output volume is required, and you care to go to the expense, you can use a couple of Mazda P.A. 20 valves, but these require 2 amp. for the filament (at 2 volts), and will take a maximum anode voltage of 250. When so fed, and given 30 volts G.B., this valve will provide a maximum undistorted output of nearly 3 watts, 2,800 milliwatts to be precise. Consequently, a pair of these valves in push-pull would give a maximum possible output of 7 watts. To obtain this figure, however, at least one intermediate L.F. stage would be required. On the other hand, they could be under-run, as regards H.T. voltage, so as to obtain an output of more than three watts with about 150 volts H.T. In that case, the intermediate L.F. stage could be dispensed with by using a 1 : 5 transformer, and the total H.T. current consumption need be no more than about 45 mA.

In most cases, it would be better where possible to use one of these valves, feeding it from a 250-volt H.T. source, and providing it with a preceding L.F. stage. You could then use resistance-capacity coupling between the detector and first L.F., and between the L.F. and power-output stages. That brings us back to the old and well-tried arrangement—but the 2 amp. filament current cannot be overlooked.

H.F. and Detector

What about the part of the set which precedes the output stage? For local reception we believe that you can do little better than use an H.F. pentode followed by a power-grid detector, as shown in Fig. 2. Two H.F. transformers are used for aerial and inter-valve coupling, and these can be of perfectly normal type, provided that they do not tune too sharply. Do not use iron-core coils, but preferably a pair of air-core coils of the older-fashioned type—many of you will have these in the junk box. Reaction is not used, and tuning should be sharp enough to enable the local transmitters to be received free from interference, but not so sharp as to cause any noticeable high-note cut-off. In some respects, a band-pass filter would be better between the H.F. and detector valves, but that is not essential if reaction is not employed, and if the coils and condensers are matched and carefully trimmed.

A volume control will be required, and this might well take the form of a 100,000-ohm variable resistance—but it must be a good one, such as the Polar-N.S.F.—connected across the detector output. In theory, this arrangement is not ideal, but it operates very successfully in practice. Alternatively, a variable-mu control could be applied to the H.F. pentode if this were of the variable-mu type. Another idea is to use a differential condenser connected in the aerial-input circuit, as shown in Fig. 2. This performs quite satisfactorily, and might be used in addition to the variable-resistance L.F. volume control.

We hope that we have not damped your ardour in connection with the battery-operated "quality" set, but we should be doing both you and ourselves an injustice if we claimed that the problem of design is easy of solution. We have presented facts which have been established as a result of extensive experiments, and if you think our ideas are wrong we can only say: "Go; do better!" If you think that you have done better, please let us know all about it; we like to hear from you. Cheerio.

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Erie Grid Leaks

THESE well-known grid leaks and resistors are made with a special composition of carbon and rare earths which have the property of carrying a high load without any tendency towards open circuiting. The wire leads are soldered to copper which is forced into the ends of the resistor under intense heat, and it is claimed for these resistors that they are absolutely silent and stable in use. A simple colour code is used to designate resistance values, and in addition, the resistance value is indicated on a small label. Erie resistors are obtainable in all values from 50 ohms to 5 megohms. Particulars of the full range of these components are given in a folder issued by The Radio Resistor Coy., Ltd., 1, Golden Square, Piccadilly, London, W.1.

Westinghouse Metal Rectifiers

A USEFUL handbook, entitled "The All-Metal Way, 1938," deals with the construction of H.T. battery eliminators and battery chargers embodying Westinghouse metal rectifiers. The book, which is primarily of interest to home constructors who prefer to build their own apparatus, deals fully with rectification, battery eliminator problems, mains conversion, battery charging, and the application of Westinghouse metal rectifiers in television receivers. There is also a section devoted to Westectors, and their uses in various circuits. The handbook, which is well illustrated with diagrams, should be particularly useful to the home constructor. It is issued by The Westinghouse Brake and Signal Coy., Ltd., 82, York Road, King's Cross, London, N.1.

BOOKS RECEIVED

Broadcast Talks

A BOOKLET containing full particulars of the B.B.C. Talks Programme to be given from the National and Regional transmitters is now available to the public. Among the many talks on various subjects it is interesting to note that on Sunday evenings at six o'clock, momentous scenes in the House of Commons will be brought to life by descriptive talks and quotations from speeches delivered at the time.

On Monday evenings, at eight o'clock, Anthony Bertram, who has been touring the country for material for these talks, will discuss "Design in Everyday Things," and on Tuesdays, at 7.30 p.m., R. W., Jepson will give a series of talks on "Clear Thinking." At 9.20 p.m. on the same evening the popular series of eye-witness accounts of famous events, entitled "I Was There," will be continued. Among the speakers will be Lord Baden-Powell on the Relief of Mafeking.

Books talks will be given on Thursdays at 6.20 p.m..

On Fridays, at 6.25 p.m., talks or readings in German will be broadcast, and at 7.10 p.m., under the editorship of Sir Walford Davies, the popular series entitled, "Music and the Ordinary Listener," will be continued. At 9.20 p.m., Sir Henry Tizard will open a series which aims at showing the intimate relation between the work of the scientist and the lives of everyone.

The pamphlet also gives details of daytime talks, readings, Regional talks, and Sunday talks on religion. Mr. C. H. Middleton will continue his weekly talks.

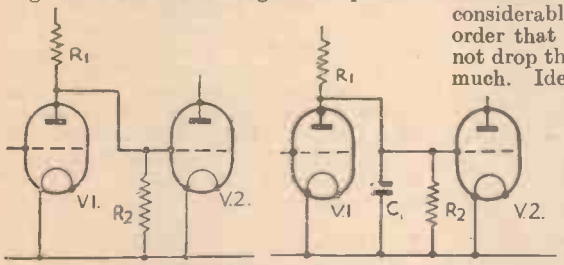
The Amateur Set Designer

This Fourth Article of the Series Deals Further with Biasing Arrangement for the Output Stage, and also Resistance-capacity Coupling

(*Continued from page 29, September 25th issue*).

THE resistance of R1 should not be less than twice Ra, if V1 is a triode, and it is unusual to make it greater than ten times Ra. As a first choice, R1=5Ra will probably be useful.

So far we have been considering the gain from grid to anode of V1. What is more important is the stage gain, i.e., the gain from grid of V1 to grid of V2, and we must begin to think about the behaviour of the stage over the whole range of frequencies



Figs. 12 and 13.—R.C. coupling showing the stray capacity (C1).

to be handled. It is quite wrong to regard an R.C.C. stage as absolutely constant in behaviour from one end of the frequency range to the other. For one thing, the reactance of C (Fig. 11) rises with decrease of frequency. Again, at the upper frequencies the shunting effects of stray capacities can become pronounced. It is up to the designer, however, to work towards making the frequency response as even as possible and, in this respect, the R.C.C. stage can be made to behave very well indeed.

Let us look into the matter of the lower frequencies. In all circumstances, for Fig. 11, the stage gain is the ratio of the signal voltage developed across R2 to the signal voltage between the grid and filament, or cathode, of V1. For the lower frequencies the choice of capacity of the coupling condenser is most important, and there are two conflicting requirements: First, that the capacity of C shall not be so small that the signal voltage available across R2 is considerably lessened, due to the drop across C and, secondly, that C shall not be so large that grid-blocking effects occur at V2. The resistance of the grid leak R2 is also concerned with the latter possibility. This being so, do we choose C first and R2 accordingly, or vice-versa? It depends upon where we have the freer hand. If V2 is the output valve of the receiver, there may very possibly not be a great freedom of choice for R2, because the valve manufacturer may place a limit upon its value, and it may not always be advisable to go much below that limit. However, having made some choice, either for C or for R2, a first choice for the other value can be made by arranging that the product of C (mfd.) and R2 (megohms) equals .007, which represents an average figure for the usual run of R.C.C. stages.

At the middle frequencies the reactance of the coupling condenser should have dropped to so low a value that it is negligible compared with the resistance of R2. Thus, as far as the signal current components are concerned, the existence of the coupling condenser might just as well be forgotten, and the circuit becomes equivalent to Fig. 12. Now, R2 is effectively in parallel with R1 so, obviously, it is desirable that the resistance of R2 shall be considerably higher than that of R1 in order that the shunting effect of R2 shall not drop the effective anode load of V1 too much. Ideally, R2 should be about ten times R1, but this cannot always be arranged, and the designer must sometimes be content with a lower ratio. Having chosen a value for R2, however, it is as well to see how the ratio R2/R1 stands. Should it come out rather on the low side, it may pay to consider if there is any latitude for a decrease of R1, or an increase of R2. Incidentally, the CR2 figure of .007, quoted

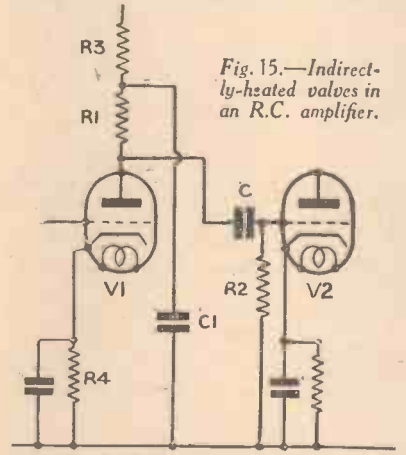


Fig. 15.—Indirectly-heated valves in an R.C. amplifier.

in col. 1, need not be made a fetish, and the designer need not hesitate to go a little higher if there is some obvious advantage in doing so, and there is not some strong reason against it.

At the upper frequencies all the stray capacities come into play. These include capacities between wiring, inter-electrode valve capacities, etc., but taken altogether they may be regarded as a lumped capacity, shown as C1 in Fig. 13. (The coupling condenser is not shown in Fig. 13 because, from the frequency response point of view its effect is negligible at the upper frequencies.) Obviously if the reactance of C is not very much greater than the resistances of the stage there will be bad high-note loss. Quite a lot could be written about the nature and effects of all the stray capacities in an R.C.C. stage, but if the designer works along the lines of planning already suggested, and if he avoids all unnecessary stray capacity in the construction work, he should not experience any trouble.

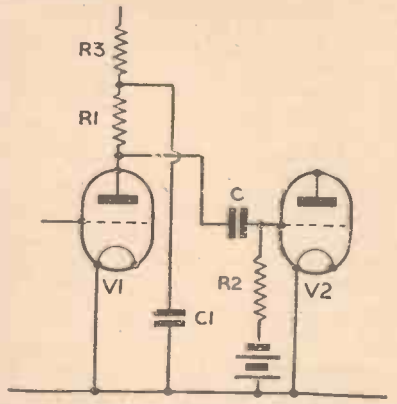


Fig. 14.—The full resistance-capacity circuit with decoupling components added.

The Decoupling Resistance

If a decoupling resistance, R3, is inserted, as shown in Fig. 14, it will not appreciably alter the effective anode load from the signal current point of view provided that the reactance of the decoupling condenser, C1, keeps of comparatively small value even at the lower end of the frequency range. R3, however, is bound to increase the D.C. voltage drop and to make the mean anode voltage lower than it would be in the absence of R3. More will be said about decoupling in a later section of this series but, in the case under consideration, it is obvious that R3 must not be made so large in value that V1 will not have enough anode volts for satisfactory working.

Bias—and a Check Up

Now the question of bias for V1 crops up, it being understood that we are assuming that V1 is an L.F. valve.

The correct bias for V1 will largely depend upon the maximum grid voltage swing that is to be handled by V1. In the case of the mains-operated receiver where V1 is biased by a cathode resistance, as shown at R4 in Fig. 15, the value of this resistance will depend not only upon the grid bias voltage required but also upon the value of the mean anode current. As the value of the mean anode current will be dependent upon the bias it may appear to the reader than the position has become a little awkward.

Some very pretty graphical work can be done with the anode current-anode volts characteristic curve diagram of the valve and, as a matter of fact, this work plus the use of some formulæ, can give the complete design data for an R.C.C. stage. But the

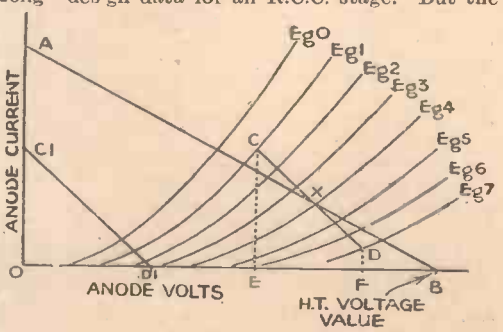


Fig. 16.—The dynamic curves of an amplifying valve.

writer is trying to smooth the way for the average amateur designer and so far we have been dealing with the R.C.C. stage without reference to any graphical working. One result has been to leave the question of a mains bias resistance rather "in the air."

Of course, there is the usual loophole of deciding the issue by practical experiment. Where battery biasing is concerned experimenting with values is an easy enough job, only a matter of seconds. With mains auto-biasing, however, the job may not always be convenient unless, at least, some idea of the order of value for the bias resistance can be obtained.

Dealing with the mains case it can be said that the position of the designer at the moment is that he has made tentative choice of values for R1 and R2 (see Fig. 15), and that the valve type for V1 has also been chosen. If the resistance of R3, and also the H.T. voltage, are given values it becomes quite an easy matter to take up the anode current-anode volts characteristic curve diagram for V1, and to make a general check up on the suitability of all the chosen values, and also to get at the bias resistance value for V1. This check up is a very different proposition from that of "working from the raw" with the curves.

If the anode current-anode volts characteristic curve diagram for the valve is not obtainable, and the designer is not prepared to plot it out from a set of anode current-grid volts curves, or if the latter are not obtainable, then there is nothing more to be said but to advise experiment as the means of determining final values.

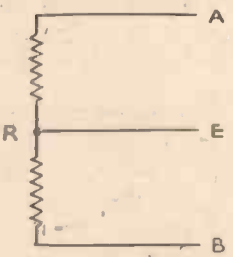


Fig. 18.—Study this diagram in conjunction with the explanation of R.C. push-pull.

Assuming, however, that the designer does propose to have a check up with the aid of a curve diagram, let us see how simple the job is. Fig. 16 shows a set of anode current-anode volts curves, each individual curve being appropriate to a certain value of grid voltage normally specified against each curve. The grid voltage values may be 0, —1, —2, —3, etc., or perhaps 0, —2, —4, —6, etc., or other values. To avoid any undue emphasis upon any particular grid voltage increment the curves of Fig. 16 are marked Eg0, Eg1, Eg2, etc., but it must be understood that the grid voltage increments are equal.

Referring to Fig. 15, the D.C. anode load is R1 + R3 + R4. We do not yet know the value of R4 but, fortunately, it is bound to be much smaller in value than R1 + R3 so, as a first approximation, take the D.C. anode load to be R1 + R3. Referring to Fig. 16, find the point B on the voltage axis corresponding to the H.T. voltage. On the current axis find point A such that the value of voltage represented by OB divided by the value of current (in amps.) represented by OA equals the resistance (in ohms) of R1 + R3. Join A and B by a straight line. The fact of importance now is that, ignoring the complication of R4 having been left out, there will be some point on AB which not only corresponds to the bias voltage, but also gives us the value of anode current for no-signal conditions, and it is this current value, remember, that we want before we can settle on the value of R4.

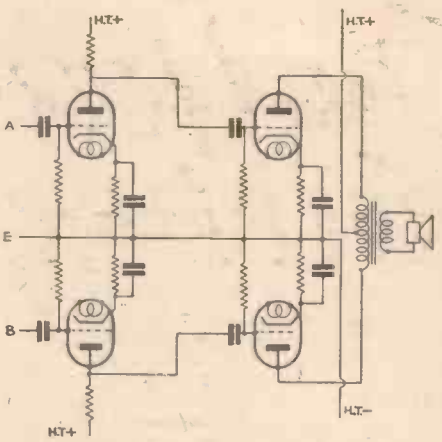


Fig. 17.—Double R.C. push-pull circuit.

Obviously, the grid bias voltage must be midway between the limits of grid voltage swing. The upper limit is easy to decide upon. We must not permit grid current under any circumstance, which will suggest making grid volts=0 the upper limit. To be on the safe side, however, it is better to keep the upper limit somewhat negative. (say —1 volt).

Make an estimate of the bias voltage, and mark the corresponding point on AB (point X in Fig. 16). Work out the resistance of R4 from the values of bias voltage and anode current.

The time has now arrived for the general check up. If the designer feels in a very fastidious mood he may care to get a closer approximation of R4 by redrawing AB, taking into account the additional resistance represented by the first calculation of R4. If there has been a slip up anywhere in the design plan of the R.C.C. stage it will have either the result of giving bad amplitude distortion, or that of giving an output signal voltage unsuitable for the following valve.

Take the signal load as being that of R1 and R2 in parallel (see Fig. 15) and work out the value of

$$\frac{R1R2}{R1 + R2}$$

Now referring to Fig. 16, draw C1 D1 such that the anode voltage represented by OD1 divided by the anode current (in amps.) represented by OC1, equals the resistance value calculated above. Through point X draw CD parallel to C1D1, and make C and D, respectively, correspond to the upper and lower limits of grid voltage swing (maximum).

If the lengths of CX and XD came out equal it would indicate no amplitude distortion at all, and it is not to be expected that they will be equal. Inspection should be made, however, to see that the inequality is not too great. As already explained in this journal, a ratio CX/XD of 11/9 will indicate 5 per cent. second harmonic distortion, which is the maximum permissible, and if several L.F. stages have to be taken into account a lower limit must be worked to.

As regards the output voltage swing this can be taken as approximately equal to the difference between the anode voltage values represented by E and F of Fig. 16. Should it turn out that things do not look too good on the results of the check it may be as well to keep in mind the possibility that the choice of valve type for V1 might have been bettered.

R.C.C. with the Pentode Detector

The H.F. pentode seems to have come to stay as a grid detector, although we will not discuss this matter at the moment. There are some points, however, that need comment where resistance-capacity coupling from the pentode detector to the next valve is concerned.

In this case the anode load resistance will be less than the valve impedance, but no good purpose will be served by specifying any particular ratio. The valve impedance is not normally specified in valve data for low anode voltage and, in any case, is very dependent upon operating conditions. The valve impedance is high so it is to be anticipated that the anode load resistance will be of a fairly high order. The mean anode voltage must necessarily be considerably lower than would be the case with the valve in use for H.F. amplification, and it is important to note that the screen voltage must be dropped accordingly. For the H.F. pentode detector it is advisable to make the screen volts not more than 60 per cent. of the anode voltage.

Although there is always scope for experiment to find the best arrangements to meet particular circumstances, the designer is certain to be near the mark if he chooses 100,000 ohms as anode load resistance for a mains H.F. pentode detector. For the screen voltage series, voltage-dropping resistance 0.5 megohms will probably be satisfactory, although it is not unusual for as high a value as 1 meg. to be used.

For the battery operated detector 100,000 ohms for anode load is a very useful value, too. Screen voltage is most readily obtained by a tap on the H.T. battery and, with 100,000 ohms anode resistance, and 120 volts H.T., about 24 volts on the screen will be suitable.

Resistance-capacity Push-pull

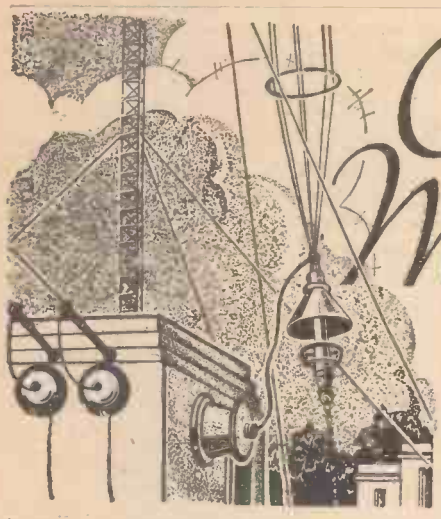
We have seen that the push-pull system has certain particular merits, and also that resistance-capacity L.F. coupling has much to be said for it, so a push-pull system with resistance-capacity coupling is a logical development.

In Fig. 17 two push-pull output valves are shown, and if there is to be a pre-output L.F. stage, and the latter is to be of the push-pull type, it is simple enough to see that the arrangement will be as shown in the diagram. Decoupling and grid stopping resistances are omitted, for clarity.

It will be understood that we cannot keep working back from the output stage with pairs of valves. Sooner or later it will be necessary to feed two valves with the signal output of one valve, and it will be necessary for the antiphase grid voltage relationship typical of push-pull to be produced somehow or other.

There are quite a number of different ways in which the phase splitting can be brought about, and there is scope for experiment to decide upon the most suitable method. There is no need, however, to regard the phase splitting as any sort of "mystery" business, and the writer feels that understanding of the principles is half the battle when the design of an R.C.C. push-pull amplifier is being considered. It should not be overlooked that the problem of phase splitting is not essentially different from that met with in ordinary transformer coupled push-pull. In the latter case phase splitting is necessary, and it is done merely by using an input transformer with a centre tapped secondary winding. The primary of the transformer produces an alternating voltage across the whole secondary. By "anchoring" the potential of the centre point to a value constant in respect to the cathodes, and by feeding the grids via the two ends of the secondary the necessary 180 degrees phase difference is brought about.

(To be continued)



On Your Wavelength

By Thermion

"King of Anti-crooners"

I RECEIVED a letter the other day addressed to "Thermion, King of Anti-crooners." The letter reached me all right! So that's what I am!! You might say that I am the Ace, King, Queen, Jack, Ten, and that I hold all the trump cards on this pernicious appendage to the musical mélange and montage which constitutes the musical pabulum provided by the programme producers.

Autographs

SINCE I was promoted to the presidency of the B.L.D.L.C. I have received many applications for autographs, and I understand from the registrar that there has been a rush of new members in order to obtain one of the neat little new certificates of membership of the B.L.D.L.C., which contain subscribed in the right-hand corner a reproduction of the calligraphy of yours truly. I do hope that when I leave the offices of this journal I shall not be assailed by autograph hunters whilst another gang endeavours to obtain my cheque book!

Discharge Rate

ON page 658 of our issue dated September 11th the printer made me say: "A lead-acid cell which will give, say, 100 ampere-hours when discharging continuously at 10 amperes, will give about 200 ampere-hours when discharging at, say, 20 amps." I want to tell my readers that I actually wrote nothing of the sort. What I did say was that a lead-acid cell which will give 100 ampere-hours when continuously discharging at 10 amps. would give *about* 50 ampere hours when discharging at, say, 20 amps. I hasten to point this out in case my readers presume that I have discovered some method of increasing the ampere-hour capacity of an accumulator by the simple process of doubling the discharge rate.

Service

I HAVE received the following letter from Mr. C. S., of Horsham:—

"Many thanks for your articles; they are *very* frank and good reading.

"In one of the Show numbers of PRACTICAL AND AMATEUR WIRELESS you stated that a speaker had been serviced in about four days. Well, I can beat that! Last week I wanted a resistor, and as one of the family was going to town I asked the said person to get it for me.

"On asking for it at the shop, however, the person was told the legend: 'We don't stock them, but we can get it for you.' We gave our address, etc., and that settled the matter so far.

"When told later in the day that the resistor would be sent on, I grinned and settled down to wait—but not for long. The resistor was ordered on Monday, about 4 p.m., and on Wednesday it arrived.

"The resistor was of the required value when it arrived!"

Television at Highbury

AN experiment unique in the history of television and of football was made at the Arsenal ground recently, when one half of the team watched by television the other members undertaking their routine training.

The occasion was a broadcast carried out by the B.B.C. Mobile Television Unit direct from the stadium at Highbury, and viewers were introduced by Manager George Allison and Trainer Tom Whittaker to the work which goes on behind the scenes of a first-class football club.

The pictures, which included demonstrations of ball-trapping by Bastin and head-work by Drake, Roberts, Hapgood, Male and others, were picked up by the Marconi-E.M.I. Emitron cameras located at vantage points around the ground, and were transmitted by the Mobile Television Unit direct to the television station at the Alexandra Palace. From there they were re-radiated on the normal television wavelength, and were picked up on a Marconiphone television receiver in the directors' room at Highbury Stadium. The reception throughout was remarkably good, and players looking-in were easily able to recognise their colleagues before the Emitron cameras outside.

This is the first time that a television broadcast has been made from a football ground, and is an experiment designed to test the practicability of including football matches in the television programmes.

Experiment for Deaf and Dumb Men

FOR some time past the General Electric Company has been interesting itself in the problem of the deaf. As a result a G.E.C. television set was installed at a certain Home in June of this year, following a suggestion that it appeared to offer great possibilities to those unfortunate people to whom radio has meant nothing.

It was decided, as a result of a conversation at Radiolympia between an official of the Home and a G.E.C. official, to carry the experiment a stage further.

There are in the Home a number of men who are not completely stone deaf, and they have been in the habit of listening to the radio by special amplifying headphones. Some of them, however, are unable to distinguish sounds—some of them, for example, cannot tell the difference between music and talks—and so the radio was providing very little entertainment. To be able to see at the same time, however, provides an interpretation of the sound.

It has been found in actual fact that the co-ordination of the aural and visual faculties does assist the men to hear, or to understand what they are hearing. Among the patients is an ex-soldier who was deafened in the War, and he has heard for the first time since the G.E.C. attached their special headphones to the television set.

It seems likely that headphone

television will be a valuable adjunct for teaching deaf children:

Only a small proportion of the men are affected by the sound, and television still continues to give pleasure to those who are totally deaf.

Twelve Years of Radio Progress

I NOTICED that the Whiteley Electrical Radio Co.'s stand at Radiolympia was one of the busiest centres during the Radio Show. Record business has been done, and Mr. A. H. Whiteley and his London representative, Mr. G. S. Taylor, are, I understand, well pleased with the results obtained with their new complete receiving set, which they have put on the market for the first time this year. For the past 12 years this firm, as is well known, has been in the forefront of loudspeaker manufacture, being makers of the popular Stentorian type.

The first to put on the market a permanent magnet moving-coil loudspeaker, they have been the first to adopt every innovation and improvement as it came along. They can claim to have held the lion's share of the loudspeaker market, and this position is maintained. Many valve manufacturers use W.B. valveholders for laboratory tests, a proof of their reliability. Regular users include the B.B.C., National Physical Laboratory, Mullard Valve Co., Siemens, Standard Telephones and Cables, etc. The business really started with the manufacture of valveholders.

To-day they are specialists in the extension loudspeakers, which they began pushing three years ago at a time when there was no demand from the private consumer. By introducing a multiple-matching device rendering their extensions adjustable to all sets, and originating the only used method of remote control in the speaker itself, a demand was created, and now extension loudspeakers are to be found in a large number of private homes.

Extension Speaker Refinements

THE extension loudspeaker which was shown at the W.B. stand has unique qualities. It can be turned off at the main by pressing a button placed in the centre of the volume control knob, or, if preferred, it can be turned off in one room while left running in others. Thus one can go to bed with an extension beside the bed, and by pressing a button turn off the set in another part of the house, or merely turn off the speaker in bedroom.

The firm supply over 100 wholesalers in Britain and export to India, Dutch East Indies, Iceland, Norway, Holland, Egypt, and Africa.

Hum on A.C.

MANY districts are now changing over from D.C. mains to A.C. and we have received numerous complaints from readers concerning the hum they are experiencing from their A.C.-D.C. sets after the change-over has been effected. There are very few A.C.-D.C. sets available which have as low a hum level on A.C. as on D.C., even when new, and it is our experience that this hum level when the set is supplied from A.C. increases in many cases after the receiver has been supplied from D.C. for a lengthy period. When tests have been made on these sets it is generally found that valve substitution provides a remedy. The old valves work satisfactorily on D.C. mains, but when the supply is A.C., excessive hum is immediately apparent. The cause of this has not been definitely diagnosed yet, but it is probably due to poor cathode-heater insulation.

Electrolytics

ANOTHER trouble commonly experienced when a change-over from D.C. to A.C. occurs is defective electrolytic condensers. These may function well on D.C., but break down, causing crackling noises and in some cases lack of signals, when the supply is A.C. The only safe remedy is to replace the condensers when trouble of this nature occurs—fortunately it is not a difficult matter to trace a faulty smoothing condenser.

Trickle Charging

THERE are several inexpensive chargers available now which are intended for home-charging of two-volt accumulators. Their charging rate is approximately .5 amp. and can therefore be used for charging most accumulator types in general use. Many readers have written to ask whether these chargers are suitable for accumulators that have a manufacturer's maximum rating of 1 or 2 amps. The answer is, of course, in the affirmative. Provided that the rating of the accumulator is not lower than the output from the charger, no harm can be done, but an accumulator requiring a maximum charging current of 2 amps. will naturally take four times as long to charge if the charging rate actually used is .5 amp. instead of 2 amps.

The loudspeaker presented at this year's Radiolympia competition is of great interest, scientifically. It achieves a range which considerably overlaps the human capacity to hear at both ends of the scale. The sounds it records go too low for the human ear—and also too high. A dog can hear tones so high-pitched as to be inaudible to the human ear. This loudspeaker attains these tones—14,000 vibrations per second—more than 2,000 vibrations per second above human audibility. The factory at which the loudspeakers are made is spotlessly clean. No grit or grain of dust must be in the atmosphere, and power vacuum cleaners are incessantly at work during manufacturing. The 600 girls employed are forbidden the use of powder for this reason.

A. H. Whiteley, founder of this business, put his life's savings into radio manufacture 12 years ago, capitalising W.B. Radio, Ltd., at £350. Since then the capital has been turned over 3,000 times. It is turned over six times a day in normal busy months.

Mr. A. H. Whiteley is a 43-years-old Yorkshireman. He has travelled widely in all parts of the world, and is proud of the fact that W.B. radio loudspeakers are in use in several of the ships of the Royal Navy.

Listeners' Views Wanted on Talks

I UNDERSTAND that a further experiment in "listener research" will be conducted by the B.B.C. during the autumn, to ascertain the views of listeners on a new series of talks entitled "Clear Thinking." The series will consist of eleven talks which will be broadcast in the National programme on Tuesday evenings from 7.30 to 8 p.m., beginning on October 5th. The first nine will be given by Mr. R. W. Jepson, Headmaster of the Mercers' School, who will discuss such questions as thought grooves, sweeping statements, tabloid thinking and errors of reasoning. The last two talks will be broadcast by different speakers.

Listeners who are prepared to listen to, and express, their views on some if not all of these talks, are invited to send postcards marked "Clear Thinking" to the B.B.C., Broadcasting House, London, W.1, giving their names, addresses and occupations in block capitals. Listeners are asked to state their occupations in order that the panel may be made as representative as possible. Special forms will be issued, with reply-paid envelopes, to all members of the panel for them to express their views on the talks to which they listen.

A PAGE OF PRACTICAL HINTS

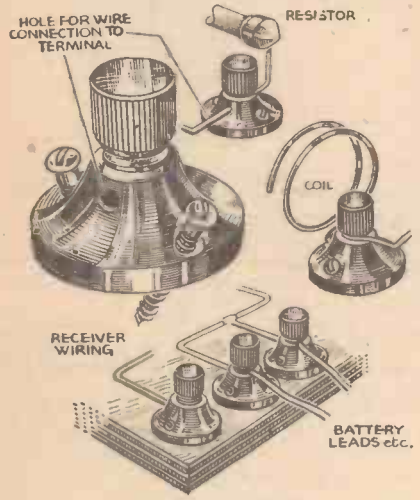
SUBMIT YOUR IDEA — **READERS WRINKLES** — THE HALF-GUINEA PAGE

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.

Improvised Terminal Mounts

THE accompanying sketches show how old-type screen-grid valve tops can be used as terminal mounts, short-wave coil mounts and wire-end resistor holders,



Neat terminal mounts made from old screen-grid valve tops.

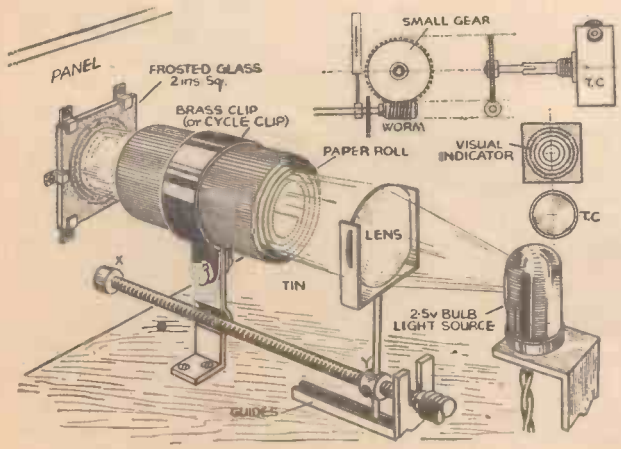
to allow for easy interchangeability. The valve tops are screwed in the positions required on top of the baseboard or chassis. —G. D. RANSOME (Brighton).

Visual Tone-control Indicator

THE attached sketch shows the principle of a "Target" visual tone-control indicator which I have just completed.

A roll of strong paper acts as the governing medium for the ray which is projected on to a ground glass screen or other suitable transparent viewing area.

If sharpening of the "spot" edge is required, this may be obtained by adding a further lens between the roll and the screen.



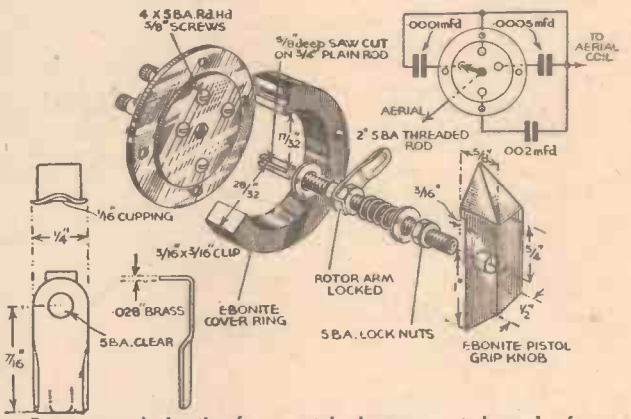
A novel visual tone-control indicator.

The movement of the lens, as shown, is effected by a threaded rod, and two bushes "X" and "Y," which are of brass, one (Y) being tapped to actuate the focusing lens, and the other (X) being untapped but soldered to the rod at the point of entry into the panel.

The worm gear was purchased with a suitable cog, and the finished job was very satisfactory.—M. E. BARTERSON (Axminster).

A Novel Aerial-selectivity Switch

CONSTRUCTIONAL details of a very compact and low capacity 4-point switch, constructed from a chassis-mounting valve socket, are shown in the accompanying sketch. The cathode (central) socket is utilised for the rotor: a 5 BA threaded rod 2in. long with a slotted shank fits into the socket and carries the rotating arm, which is locked upon the rod by two 5 BA lock nuts, and is kept pressed against the base by means of a small helical spring. The other end of this rod carries an ebonite pistol grip knob secured by a threaded hole and another lock-nut. A detail of the rotor arm is given, and also the diagram of the connection. An ebonite cover ring to exclude dirt, and serve as a distance piece, fits between the panel and the valve socket, being secured by four 5 BA screws. The remaining valve sockets are fitted with 5 BA round headed screws, while the existing terminal screws are retained for connection purposes. It may be added, as a point of interest, that the moulded type mica-dielectric condensers were actually secured by three of the four base and ring fixing screws.—WM. A. HARRISON (Aintree).



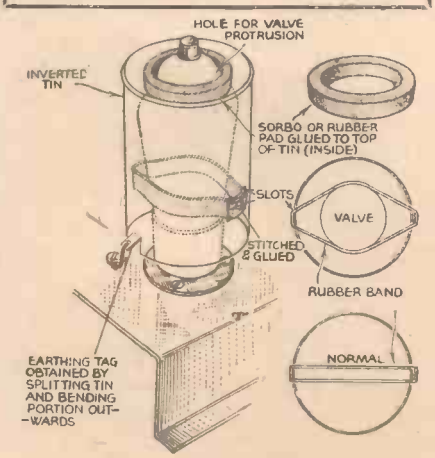
Constructional details of an aerial-selectivity switch made from a chassis-mounting valve holder.

A Valve Screen

A USEFUL valve screen may be constructed from a small tin, rubber band and sorbo pad obtained from a sorbo ball, or failing this a rubber washer. The assembly is simple to carry out and the finished job neat and efficient. The hole in the base of the tin may be tackled in many ways, for example, by the use of a piece of large diameter iron pipe with a chisel edge; drilling a number of holes, and cutting with the aid of a cold chisel, etc.

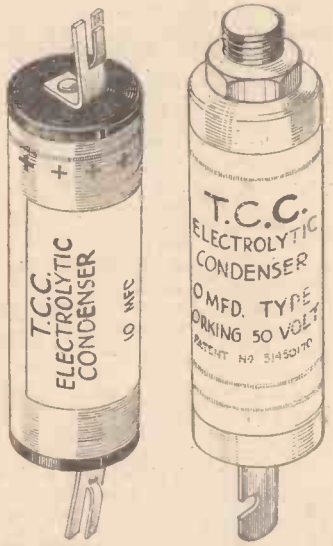
The rubber band should be rather taut in its normal position, as shown, being first cut then threaded through the four slots —also made with a chisel—then glued and stitched. The solder tag needs no explanation.—J. C. BENSON, Junior (London, E.10).

Free Blueprint of F. J. Camm's Corona All-wave 4 Next Week!

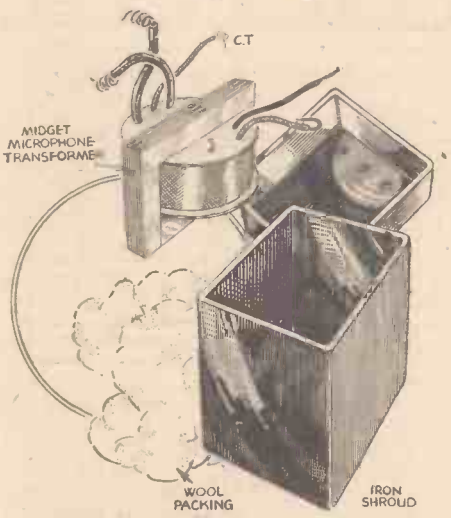


A simple but effective valve screen.

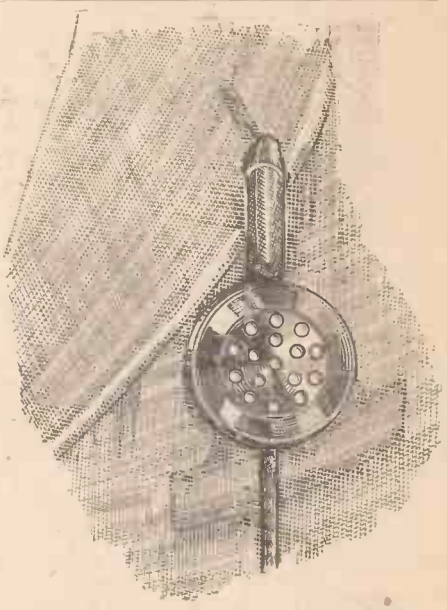
More Components Seen at Radiolympia



Two types of modern T.C.C. electrolytic condenser which facilitate constructional work. The model on the left may be suspended in the wiring, for which soldering tags are provided, and the right-hand model may be locked to a metal chassis for the negative connection, a lead being soldered to the tag for the positive connection.

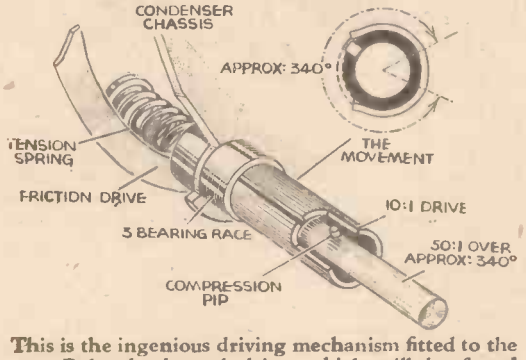


The Shaftesbury Microphone Transformer obtainable in a heavy-shrouded or an unshrouded pattern. It may be obtained to suit any particular characteristics, but standard models with 200- to 400- ohm primaries are most suitable for general use. It is designed for use with the velocity type microphone, and it will be noted that wool packing is employed to avoid vibration and other troubles.

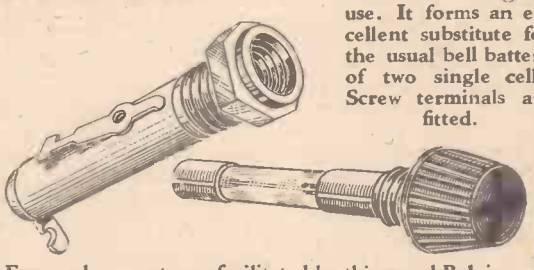


A useful lapel microphone supplied by Sound Sales. Only 1⅝in. in diameter and ¼in. deep this component costs £2 and does not have to be held near the mouth, but simply hangs as shown in this illustration. The wearer may turn about and speak completely unconscious of the mike, which will transmit his voice without fail in all circumstances.

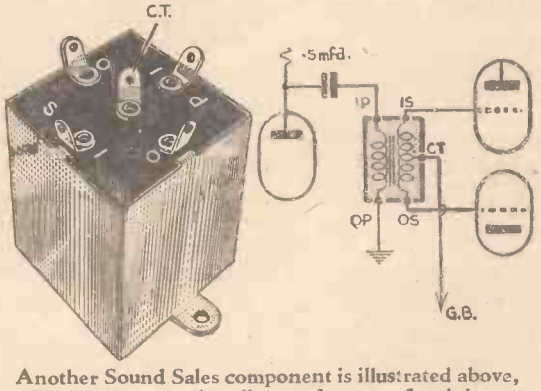
Constructors will find this neat little 3-volt Siemens cell of great use. It forms an excellent substitute for the usual bell battery of two single cells. Screw terminals are fitted.



This is the ingenious driving mechanism fitted to the new Polar horizontal drive, which will be found ideal for receivers employing all-wave tuning circuits.



Fuse replacements are facilitated by this novel Bulgin single-hole panel-mounting fuse holder. It takes standard 1¼in. cartridge fuses, and a blown fuse may be removed and a new one inserted in the minimum of time.



Another Sound Sales component is illustrated above, and this is a push-pull transformer of miniature dimensions. The size is approximately 1¼in. cube and the primary inductance is 80 henries. The frequency response is claimed to be remarkably wide and straight and it costs only 5s.

This Cosmocord pick-up has many novel features. The "exploded" view of the head shows the novel form taken by the magnet system, and the reed is completely undamped in the normal position. Ready response to transients is claimed and the pick-up delivers a very good quality of reproduction from modern records.

Practical Television

October 2nd, 1937. Vol. 3. No. 68.

IMAGE CONVERSION

EVERY month the science of electron optics becomes of increasing importance, and not the least of its applications is in the field of television. Many of the established laws of optics can, with suitable substitution of the symbols in the formulæ, be used direct in both the theory and practice of certain forms of television equipment. Take, for example, the Farnsworth image dissector tube, improved and developed later as a Baird Electron Camera. Here an optical image of the scene or object to be televised is focused on to the surface of a relatively large but quite uniform photo-electric cathode of high sensitivity. This has the effect of liberating electrons from the cathode at every point covered by the image in direct proportion to the degree of illumination at that point. The result is an "electron image" of photo-electrons at or very near the surface of the cathode, which corresponds exactly in electron density to the optical image.

In any normal photo-electric cell the emission of photo-electrons becomes quite diffused inside the glass container, but in the Electron Camera referred to the electron image is brought into a sharp focus in a plane parallel to the cathode, but at some distance removed from it. This is due to a very careful combination of both electro-magnetic and electrostatic fields. Naturally, the electron image is quite invisible, being composed of variations in electron density corresponding to the variations of illumination on the cathode. If, however, a fluorescent screen is placed in the plane of this image, it will become visible, and is the principle of the electron microscope, or image converter, referred to later.

The Path Traversed

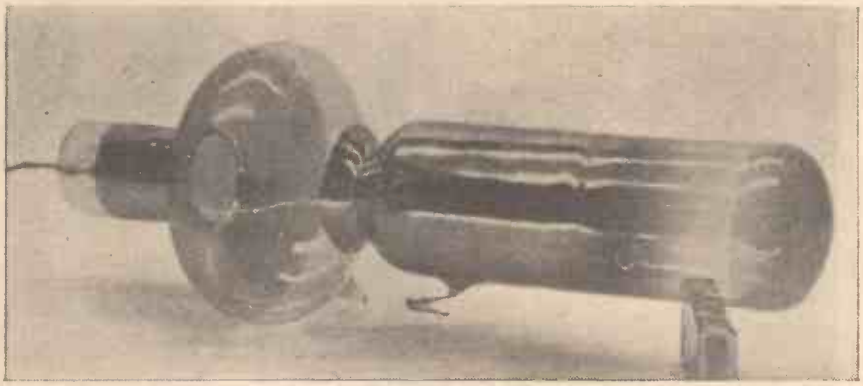
With the aid of mathematics it can be proved quite simply that the angular velocity of every electron which leaves the cathode surface is proportional to the magnetic field in which it moves and not to the component of motion. Under these circumstances, therefore, electrons with different initial velocities are made to describe circles of proportional radii, but they will nevertheless take the same time to describe a complete circle.

At the same time, however, the velocity component along the axis remains constant, and in consequence the actual paths of the electrons will be helices which are centred about the line of magnetic force passing through the point of origin. If the fields are, by design, made quite homogeneous, therefore, all the electrons will travel by different paths towards the plane of the scanning aperture. On arrival at that plane, however, they will all bear the same relative positions and velocities as they had at the instant of emission, with the result that they are in exact focus.

This same simple but important principle is utilised in the more modern device which has come to be known as the image converter. Its somewhat specialised application is in the observation of still or moving pictures or for the microscopic examination of minute organisms, and in the last-named case the instrument is called an electron microscope.

An Important Application

One form taken by the device is shown in the accompanying illustration of a Baird image converter. The photo-electric cathode, approximately the size of a penny, is accommodated in the short cylindrical glass section on the left-hand side, the appropriate connecting lead being brought out through a seal. The container then takes on an almost spherical shape of clear glass, this being joined to a long cylindrical portion at the end of which is the screen. The screen is composed of a special fine grain fluorescent powder bound to the interior of the glass face by a process which makes it impossible for any of the powder to flake off, and become deposited on the photo-electric cathode, an occurrence which would destroy the efficiency of the whole tube.



A simple form of Baird image converter.

The deposited metalising on the cylindrical tube can be seen very clearly, a contact lead being brought out so that a potential difference applied between cathode and metallising will provide the required degree of electrostatic field into which the electrons pass on their passage towards the fluorescent screen. The magnetic field is brought about by surrounding the long neck with a solenoidal coil. A direct current fed through this coil, and made variable between certain predetermined limits, gives the requisite focus to the final observed image.

Any object, picture or scene which is focused with the aid of an ordinary lens through the thin spherical glass wall of the tube on to the cathode will produce an optical image which in turn brings into being the electron image. The combination of the electrostatic and magnetic fields draws the image forward to the front screen and when focused magnetically a sharp, bright and clear picture may be observed as a result of the fluorescence brought about by the electronic bombardment at high velocity. For certain scientific examinations this image converter is admirably adapted, while the alteration of magnetic forces will enable any particular section of the image to be enlarged several times when such a course is desirable. One field in which this device is already proving of great value is that in which the examination of micro-organisms is necessary. The ordinary microscope is unsatisfactory since the organisms die when subjected to any form of intense light, or alternatively are suspended in a coloured fluid to make their presence more pronounced.

By flooding the organisms with infra-red light which is invisible and quite harmless to this form of small life, a clear bright picture will still be obtained by making the photo-electric cathode specially sensitive to the infra-red end of the spectrum. Any form of infra-red detection or examination can be undertaken on similar lines and the device is simple to handle and operate in even unskilled hands.

To prevent pin-cushion distortion on the rounded fluorescent screen face the cathode surface is made concave. By a careful attention to the degree of curvature the picture observed is then an accurate light replica of the scene or object undergoing examination. No doubt as the electronic art develops many other applications of image conversion will be found, although at the moment the most popular is that associated with television.

TELEVIEWS

The Radio Link

IT was a matter of great regret that the radio link which so far has proved so successful between the outside broadcast television van and the Alexandra Palace, failed to work satisfactorily for televising scenes of the recent air race round Britain. Between Hatfield and the B.B.C. station are one or two intervening hills and this may have provided quite an effective screening to the directional waves which are beamed from the site of the camera equipment to the receiving aerial surmounting the transmitting aerials at the Alexandra Palace tower. Then, again, it was known that some form of electrical interference was picked up by the television signal which ruined its quality. These are matters for very close investigation, for it is certain that the most popular items in any B.B.C. television programme are those associated with outside broadcasts. It stimulates public interest to a far greater degree than studio transmissions, and every effort is being made by the engineers to circumvent the difficulties with which they are faced in this connection. In any

case, it is gratifying to know that we are still well ahead of America in all forms of television activities. Mr. Sarnoff of the R.C.A. excuses this by saying that a new technique must be built up, and this must not be done in a hurry. Surely there is nothing better than a public service to expedite these matters. It is admitted quite frankly that in America the picture screens on the few receivers available to engineers are smaller than in this country, and still green in colour. No doubt the last named is in an effort to achieve satisfactory brightness, but in England the brightness problem has been solved satisfactorily with the more natural and popular black-and-white colour. Transmitting and synchronising difficulties which have already been solved in this country still present trouble in the U.S., but this may be due to the nature of the buildings peculiar to the big American cities. England has made a good start, as should be the case, for it is the birthplace of television through the genius of the pioneer Baird, and there is no reason why technically we should not keep ahead of the whole world.

A view of the Baird Stand at Radiolympia.

Repeater Station Design

ALTHOUGH the laying of the co-axial cable between London and Birmingham is now complete, and the run is being extended further North, television signals cannot be fed over it until the correct design of the repeater stations is finished. Due to the transmission losses at such high modulation frequencies it has been calculated that repeater points must be inserted at approximately eight-mile intervals. These thermionic valve amplifier junction points must relay the signals into the next section without phase or amplitude distortion, otherwise the signal would be ruined. The required degree of correction must be applied to compensate for losses and unbalanced frequency attenuation, and it is this problem which is now engaging the attention of Post Office research engineers. Another possibility which may arise concerns the erection of low-power relay stations on the route, so as to cover local but densely populated areas, and thus very materially extend the service area for the television signals. It is known that this and other factors of equal importance are engaging the attention of the Television Advisory Committee and the decisions, when made, will have a most marked bearing on the rapidity with which high definition television will extend to the provinces. The questions asked at Radiolympia proved beyond doubt that the population in the provinces are keen to take advantage of sight and sound transmissions, and manufacturing policy will expand rapidly once this market is opened.

This Standard Question

THE diversity of opinion as to which is the best picture definition standard for television transmission and reception is becoming even more marked now that the Germans have decided to use 441 lines interlaced with 50 frames, 25 complete pictures per second. Actually the difference between 441 and 405 lines is really too small to be noticed in picture quality and detail in the present stage of the art's development, but this is not the main concern of manufacturers. Receiver design will only become unnecessarily complicated if sets are to be suitable for reproducing pictures of two or three standards, as would be the case if the export market is to be considered. The early chaos of sound broadcasting due to lack of standardisation and an absence of international control should be a lesson to those charged with television's development. It should be a relatively easy matter to confer with the main European countries on this question. One of the difficulties concerns the picture frames per second, which at the moment corresponds with the National A.C. mains electricity supply frequency. While this is convenient it is not essential, and some standard should be set at the earliest possible moment. The problem of correct carrier frequency for the radiated television signals will also arise, particularly if the service range extends very materially. Border line interference will then have to be faced, and it is surely far better to anticipate these difficulties, and suggest immediate solutions, than to wait until they arise and then propound unsatisfactory palliatives which are not thoroughly acceptable to any party concerned.

PROGRAMME FEATURES

North London Exhibition

ONE of the first outside broadcasts by high-definition television nearly a year ago will be repeated when the cameras range the North London Exhibition in Alexandra Palace on Wednesday, October 13th. The feature will be included in the afternoon and evening editions of Picture Page, the television topical magazine.

The North London Exhibition brings housewives and many of their men folk from all over London to see the latest household utensils and labour-saving devices. Television cameras will visit the cabaret show with glimpses of the Dress Parades.

"Carnaval"

MEMBERS of the Vic-Wells Ballet Company will visit Alexandra Palace on October 11th for an afternoon and evening performance of Schumann's "Carnaval," arranged as a ballet by Michael Fokine, with orchestration by Gordon Jacobs. It is hoped that all the leading members of the famous Vic-Wells Company will be present, including Elizabeth Miller, Ursula Moreton, Mary Honer, Joy Newton, Harold Turner, Frederick Ashton, William Chappell, Claude Newman and Robert Helpman.

The B.B.C. Television Orchestra will be conducted by Hyam Greenbaum.

NEW RADIO RELAY RECEIVER

THE employment of central radio receiving and amplifying equipment for feeding a large number of loudspeakers has increased considerably in the past few years, the demand coming mostly from hospitals, blocks of modern flats, schools and other such institutions. Sometimes even a whole town and its surrounding country require a receiver which can relay programmes to loudspeakers fitted in private houses.

Distant and foreign stations do not often figure in relay operators' programmes because they cannot be tuned-in at sufficient strength and consistency of volume to make them really entertaining. These disadvantages are overcome by a new radio unit built by the General Electric Company to fulfil multiple-speaker relay requirements.

The receiver employs a 9-valve superheterodyne circuit with no fewer than 17 tuned circuits. Four tuned circuits precede the first detector, and the automatic volume control is so effective that an input variation of 40 d.b. is reduced to 3.5 d.b. in the output. This means that a weak station from a distant part of the world can be received and maintained at an even strength.

Good signal strength is ensured to listeners by a special sensitivity control incorporated in the circuit which automatically measures the volume of a station. If the station is not strong enough to provide good listening it is "rejected," but if its signal strength is sufficient, then it is "accepted."

This sensitivity control is adjustable and can be set so that the range of the receiver is brought down to 20 or thirty stations, all of which are transmitted from strong signals. The designers have incorporated a kind of "traffic light" control so that a station providing a programme which can be relayed at full loudspeaker strength causes a green light to flash. This light remains on as long as the station is in tune. When the set is tuned-in to a weak signal or where no programme is receivable, the red light warns the operator.

INTRODUCING

F. J. Camm's All-wave "Corona" Four

Preliminary Details of a New Four-valve Battery Receiver Employing the Latest Three-range Coils

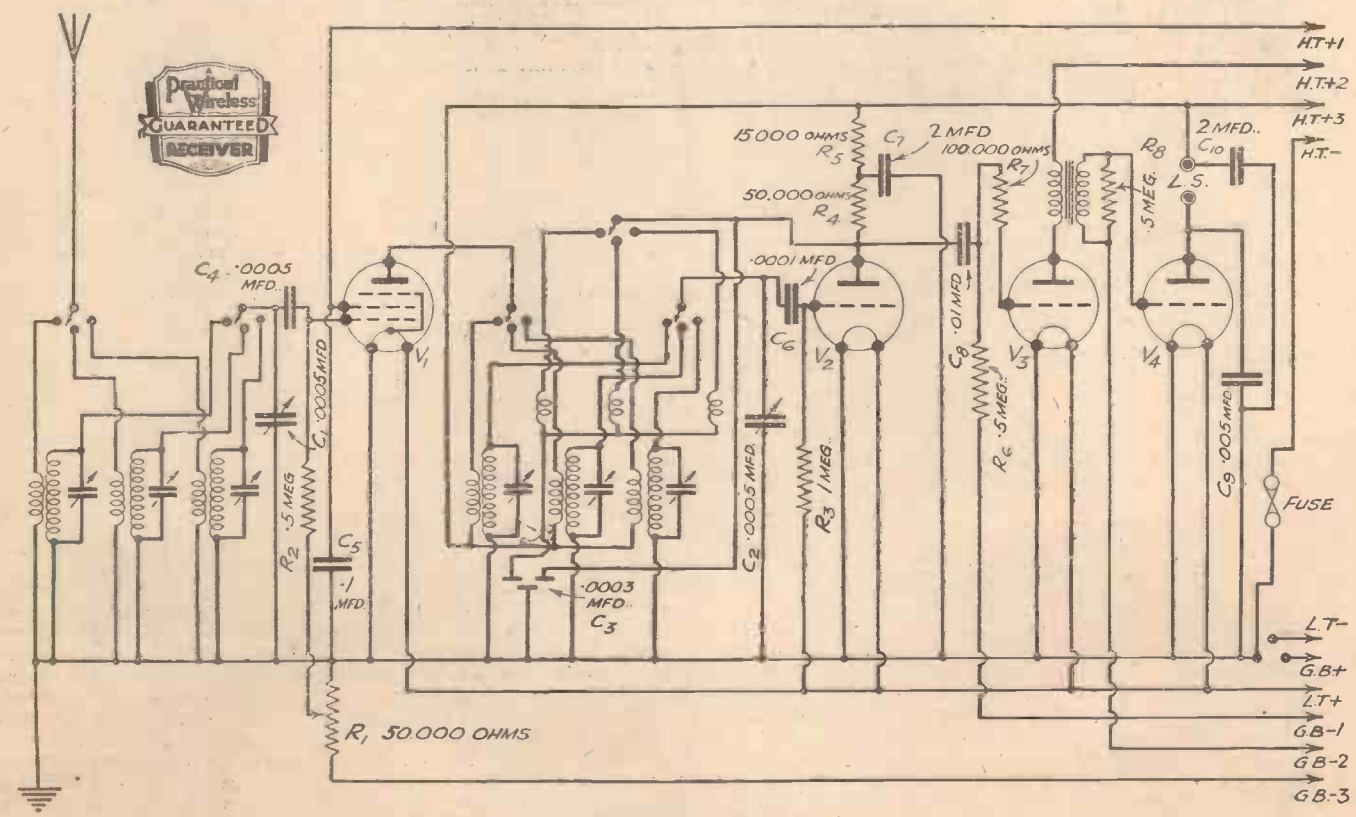
LAST year I described a four-valve receiver designed for all-wave reception, in which a standard dual-range coil was combined with a special short-wave tuner to provide the necessary tuning range. Thousands of readers built this receiver and found that it provided all they required in the way of range and volume. Many readers have also built one or other of the all-wave receivers which were described in our recent Show numbers, but require something more powerful, designed on the lines of the Limit. Accordingly, I introduce this week a four-valve receiver in which the latest Wearite coils are featured, and thus construction is simpler than in the Limit, whilst the main advantages of the new all-wave coils are provided. The theoretical circuit diagram is given below, and it will be seen that there is nothing extraordinary about it, but a well-tried and proven arrangement has been adopted with the multi-range coils designed to provide maximum results on all bands. The H.F. stage utilises a standard H.F. pentode valve whilst the coupling between the detector (a triode) and the first L.F. stage is carried out by a resistance-capacity unit and is also decoupled to ensure stability. An L.F. transformer is included in the anode circuit of the first L.F. valve and feeds the output valve.

Valve Types

A great deal of controversy exists regarding the best valve types for various circuit arrangements, and we have dealt in the past with the advantages of the pentode over the triode and the best type of output stage. After analysing the many hundreds of letters which have been received from listeners, I have come to the conclusion that the triode valve is most popular for an output stage and accordingly have used this in preference to a pentode in this particular receiver. Many constructors prefer a tetrode or even a pentode for a grid detector, and although there are certainly some advantages to be gained from this type of valve, they are very often off-set by various snags. The critical setting of the S.G. voltage is not the least of these, and I have found that in many home-made receivers in which this type of detector has been used, the average results are not superior to those given by a good triode. Thus, the final arrangement of the valves in the "Corona" receiver has been H.F. pentode, followed by three triodes. The mixed L.F. couplings will ensure that the quality on the normal broadcast bands is as good as can be obtained with ordinary battery circuits, and at the same time those short-wave broadcast stations which are received at suitable volume will also provide a reasonably good quality signal on the loudspeaker.

Self-contained Switching

The main advantage of the new coils is that the switching is self-contained and is ready wired by the makers. Consequently efficiency will not be reduced due to losses in wiring.



Theoretical circuit of the "Corona" receiver.

CIRCUITS A

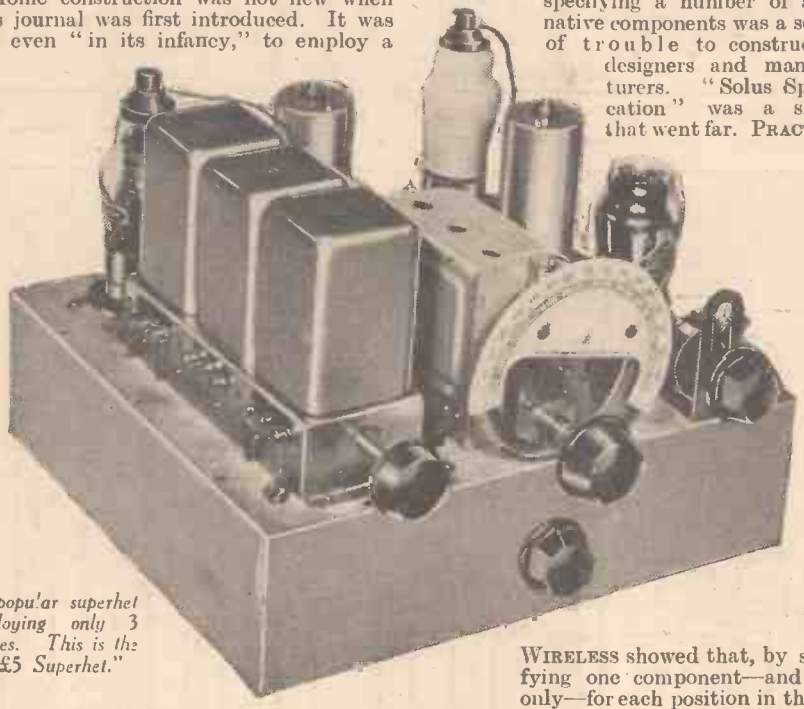
THROUGH THE LA

A Very Brief Review of the Changes that Have Receivers which have been Fully Described in

One of our most popular early receivers, employing 2 H.F. stages—"The Fury Four."

FIVE years ago—on September 24th, 1932, to be exact—the first issue of PRACTICAL WIRELESS was on sale. Despite the fact that an extremely large print order had been placed, it was out of sale within a few hours; reprint copies were rushed through, and they were sold out. The process was repeated, but reprinting could not proceed indefinitely—after all, Number Two of a new home-constructor's journal had to be produced.

Home construction was not new when this journal was first introduced. It was not even "in its infancy," to employ a much over-worked and inapplicable cliché. In fact, one might have said that home construction had gained a firm hold on the wireless public. Nevertheless, it remained for PRACTICAL WIRELESS to show the real meaning of home construction, and the new periodical did that in no uncertain manner. It is no exaggeration to say that the number of home constructors increased at a very rapid rate after the introduction of the new stimulus.



A popular superhet employing only 3 valves. This is the "£5 Superhet."

New Policy

Perhaps it would be presumptuous to claim that home set building would never have attained the popularity that it now holds, had it not been for PRACTICAL WIRELESS, but no one can deny that this journal did more than did anything else to foster the spirit of radio construction and experiment. And there is no secret about the reason for this; it was the novel and powerful policy behind the paper. The editor proved to constructors that the erstwhile general method of using a baseboard to carry the main components was wrong in principle and in fact. He also demonstrated that the previous idea of specifying a number of alternative components was a source of trouble to constructors, designers and manufacturers. "Solus Specification" was a slogan that went far. PRACTICAL WIRELESS showed that, by specifying one component—and one only—for each position in the circuit of a new set, the constructor could duplicate the instrument originally produced in our laboratories. This journal went further than that and said: "If, after building the receiver exactly to specification, you fail to obtain the results claimed, we will service that receiver free of charge." No other journal, before or since, has ever made such a bold offer. That is one reason why the readership of this journal has gone from strength to strength; why it has to-day a larger number of readers than any other publication in its field.

Those original ideas, that original policy, have stood the test of five years; and that is a long time in a growing hobby such as wireless. The fact that the policy to-day remains unchanged is ample justification for it.

The statements that have just been made are taken for granted by old and regular readers, but it is necessary to remind newer readers—and there are new readers every week—of the unique facilities that we still offer to home constructors throughout Great Britain, and in every part of the British Empire.

An ideal 3-valver for the b Three," descr

Design in 1932

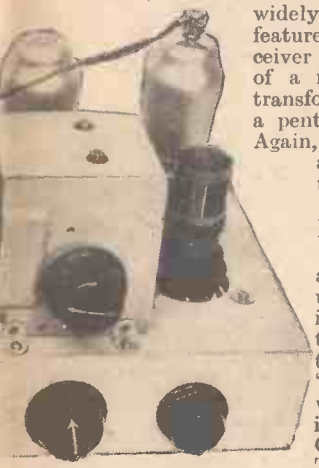
It is interesting now to look back on the position of home construction, and of wireless set design, five years ago. At that time, the variable-mu valve was in the way of a novelty. Notwithstanding

An all-wave three for mains use, described last year. This is the "Mains Record Three."

ND SETS

ST FIVE YEARS

e Been Made, and of a Few of the 80-Odd
n these Pages - - By FRANK PRESTON



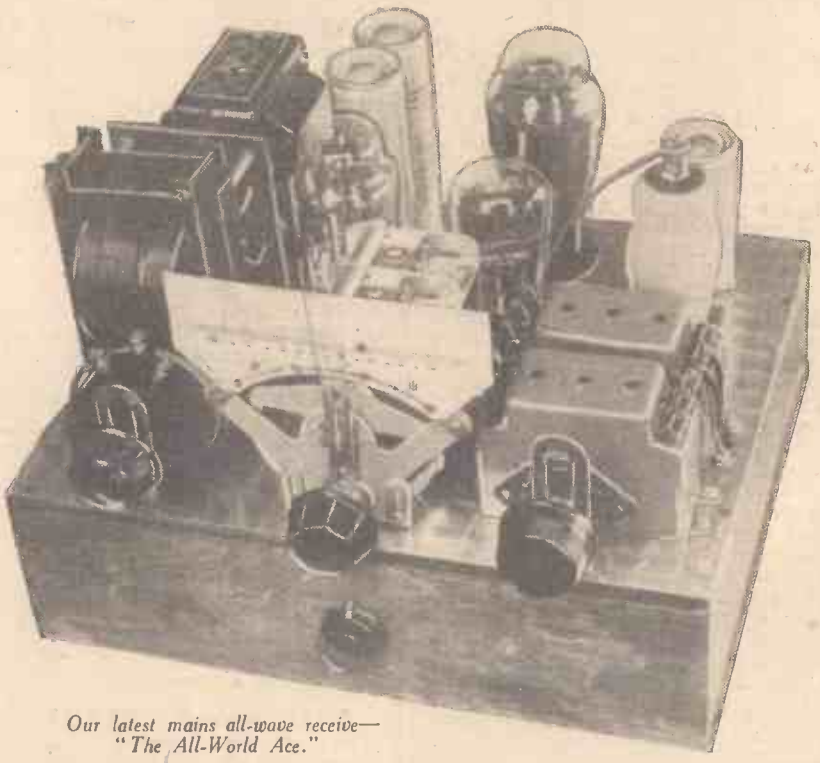
eginner, "The Hall-Mark ibed in 1934.

that, it was used with complete success in the first receiver to be described in this journal: the "Long Range Express Three." That receiver was built on a metal chassis, in a form that has since been widely copied. Another feature of the same receiver was the inclusion of a resistance-fed L.F. transformer, feeding into a pentode output valve. Again, the design was almost ahead of its time.

Early Midgets

Midget receivers are often looked upon as being novel in 1937, but a three-valve set of this kind, the "Bijou Three," was fully described in this journal dated October 29th, 1932. Then, on December 7th, 1932, we described a midget two-valve receiver measuring 4in. cube, inclusive of the containing case. Even to-day it would not be easy to produce a much smaller efficient receiver.

But battery sets did not occupy the whole of our attention, for mains versions of most of the larger models were dealt with, and made successfully by a number of readers who had previously thought that the construction of this type of set was well beyond their ability. The "Mains Express Three," for example, was described in the issue dated October 8th, 1932.



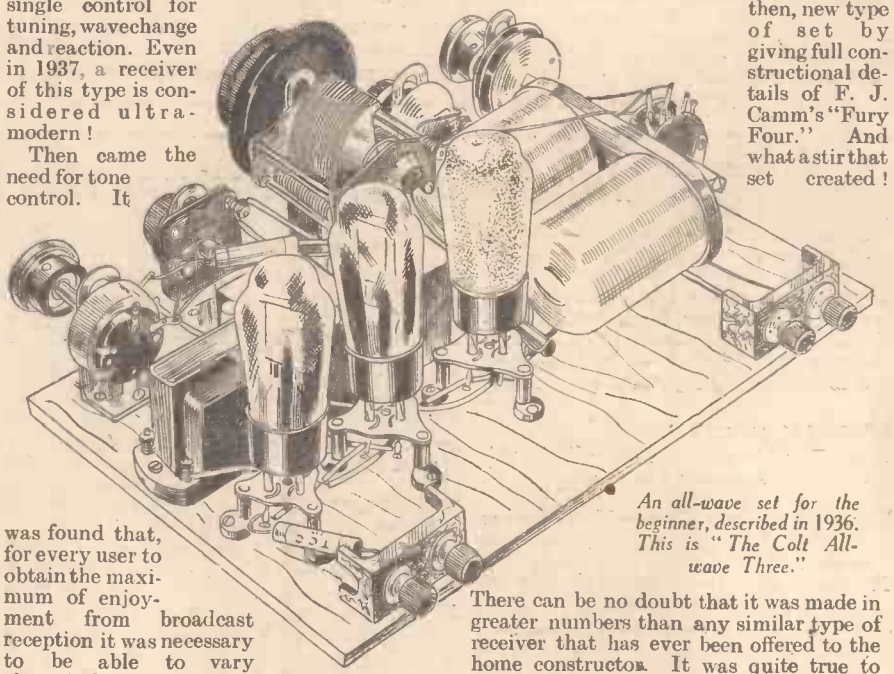
Our latest mains all-wave receive— "The All-World Ace."

In the same year there was a growing desire for simplified tuning controls; the "Solo-Knob Three," described in December, was the practical reply. There was a single control for tuning, wavechange and reaction. Even in 1937, a receiver of this type is considered ultra-modern!

Then came the need for tone control. It was found that, for every user to obtain the maximum of enjoyment from broadcast reception it was necessary to be able to vary the pitch or tone of reproduction to suit the room, loudspeaker and individual likes. That was why the "Selectone" Det.-L.F.-P. receiver was designed and described. It marked the beginning of a new era. It was followed by what was probably the first table-model, two-valve radio-gram, the "Selectone A.C. Radio-gram."; this also had a tone control.

Famous "Fury"

By the beginning of 1933 the selectivity problem was becoming acute. A rapid increase in the number of stations operating on the broadcast bands, as well as increased powers, made it essential for any long-range receiver to tune sharply. PRACTICAL WIRELESS anticipated the demand for the, then, new type of set by giving full constructional details of F. J. Camm's "Fury Four." And what a stir that set created!



An all-wave set for the beginner, described in 1936. This is "The Colt All-wave Three."

There can be no doubt that it was made in greater numbers than any similar type of receiver that has ever been offered to the home constructor. It was quite true to say that "everybody's making it." Two highly-efficient and highly-sensitive H.F. valves coupled to a triode detector, feeding into a pentode output valve, briefly summarises the circuit.

The "Fury" was tested all over the country by all kinds of people; all gave it the same unstinted praise. To use a

(Continued overleaf)

CIRCUITS AND SETS THROUGH THE LAST FIVE YEARS

(*Continued from previous page*)

rather vulgar Americanism, it was a "wow." So much so that A.C., D.C. and radio-gram versions simply had to be produced. A year later, constructors were still clamouring for constructional details. But as all of the original copies of the constructional article were out of print, Mr. Camm produced the "Fury Super"—a slightly-modified version which included the then new iron-cored tuning coils.

An Eminent Portable

Class B and Q.P.P. were being introduced. This journal published first details of a complete Class B amplifier, and then the famous "Featherweight Portable," with Class B output. This was the most outstanding portable set of the age—compact, extremely light in weight, and capable of giving a larger output than had hitherto been thought possible with a portable.

Then there was the "Ferrocart Q.P.P. Hi-Mag Three," with iron core tuning coils and Q.P.P. output—another practical novelty that attained remarkable success.

But we must not forget the part that PRACTICAL WIRELESS played in the short-wave field, which it has always pioneered. The "Empire Short-wave Three" took the short-wave constructor field by storm. Advanced in design, simple in construction and use, it gave a new interest to short-wave reception and experiment.

All-waves in 1933

All-wave reception was thought about, but manufacturers of complete receivers had not produced an instrument that was considered satisfactory for general marketing. Nevertheless, the "All-Wave Two," described in our Radiolympia issue of 1933 gave practical proof of the possibilities of all-wave reception at low cost. It was followed later by such receivers as the "All-Wave Unipen" the "All-Wave Three," "A.C. All-Wave Three" and many others, including the "Limit All-Wave Four," described as recently as September, 1936, and the latest all-wave designs detailed in this year's Radiolympia numbers.

The £5 Superhet

During 1934 the superhet was regaining the popularity which it had held some years previously, but it was generally considered too complicated and too expensive for the average constructor. This journal showed that an efficient superhet need not be complicated or expensive; moreover, it proved that a large number of valves was by no means essential for excellent results. The "£5 Superhet Three" was the first really efficient superhet at anything approaching its price. So efficient did its pentagrid-I.F.-metal rectifier-pentode circuit prove to be, and so selective, that even to-day there is nothing of its kind to beat it.

Inexpensive Quality

"Quality" reproduction has always been in demand, and always will be, but it was left to PRACTICAL WIRELESS to produce an A.C./D.C. four-valve receiver of the "quality" class capable of giving over 5 watts output, and costing little more than a normal four-valve set. Thus was the "Universal Hall-Mark" designed and described at the beginning of 1935. It was not heralded as a super-selective, long-range receiver, but it has always lived up to its reputation of being one of the cheapest and most reliable "quality" sets for the home constructor.

The question of cost always arises, and nobody appreciates that fact more keenly than does the editor of this journal. That is why, more than three years ago, we started a "price war"—a war (although that is not quite the right word) that has been fiercely waged ever since, in the interests of home constructors. It is this which explains why PRACTICAL WIRELESS receivers can always be built more cheaply than those of a similar nature sponsored by competitors. It also, in a large measure, explains why this journal has always had the strong support and close co-operation of every one of its thousands of readers.

A Set For You

It has been possible to mention only a very small percentage of the 80-odd receivers which have been described in this journal since that memorable September of 1932, but every reader will appreciate that among the many blueprints and back numbers still available there is a set for everybody.

Every week you will find a list of issues and blueprints that are still available. You can take your choice, and if you require any advice regarding the type of set most suitable for your needs, you have only to write to the Technical Staff, whose services are at your disposal free of all charge.

Important Broadcasts of the Week

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

Wednesday, September 29th.—The Company of Heaven, a programme devised for Michaelmas, by R. Ellis Roberts.
Thursday, September 30th.—The Peaslake Crash, a radio play, by Lance Sieveking.
Friday, October 1st.—Palace of Varieties.
Saturday, October 2nd.—Last Promenade of the Season, from Queen's Hall, London.

REGIONAL (*342.1 m.*)

Wednesday, September 29th.—Promenade Concert: Brahms; from Queen's Hall, London.
Thursday, September 30th.—More Mexican Music, a programme of gramophone records.
Friday, October 1st.—Promenade Concert, from Queen's Hall, London.
Saturday, October 2nd.—Music Hall programme.

MIDLAND (*296.2 m.*)

Wednesday, September 29th.—A recital by members of the B.B.C. Midland Orchestra.
Thursday, September 30th.—Band concert.
Friday, October 1st.—Choral programme.
Saturday, October 2nd.—A Border Journey, programme devised by Robin Whitworth.

WEST OF ENGLAND (*285.7 m.*)

Wednesday, September 29th.—Variety programme from the Palace Theatre, Plymouth.
Thursday, September 30th.—Farewell to Summer.
Friday, October 1st.—Forecast of West of England programmes for the next three months.
Saturday, October 2nd.—Western Salon, from Marston Court.

WELSH (*373.1 m.*)

Wednesday, September 29th.—Concert Party programme from Colwyn Bay.
Thursday, September 30th.—Men of Harlech, a dramatic feature.
Friday, October 1st.—Speeches from the Civic Reception and Dinner held at the Guildhall, Swansea, to celebrate the opening of the new Swansea studios.
Saturday, October 2nd.—Commentary on the final of the Men's Singles Championship in the 44th Covered Tennis Courts Championships.

NORTHERN (*449.1 m.*)

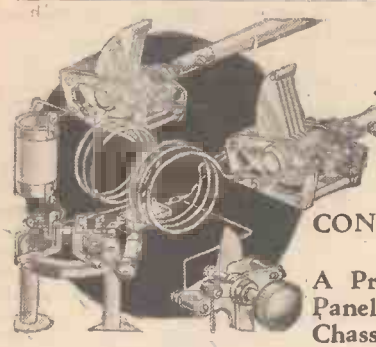
Wednesday, September 29th.—Promenade Concert from Queen's Hall, London.
Thursday, September 30th.—Northern Notions programme.
Friday, October 1st.—North Country Farming, a talk.
Saturday, October 2nd.—The Swearing-in of Vice-Admiral William Spencer Leveson-Gower as Lieutenant-Governor of the Isle of Man.

SCOTTISH (*391.1 m.*)

Wednesday, September 29th.—Variety programme from the New Metropole Theatre, Glasgow.
Thursday, September 30th.—The Mod of the Highland Association Ceilidh.
Friday, October 1st.—Organ recital from Glasgow Cathedral.
Saturday, October 2nd.—Landings at Lossiemouth, a programme of the Fishing Industry, from the Quayside, the Fish Market and a Fisherman's House in Lossiemouth.

NORTHERN IRELAND (*307.1 m.*)

Wednesday, September 29th.—A Ballad concert.
Thursday, September 30th.—Northern Ireland Regional Director's Talk.
Friday, October 1st.—The Future of Ulster Agriculture, a talk.
Saturday, October 2nd.—Orchestral concert from the Ulster Hall, Belfast.



Short Wave Section

CONSTRUCTIONAL HINTS FOR SHORT-WAVE EXPERIMENTERS.

A Practical Article Dealing With the Uses of Panel Brackets, Screening Arrangements and Chassis Construction. By A. W. MANN

IT is common practice amongst short-wave enthusiasts nowadays to use components which are electrically and mechanically sound. In some instances, however, what would otherwise be a most satisfactory receiver is spoilt by a mechanical defect which with a little forethought could have been avoided.

Let us take, for example, panel brackets, and chassis, baseboard and panel assembly

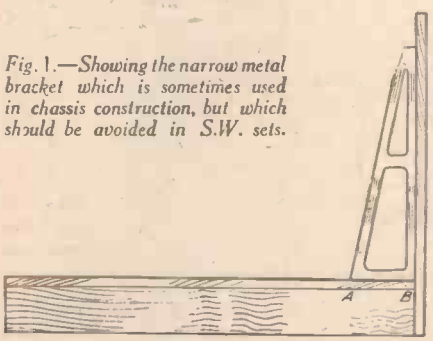


Fig. 1.—Showing the narrow metal bracket which is sometimes used in chassis construction, but which should be avoided in S.W. sets.

arrangements as used by home constructors. In some instances metal brackets with a very narrow base or foot, which are usually relics of an early broadcast receiver, are used to support the panel of the new short-wave receiver. A bracket of the type mentioned is shown in Fig. 1.

When this type of bracket is used, a rigid panel and chassis assembly can hardly be expected, and it is found in practice where a cabinet is not used to provide additional support, that even though components are mechanically free from noise during operation, and all connections soundly made, noises in the headphones or speaker are experienced due to panel movement setting up microphonic noises inside the valves used in the receiver.

If sheet metal brackets are used, the width of foot, as shown at A—B in Fig. 1, should be at least 3 to 3½ins., and the chassis or baseboard should be of strong plywood of reasonable thickness, and free from whip.

Sometimes the method illustrated in Fig. 2 is favoured, and at first sight may appear fundamentally sound. Whilst granting that it provides a firmer support to the top edge of the panel, the fact that this type of bracket does not act as a batten across the width of the panel should not be overlooked. Fig. 2 (C to D) illustrates this point.

As a result, especially where plywood panels are used, warping takes place, and the fixing nuts of tuning condensers, switches, etc., are bearing up against a

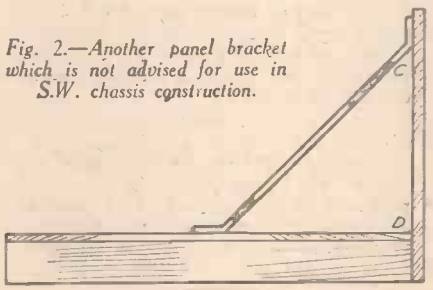


Fig. 2.—Another panel bracket which is not advised for use in S.W. chassis construction.

slightly radiused surface, instead of one which is perfectly flat.

Under the circumstances, to tighten components firmly in position is impossible, and to fit separate tuning dials properly and assure smooth operation is equally impossible. In time, both condensers and dials loosen, causing faulty connections and ruining the calibration of the receiver.

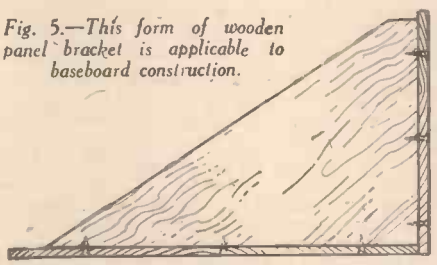


Fig. 5.—This form of wooden panel bracket is applicable to baseboard construction.

Using Wooden Panel Brackets

There are two methods of construction which may be applied to chassis and baseboard assemblies, which will ensure rigidity, and are to be specially recommended for adoption by experimenters who do not enclose their receivers in a suitable cabinet. They are shown in Figs. 3 and 5.

Let us consider first of all that shown in Fig. 3. The wood used should be free from shakes and knots, and the bracket marked out so that the grain runs as shown in Fig. 3, so as to avoid splitting the wood. A thickness of ⅜in. will be quite satisfactory. Let us pass for a moment to Fig. 4, which shows the chassis face, E and F, stepped back and cut away to the width and thickness of the bracket foot. The width should be about 2½ins. to 3ins. It will also be noted that the end runners, fitted on the underside, are set back with the sides level with the edges of the stepped or cut back portions of the chassis.

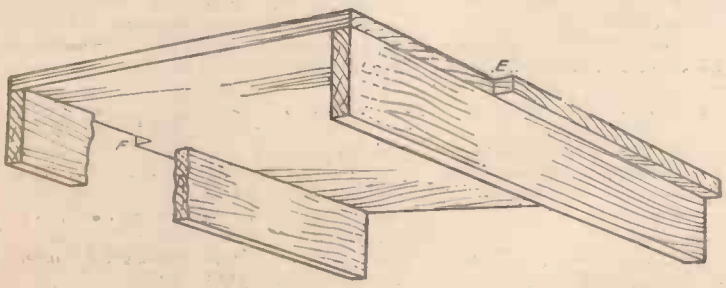


Fig. 4.—Showing how the chassis face is stepped back to accommodate the ends of the brackets.

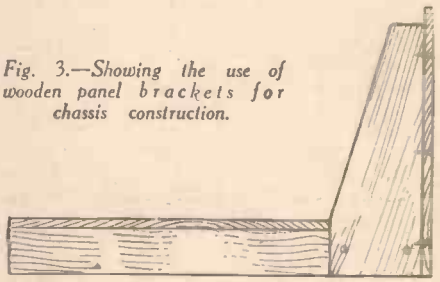


Fig. 3.—Showing the use of wooden panel brackets for chassis construction.

Fig. 5 shows another method worthy of attention, and applicable to baseboard construction, the run of the grain, as in the previous example, being of equal importance.

Cabinet Construction

In some instances experimenters build first-class short-wave receivers, yet fight shy of cabinet construction due to a limited number of woodworking tools, and an idea that cabinet construction is a little beyond their constructional abilities.

It is possible to design a simple or multi-stage short-wave receiver, together with a suitable cabinet, as a complete unit. This applies equally to the all-wave tuner and plug-in coil types. It is the latter with which we are concerned in this article.

The type of cabinet usually associated with a plug-in coil type receiver has of necessity a hinged lid to facilitate coil changing.

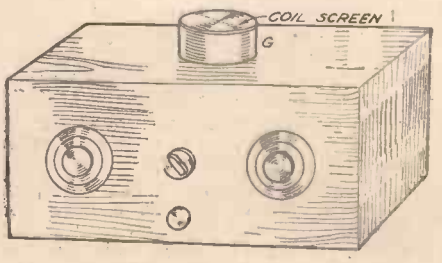
To those who find the construction of this type cabinet difficult, the example shown in Fig. 6 will be of interest.

The cabinet is of simple box construction with a solid top, the tuning-coil base employed in the set being mounted in the centre of the baseboard, or chassis, and supported on pillars or lengths of ebonite rod.

In the centre of the cabinet top, a clearance hole is cut, which will allow the coil to be inserted without difficulty as the height of the coil-holder is sufficient to allow the coil to stand about one inch above the cabinet-top. A standard coil-screen is cut down in height, the centre of the flanged base is cut away to a diameter equalling that of the hole in the top of the cabinet, and the complete coil screen and flanged base are mounted as shown at G, Fig. 6.

Fig. 7 shows the general arrangement in

(Continued overleaf)



No. 6.—A novel form of cabinet construction for an S.W. receiver.

SHORT-WAVE SECTION

Continued from previous page)

detail. There is, however, one important point which should not be overlooked; the diameter of the coil screen should be sufficient to allow at least ½in. clearance between the coil former, and the height sufficient to allow an equal clearance between the top face of the same and the inside of the screen, in order to avoid the possibilities of undue damping.

Screening Arrangements

There are various methods of applying screening to short-wave receivers, both elaborate and simple. The usual methods employed by experimenters are to use a foil-lined or metal chassis together with a metal panel, or build a completely screened receiver in a metal screening-box.

For those who wish to break fresh ground, and who are skilled in the use of metal-working tools, the example shown in Fig. 8

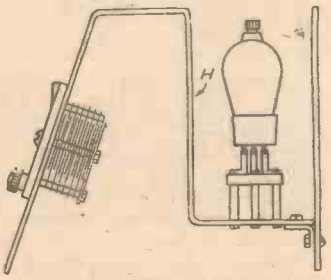


Fig. 8.—A novel form of chassis construction.

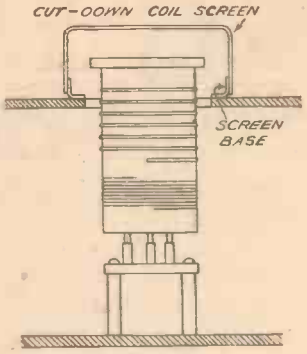


Fig. 7.—General arrangement of the coil screen shown at G, Fig. 6.

will prove of interest. The general idea is by no means new, but is, nevertheless, a most efficient method of screening as applied to short-wave receiver construction.

It will be noted, for instance, that by adopting this method of construction, the possibilities of hand-capacity effects being experienced are, other things being equal, reduced to a minimum, due to the fact that the centre portion, shown at H, acts as an efficient sub-panel.

The tuning condensers are mounted directly on the main panel, whilst the tuning coil and valves are mounted within the centre portion. An R.C.C. unit or midget L.F. transformer, fixed condensers etc., can be arranged underneath the chassis.

When a chassis and screening arrangement of this form are used, it is absolutely necessary to use stout-gauge aluminium sheet, or, better still, cadmium-plated steel, and enclose the whole in a specially constructed cabinet in order to avoid whip when operating the receiver.

Fig. 9 shows a more simple variation, which, nevertheless, has definite advantages and can be carried out at comparatively low cost. In this instance also the advisability of using stout-gauge material is also stressed.

So far as the majority of constructors are concerned, the purpose of experimental short-wave receiver construction is to find a combination of circuit, layout and general construction which will assure stability, ease of operation and improved efficiency, and the ideas outlined in this article are well worthy of consideration as contributory factors to the aforementioned results.

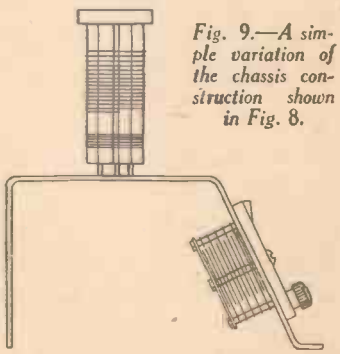


Fig. 9.—A simple variation of the chassis construction shown in Fig. 8.

Leaves from a Short-wave Log

Is it a Coincidence?

ON a wavelength tallying within a hair's breadth of that of Moscow on 25 m., you will find nightly a station broadcasting two melodies incessantly, namely, "Ramona" and "Hallelujah." No call is given during, before or after the transmission. The broadcast is usually carried out when the Moscow station gives its news bulletins and talks in the German language. The station remains a mystery one to numbers of listeners who are anxious to identify it.

Clearing up the Cuban Short-wavers

In view of the large number of Havana stations on the air nightly the following details may prove of use to interested log-keepers: COBC, giving the address: Apartado Postal 132, Havana (Cuba) and working on 32.22 m. (9.31 mc/s) relays CMBC, a medium-wave station working on 309.3 m. (970 kc/s). The slogan is: *El Progreso Cubano.* It is on the ether every night from G.M.T. 22.00 until 02.00 and sometimes to a later hour, works in a network with COCO, Havana, and gives its call every 15 minutes.

COBZ, Havana, of which the last letter of the call is given as *Zee* thus causing confusion with the above, operates on 33.32 m. (9.03 mc/s), and relays the programmes of CMBZ, *Radio Sallas*, in the Cuban capital. It broadcasts daily from G.M.T. 12.00-05.00 giving four chimes as an interval signal. Two addresses have been announced, namely, Radioemisora COBZ, San Rafael, 14, which appears to be that of the studio providing the radio entertainment to both transmitters, and Apartado Postal 866, Havana, Cuba, or the Post Office Box to which reports on reception should be sent. It is an easy matter to log this broadcaster as the channel is almost immediately below that of FVA, Algiers (Nth. Africa) (8.96 mc/s), of which the signal can be picked up at great strength any evening.

COCW, another short-waver in Havana styling itself *La Voz de los Antillas* or *Radio Philco* is now on 47.39 m. (6.33 mc/s); it relays the broadcasts of CMW, also uses three chimes between items, announces frequently in English, and works until the early morning hours having been logged as late as G.M.T. 06.00. Address: Apartado Postal, 130, Havana (Cuba).

Slightly above EAQ1, Madrid *La Voz de España*, or on 30.47 m. (9.845 mc/s), you should find a lesser heard station, namely, COCM, Havana. No particular identification signal has been noted to date except that the call CMCM is frequently mentioned in announcements. Address: Apartado Postal 33, Havana (Cuba).

A Call from Bangkok

The 20 kW Siamese station HS8PJ, located at Saladeng near the capital, is still of an experimental nature and broadcasts are only made twice weekly, from G.M.T. 13.00-15.00. On Mondays the channel used is 15.77 m. (19.02 mc/s) and on Thursdays, 32.09 m. (9.35 mc/s). Announcements are given out in Siamese, English, French, Spanish, and Dutch. Interval signal: three chimes (ascending scale), consisting of notes: *soh-doh-me-doh-me-soh-me.* Local time is G.M.T. plus seven hours. An earnest request has been made for reception reports which should be addressed to: Government Posts and Telegraphs, Radio Technical Section, Bangkok (Siam).

Schooner "Effie Morrissey"

W10XDA, is the call sign of the U.S.A. schooner now in the Arctic Circle off the coast of Greenland. The transmitter in use has a power of 150 watts, and messages are broadcast nightly between G.M.T. 00.30 and 02.00 on 21.06 m. (14.25 mc/s) and 20.18 m. (14.867 mc/s).

Tokio's Short-wave Entertainments

In addition to the news bulletins nightly broadcast through JZK, on 19.79 m. (15.16 mc/s) and JZJ, 25.42 m. (11.8 mc/s) at G.M.T. 20.00 the Japanese Broadcasting Corporation brings to its overseas listeners interesting musical entertainments provided by native singers and instrumentalists. You may hear soli by celebrated geishas, recitals on the *shakuhachi*, a species of bamboo flute, or on the *samisen*, resembling a zither, and occasionally a "brass" concert given by the Toyama Military Band. Talks on Japanese life and activities are broadcast at frequent intervals during the month.

Press Wireless Incorporated

W2XGB, a transmitter situated at Hicksville (Long Island, New York), U.S.A. may be picked up daily (except Saturdays and Sundays) between G.M.T. 15.00-19.00, giving both speech and music on 17.33 m. (17.31 mc/s). Occasionally a relay is carried out of a radio programme broadcast by WOR, Newark, one of the main stations of the Mutual Broadcasting System.

ITEMS OF INTEREST

The Leeds Festival

THE B.B.C. announces that the first part of the concert which opens the Leeds Festival on October 5th will be heard in the Regional and Northern programmes. Part 2 will be broadcast on the Northern wavelength only. It is now nine years since any part of the Leeds Festival has been broadcast, and the present occasion is therefore an important one.

Dr. Malcolm Sargent will conduct the first part of the programme, which will be devoted to Busoni's Concerto in C for piano, male voice chorus and orchestra, with Egon Petri, who was a pupil of Busoni, as soloist. This Concerto has been called "a symphony with piano obbligato," for in style and layout it transcends all that is usually implied by the term "concerto." It was first performed in England at the Newcastle Musical Festival in 1909.

The second part consists of two old favourites: Beethoven's Symphony No. 4 in B Flat major, to be conducted by Sir Thomas Beecham; Brahms's Variations on a Theme by Haydn; and Sibelius's tone poem, "The Origin of Fire," for baritone solo, male voice chorus and orchestra, which has been curiously neglected in Britain, for it is one of Sibelius's finest choral works. These items will be conducted by Sir Malcolm Sargent. "The Origin of Fire" was composed for the inauguration of the new Finnish Theatre in 1902, and was played on that occasion by the Helsingfors Philharmonic Orchestra, conducted by Sibelius himself. The baritone solo will be sung by Dennis Noble.

Changes of Address

THE following changes of address are notified: Messrs. Holiday and Hemmerdinger have moved to larger premises at 74-78, Hardman Street, Deansgate, Manchester, 3. The Radio Development Company have also now moved to more commodious premises, and the new address is "Epoch" House, 101-105, Goswell Road, London, W.C.1.

W.B. Speaker Competition

OWING to the large number of entries for the competition which was given in our Show Number, the judges regret that they are unable yet to give their decision. It is hoped that the result may be received in time to be included in our next issue.

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 56 mc. Log Correspondent Wanted

SIR,—It was with interest that I read the short article on ultra-short-wave activities in the September 11th issue of PRACTICAL AND AMATEUR WIRELESS. I also note the useful list of "likely" 56 mc. amateurs, and therefore enclose my 56 mc. log for the past few weeks: G2MR, G2MV, G5IJ, G5MAP, G5WW, G8IH and G8IX. These stations were received on a 2-valve super-regen. with vertical half-wave, and rotatable horizontal dipole and reflector aerials, atop the local hills. I might also mention that the Alexandra Palace transmissions have, of course, been well received on speaker with same set since they first began.

I should be very pleased also to meet a local B.L.D.L.C. member who is interested in ultra-short waves.—C. T. FAIRCHILD (1a, Dover Rd., Brighton, 6, Sussex).

A Multi-valve Short-waver for Overseas

SIR,—It is with the greatest interest that I have read D. D. Wiggill's letter in your issue of July 3rd in which he makes a request for a "Five-valver for Overseas." I heartily endorse his suggestion, and nothing would give me greater pleasure than to see you give full details for the building of a 5, 6, 7 or even 8-valve short-wave receiver. There is no real entertainment value in 1 or 2-valve sets and it is entertainment we need in these out-stations.

As much as I like your journal on the whole, I confess to making a dive for the Short-wave Section before reading anything else.

Please let us have something really big and hot in the very near future.—H. LOVETT (Yola, Nigeria, West Africa).

[*We hope to publish in the near future a multi-valve short-wave receiver design which will satisfy the demands of the various overseas readers who have written us on the subject.*—ED.]

W6XKG

SIR,—In reply to Mr. Kyhl S. Smeby's letter in the September 11th issue of your paper I should like to state that W6XKG does verify, as I have had a letter signed by the engineer verifying my reception in May. I received this station at R5 peaking R7 on loudspeaker from 7 to 8 p.m. on May 21st.

The letter states that the transmitter is a composite job, and the antenna in use at present consists of two quarter-wave verticals, two wavelengths above ground, fed with transposed feeders.

W6XKG operates on 25.95 mc/s with a power of 100 watts, twenty-four hours daily broadcasting simultaneously with KGFJ on 1,200 kc/s.—W. PRIESTNALL (Manchester).

Correspondent Wanted

SIR,—I first became interested in amateur radio about two years ago, and since then I have spent many a happy hour listening to the amateurs of the world QSO with one another. I have now decided to apply for a transmitting licence (A.A.). I am nineteen years of age and would very much like to correspond with one of your numerous readers who is thinking of doing likewise.—MICHAEL MADDEN (1, Main Street, Roscrea, Co. Tipperary, I.F.S.).

A Suspended Receiver

SIR,—I was interested to see the illustration recently of a cabinet loudspeaker designed to hang from a picture rail, and enclose a photograph showing a similar suspension for an entire radio set—an original arrangement, I believe.

This illustration shows how Mr. Robbins suspended his receiver from a picture rail.

CUT THIS OUT EACH WEEK

Do you know

—THAT to prevent interference in a superhet a special I.F. filter may now be obtained as a complete ready-made unit.

—THAT rubbing metallic contacts in a short-wave receiver should, where possible, be short-circuited to avoid noises.

—THAT an ordinary L.F. transformer may be used as a temporary push-pull transformer by connecting two identical resistances across the secondary winding.

—THAT a rotatable di-pole aerial system offers a wider field of reception and freedom from static interference than a fixed aerial.

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.

In this case the set is suspended from the picture-rail by ordinary picture chain, on which it rests without any positive fixing. This is the second set I have had so suspended. The chain can be slung either from side to side or from back to the front of the set, as the shape of cabinet permits. By placing the rail-hooks well towards the corner, the set can be made perfectly rigid, and to hug the wall slightly. I find this is the best position in the room acoustically—all extraneous resonances are avoided, and reproduction is far more realistic than that of a self-contained radiogram standing on the ground.—E. R. J. ROBBINS (Hounslow).

An Interesting 20-metre Log from Yorkshire

SIR,—Some of my recent 20-metre 'phone logs have been of more than usual interest. Three of the elusive South Africans have been heard on August 29th at 18.40 B.S.T. I found ZU6P testing with records and announcing: "Z Zero, U Utah, 6, P Pennsylvania," and at 18.55, ZS6AJ ("America Japan") gave its location as Johannesburg. ZS6Q in the same city was heard on August 30th with records of dance music and the call: "Z Zero, S Spain, 6, Q Queensland." The hour was given as "8.45 p.m., Johannesburg time."

Another interesting amateur on August 29th was W10XDA, the schooner *Morrissey*, giving its situation as: "On the high seas." Then it contacted W2OJ and both stations gave R6-7 signals for over an hour.

September logs include the following: K6NZQ (Hawaii), W7ESK (Seattle, Washington), YL2CC (Latvia), CE3CO (Santiago de Chile), VE5OT (Vancouver, B.C.), KA1ME (Manila), VK3XJ (Melbourne), VK2ABD (Sydney), HC1FG (Riobamba, Ecuador), YI2BA (Basrah), and NY2AE (Panama Canal Zone). All announcements were in English and each location was clearly heard.

In a previous letter I stated that I had logged W7VA. I have since discovered that this station was working a portable at Nome, Alaska.

I use a 6-valve superhet (loudspeaker only) and outside aerial directed N.S.—REGINALD H. GREENLAND, B.Sc. (Barnsley).

Card Index for Logging Stations

SIR,—Perhaps the following idea, which I have used for some months, will be of interest to other readers. It consists of a card index, on which 20-metre amateur stations are indexed under their respective call-signs. The index cards can be purchased for a small sum. This idea saves considerable time spent in looking up log-books, etc., for immediately a new call-sign is heard, reference to the index will show at once whether it has been heard before. Stations on other amateur bands can be indexed on the same cards, provided a different coloured ink is used. Where many U.S.A. amateurs are heard, the card shown in the accompanying table will show an even quicker method of reference.

W3. A.	B.	C.	D.	U.S.A. E.
				W3EAZ
W3AED	W3BBB			
W3AIR	W3BFH			
W3ANH	W3BSH	W3CHE	W3DHY	W3EMM
W3APO	W3BOF			
W3AHR	W3BEI		W3DLL	W3EOZ
	W3BSY	W3CUB		W3EXG
				W3EYT

The letters A, B, C, D, E, are carried on through the alphabet so that W3 will cover six cards.—C. DAWSON (Willesden).

NEW NATIONAL TRANSMISSION PERIODS

WE are informed that the B.B.C. has now reviewed the results of the experiment of closing down the English medium-wave National programme transmitters (London and North National) on 261.1 metres, until 5.0 p.m. on week-days. The withdrawal from the Scottish National programme transmitter at Westerglen of the wavelength of 285.7 metres to allow for Wales and the West Country each to have a separate programme necessitated the synchronisation of this transmitter with the London and North National programme transmitters on 261.1 metres.

To provide for the radiation of an entertainment programme in addition to a separate Scottish schools programme it was necessary at certain times to use two exclusive wavelengths in Scotland, and for this reason the London and North National programme transmitters have to remain silent during the period of Scottish broadcasts to schools. There were two alternatives: (a) to close down these transmitters on all weekdays until 5.0 p.m. or (b) to close them down only on those days on which schools broadcasting takes place. The former was chosen as it was thought that listeners would prefer its simplicity. Except in Scotland, therefore, since July 4th the National programme has been available on week-days up to 5.0 p.m. from Droitwich only.

It has been found that certain listeners are unable to receive Droitwich, some because they still possess receivers which will not tune to the "long" waveband, and others on account of electrical interferences. It was accordingly decided to adopt alternative (b) above as from September 25th.

The West of England Regional transmitter is now open daily to transmit the National programme before 5.0 p.m. when there are alternative programmes.

The arrangement by which the Scottish schools programmes are broadcast on 391.1 metres by the Regional transmitters at Westerglen and Burghead, and the alternative entertainment programme on 261.1 metres by the National transmitter at Westerglen, will continue. In order to simplify matters for Scottish listeners, as from September 20th the 261.1-metre transmitter at Westerglen radiates the Regional programme up to 5.0 p.m. from Mondays to Fridays inclusive, in school term time, and the 391.1-metre transmitter will radiate the alternative programme whether this is the Scottish schools programme or the National programme.

SIMPLE FORMULÆ

Some Practical Applications of Simple Formulæ to Constructors' Requirements are Given in this Article, which is Specially Written for Beginners

By L. ORMOND SPARKS

THE very name—formula—is often sufficient to deter many beginners from tackling some of the problems involving calculations. Admittedly there are formulæ which look long enough and sufficiently complicated to put anyone off tackling their application, but the average constructional work with which most constructors are concerned does not call for such applications, and it is usually sufficient if one gets familiar with the more simple formulæ which crop up fairly frequently.

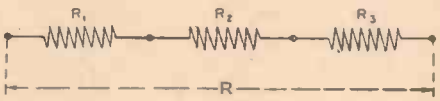


Fig. 1.—Resistances in series.

Resistance, Voltage and Current

These three items are intimately related to each other, and to practically all radio circuits, and for this reason all calculations concerning them should be mastered.

Resistance can best be defined as the opposition offered to a flow of direct current. The amount of opposition is not constant for all conductors; in fact, tables have been prepared which will be found in any good electrical handbook, showing the amount of opposition or, to give it the correct name, the Specific Resistance, of the materials most commonly used. For any given material the resistance will depend on the length, cross-sectional area and specific resistance, and it can be written thus:

$R\ (\text{Ohms}) = \rho\frac{L}{A}$ when L is the length, A the cross-sectional area, and ρ the specific resistance of the material. The units of measurement for L and A must be the same, i.e., if L is measured in inches then A must be quoted in square inches. It is not necessary to elaborate on this formula, as most wire tables give the resistance for certain lengths of a wide range of wire sizes.

Ohm's Law

Ohm's Law shows the relationship between resistance (R), voltage (E) and current (I), and can be written $I=\frac{E}{R}$ or $R=\frac{E}{I}$ or $E=I\times R$, the resistance being in ohms, the electro-motive force (E) in volts, and the current in amperes.

Examples:—

If there are 12 volts flowing in a circuit having a resistance of 4 ohms, what will the current be?

Ans. $I=\frac{E}{R}=\frac{12}{4}=3$ amps.

If the current measured in a circuit is 50 milliamps (i.e., .05 amps) and the voltage is known to be 150 volts, what is the resistance of the circuit?

Ans. $R=\frac{E}{I}=\frac{150}{.05}=3{,}000$ ohms, or, if it is wished to keep the current as milliamps, then the calculation can be written

$R=\frac{150}{50}\times 1{,}000=3{,}000$ ohms, remembering that there are 1,000 milliamps to 1 amp.

If the current in a circuit is 20 milliamps and the resistance is known to be 5,000 ohms, what will be the voltage applied?

Ans. $E=I\times R=.02\times 5{,}000=100$ volts, or, expressing the current in amperes, i.e. 20/1,000ths of an amp., it becomes $E=\frac{20\times 5{,}000}{1{,}000}=100$ volts.

It is possible to apply Ohm's Law in many ways, and here are one or two examples of calculations frequently required with even simple radio work.

A certain valve requires an anode feed voltage of 120 volts. At that voltage it will pass 5 milliamps, according to the valve-maker's figures. The H.T. supply, however, is 200 volts. Therefore, what resistance must be introduced to reduce the voltage to the required figure?

Ans. The voltage to be dropped is $200-120=80$ volts.

$R=\frac{E}{I}$ therefore, $R=\frac{80}{5}\times 1{,}000$ (working in mA.), which equals $16\times 1{,}000=16{,}000$ ohms.

With calculations of this type, always remember to deduct the voltage required from that available to obtain the voltage to be dropped.

A valve passing an anode current of 10 mA. requires a bias of 8 volts, what resistance must be inserted in its cathode or the centre-tap of its filament supply winding to produce the desired bias voltage?

Ans. $R=\frac{E}{I}=\frac{8}{10}$(bias required) $\times 1{,}000$
$= 800$ ohms.

A speaker field, having a resistance of 2,500 ohms, is inserted in the positive H.T. supply which is 350 volts. The current being taken by the receiver is 30 milliamps. what voltage will be dropped by the field winding?

Ans. Applying $E=I\times R$ we get $\frac{30\times 2{,}500}{1{,}000}=\frac{75{,}000}{1{,}000}=75$ volts. The voltage available on the set side of the speaker field will therefore be 350 volts—75, which equals 275 volts.

Resistances in Series

When resistances are connected as in Fig. 1, the total resistance of the circuit or line is given by:—

$R=R.1+R.2+R.3+\ \ldots$, etc., where R.1, R.2, and R.3 are the various resistances and R the total resistance.

Fig. 2.—Resistances in parallel.

Resistances in Parallel

If resistances are connected as shown in Fig. 2, they are said to be in "parallel," and it is rather more difficult to calculate the resultant resistance.

The formula states:

$$R=\frac{1}{\frac{1}{R.1}+\frac{1}{R.2}+\frac{1}{R.3}+\frac{1}{R.4}+\text{etc.}}$$

(Continued at foot of next page)

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. J. T. (Blidworth). The Vitesse receiver, blueprint PW. 75, should meet your requirements, or if you require an A.C. mains all-wave superhet, the general scheme shown in this circuit could be modified to incorporate mains valves.

J. J. O'H. (Birmingham). As the receiver is a commercial model we cannot suggest what is wrong and cannot give instructions for modifying the set. We suggest you communicate direct with the makers.

R. C. R. (Hartlepool). There is no single book dealing with all of the subjects mentioned in your letter. We have given separate articles on the various subjects from time to time, and we cannot recommend any textbook for your purpose.

L. E. T. (Surbiton). Messrs. Pitman can supply a book which will meet your requirements. There are also two or three American books on the subject, and details may be obtained by writing to Messrs. Holiday and Hemmerdinger, of Holmer Works, Bridge Street, Dolefield, Manchester.

C. W. (Tolworth). We have no data concerning the chassis and cannot, therefore, recommend it. We suggest you write for further particulars. The back of the cabinet must be open to prevent boom and heating troubles. A wooden frame, covered with fine net, will prevent dust entering and maintain the appearance. The only way to overcome the control difficulty would be to use Bowden drives with the knobs mounted on the motor-board.

J. G. (Wexford). We are sorry that we cannot give you details for rewinding the horn-motors for your purpose. The only solution would appear to be the use of one of the vibratory rectifiers.

E. C. (Inistioge). We regret that we are in the same position as the makers and cannot supply details of the coil. We do not carry data of commercial receivers, and if the makers no longer have the details we do not know of any source from which you can obtain them.

R. A. (Hamilton). Details of the licence are given on our Queries and Enquiries page, and a suitable transmitter for a start will be found in our issues dated January 2nd and January 9th last.

J. H. B. (Leicester). The only receiver we can recommend in your case is the Fan and Family Three, blueprint A.W.410.

H. C. B. (Romford). The trouble was due to a defect in the transmitter, and the B.B.C. apologised later in the evening. The sudden oscillation may be due to a defective valve or resistance, but we suggest that you have the set examined by the makers or their nearest local service agent.

J. W. H. (Cullybackey). The preferable arrangement is that in which the two windings are in series for long waves, and a section short-circuited for medium waves. A frame with all sides equal is preferable, although a circular frame possesses certain merits.

A. D. B. (Colwyn Bay). It is advisable first to ascertain from the makers of your receiver that it will function satisfactorily with a short-wave converter. Some commercial superhets are not suited for this modification.

(Continued from previous page)

and it must be remembered that the total resistance (R) will be less than the smallest resistance in use.

E.g. A resistance of 400 ohms is connected in parallel with one of 500 ohms. What will be the total resistance?

Ans. Using the above formula :—

$$R = \frac{1}{\frac{1}{400}+\frac{1}{500}} = \frac{1}{.0025+.002}$$

which equals $\frac{1}{.0045} = 222.2$ ohms

When one is concerned with two resistances only, the formula can be written :—

$$R = \frac{R.1 \times R.2}{R.1 + R.2}$$

It is often necessary to determine what value resistance should be placed in parallel with another of known value to produce a certain required value.

For example, to take our previous case. What value resistance must be connected in parallel with 500 ohms to produce a total resistance of 222.2 ohms?

From the above we get

$$R.1 \text{ (unknown)} = \frac{R \times R2}{R2 - R}$$ which equals

$$\frac{222.2 \times 500}{500 - 222.2} = \frac{111100}{277.8} = 400$$ ohms, taking the nearest practical value.

The British Long-distance Listeners' Club

THE longer hours of darkness are now giving anxiety to many members who are using simple receivers, on account of the fact that many long-distance stations are coming in much more strongly earlier in the evening. If you are trying for the A.E.L. certificate and are anxious to send out really reliable reports of reception, you must get down to systematic listening at this period of the year. As the range of reception increases, so it becomes more important that the reports you send out contain really valuable information. An important feature in this connection is to give details, where possible, of two-way working which you may hear. You will often find that an amateur transmitter is calling an amateur in another country, and perhaps you will hear him say part of the way through the contact that he has lost the signals of the other transmitter. If you are still able to hear him and note any variation in strength, shifting of frequency or other detail, make a careful note of it as it may prove of great importance to both transmitters.

In this connection it is necessary to remember that two-way reception is not always easy to carry out. You cannot expect to twist your tuning dial from one signal to another in order to keep in touch with both transmitters. This difficulty may be easily overcome, however, by mounting a second variable condenser on the panel. This may be the band-spreader—if you use band-spread tuning—or another tuning condenser for single tuners. Fit a single-pole change-over switch between the two condensers, and connect the arm of the switch to the grid end of the tuning coil and the two contacts of the switch to the two condensers. You can then adjust one condenser to one station, and the other condenser to the remaining transmitter, and the switch will enable you to keep in touch with both without any difficulty.

Transmitting Points

A member has been trying out one or two simple transmitters and finds difficulty in arriving at a stable arrangement. He says that he cannot afford a crystal just yet, but requires details of a really stable transmitter which may be relied upon during his A.A. experiments. This is a rather difficult point, but a small transmitter can be built using the electron-stream coupling arrangement with a tetrode valve to give very good results indeed under these circumstances. An indirectly-heated mains valve would, of course, be used with the cathode tap in the usual way. Harmonics are very strong with this arrangement, any good stability will be found if the wiring is carried out efficiently.

Several members have also asked whether it is possible to make their own crystals at home, and although it is possible, given suitable apparatus to grind a piece of quartz to a definite thickness, it will be found that the requirements of an oscillating crystal for a transmitter are such that it will not be worth while trying to do this. Good crystals are an investment and by choosing a suitable cut you can obtain good working on various bands by means of the harmonic principle.

FREE ADVICE BUREAU

COUPON

This Coupon is available until October 9th, 1937, and must be attached to all letters containing queries.

PRACTICAL AND AMATEUR WIRELESS, 2/10/37.

A WIND-DRIVEN GENERATOR

THE problem of a power supply where no electric mains are available is a difficult one, especially so in the writer's case, as power is needed for experimental transmitters as well as receivers. Various schemes have been tried to overcome this obstacle, the most successful being a dynamo driven by a small two-stroke motor-cycle engine. This has been in operation for a number of years, but even this has had its disadvantages. Noise is rather troublesome, as well as the question of expense, six to seven hours' running to a gallon of petrol being about the most one can reasonably expect.

Looking round for some other means of power supply it was decided to see what could be done by utilising the wind as a source of motive power. It was realised from the start that direct drive from the blades of the windmill to the dynamo was out of the question, owing to the necessary revolutions required to obtain sufficient charging speed; therefore, some means of gearing up the drive was desirable.

Chain Drive

Two bottom brackets, complete with gear wheels, were sawn from old discarded cycles, and these, together with a twelve-volt car dynamo, were mounted on to a framework constructed out of oak planks. By utilising two small cog wheels taken from magneto drives, it was possible to

The author's windmill removed from the mast, showing the wheel bearings.

obtain a drive ratio of sixteen to one, the drive, of course, being by means of cycle chains.

In order to take advantage of the wind from any direction, the whole had to be mounted on to a turntable, this consisting of the back wheel of a motor-cycle, the spindle acting as the bearing upon which the whole rotates.

The blades of the mill, eight in number, and five feet in diameter, were constructed from tinned sheet iron, being pitched at an angle of about thirty degrees, and fixed to wood spokes, which, in turn, are attached to wooden discs, and bolted on to the first driving wheel by five ⅜in. bolts. A tail was added to keep the blades head into the wind.

The whole structure is mounted on to a platform, which is fixed to the top of a support about ten feet high. No doubt, greater height above ground level would have given better results, but as the whole structure is rather heavy, quite a hefty support would be necessary, and this was prohibitive on account of the expense of the timber. To complete the installation a cut-out and amp-meter were added.

In a moderate wind the rate of charge to a six-volt car accumulator varies between two and five amperes. Later on it is hoped to experiment with a variable resistance in the field of the dynamo operated by governors to keep the charging rate constant.—H. J. Lonc.

NEW PHILCO SETS

THREE new special de luxe wireless receiver models have been added to the Philco range of 28 radios giving a still wider choice of sets to purchasers. The new models are: A.52, selling for 12 guineas; A.53, 14 guineas; and U.53, 15 guineas. Model A.53 is illustrated below.

Each one has an unusually modern and attractively luxurious cabinet which will appeal to those who desire their radio receiver to be not only a full-toned instrument but an ultra smart piece of furniture.

Model A.52 has five Philco high-efficiency valves in a superhet circuit which operates on A.C. mains. It has both long and medium wavelengths. The set is fitted with full automatic volume control, and has absolute 9 kilocycles selectivity, ensuring only one station at a time, and enormous power and life-like tone. The

Philco Model A.52.

large full-vision dial is illuminated and is calibrated in kilocycles. The dial gives station names in easy-to-read letters. Provision is made for the connection of an extension speaker if desired. Power consumption is approximately 45 watts.

Clear-vision Dial

Philco Model A.53 has many exclusive features housed within its sumptuous cabinet. It is designed for operation on A.C. mains. The same model for use on either A.C. or D.C. mains is known as Model U.53. Its short-wave range is 18-5.7 mc/s., or 16.6-52.6 metres; medium-waveband: 1,700-550 kc/s, or 176.5-545.4 metres; and long waveband, 320-150 kc/s., or 937.5-2,000 metres.

It has five Philco-efficiency valves on a superhet circuit, full automatic volume control, slow-motion two-speed tuning device, extension speaker and gramophone pick-up sockets, large, fully-energised moving-coil speaker giving unusual power, 3 watts undistorted output, and continuously variable tone control.

RADIO CLUBS AND 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.

Bradford Short-wave Club

THE last meeting of this club was devoted to morse practice and general discussion. Mr. Varley, the vice-chairman, exhibited a new set he has constructed for the 5-metre band, but unfortunately a demonstration was not possible.

The general desire of the club seems at the moment to be one of "getting on" with the winter programme, and this promises to be an exceptionally fine one. Friday, October 22nd, will undoubtedly be a useful evening for any enthusiast, for then Messrs. Stratton and Co. have arranged a demonstration of "Eddystone" short-wave products.

Any non-member of the club who is interested in any event mentioned in these columns during the session should write to the Secretary, Mr. G. Walker, 33, Napier Road, Thornbury, Bradford.

International Short-wave Club (London)

A VERY interesting evening was afforded radio enthusiasts who attended the meeting of the International Short-wave Club (London Chapter) on the evening of Friday, September 17th. Mr. S. G. Morgan (G6SM) delivered a lecture on his recent 5-metre experiments from which quite a lot of useful data was obtained. Mr. Morgan also described the construction of 5-metre transmitters and receivers, the circuits of which were illustrated with drawings on the blackboard.

All readers are invited to attend the meetings, which are held every Friday evening at the Clubroom, 80, Theobalds Road, W.C.1. On October 1st there is to be a demonstration of television. You are requested to come early.

A copy of the club's "News-Letter" will be sent to all readers who send their application on a postcard.—Arthur E. Bear, Secretary, 100, Adams Gardens Estate, London, S.E.16.

Exeter and District Wireless Society

THE following list gives details of our early Autumn programme. All meetings are held on Mondays at 8 p.m. at the Y.W.C.A., Dix's Field, Southernhay, unless otherwise stated.

Oct. 4th : A demonstration of short-wave sets and apparatus by Mr. E. Cholot. (By courtesy of Messrs. Lissen, Ltd., London.)

Oct. 11th : A visit to the High Frequency Dept. of the Royal Devon and Exeter Hospital. Conducted by Dr. C. Wroth.

Oct. 18th : Demonstration of the season's new sets, by Mr. F. J. Thorn.

W. J. Ching, Hon. Sec., 9, Sivell Place, Heavitree, Exeter.

Southend and District Radio and Scientific Society

A FURTHER Direction Finding Contest in the successful series organised by this Society was held on Sunday, September 12th, when 36 members and friends took part in a search for a transmitter concealed near Nobles Green, Eastwood, Essex. Three parties succeeded in finding the transmitter within the prescribed time, the winners being Messrs. L. Pugh and J. Leggett, who took a short cut through a narrow lane which had previously been considered impassable by cars. This exploit, and the accuracy of their bearings, enabled them to win in the record time of 1 hour 6 minutes.

The last open-air event of the 1937 series will be a night Direction Finding Contest, commencing at midnight on October 9th. The Hon. Secretary, Mr. F. S. Adams, of 27, Eastern Avenue, Southend-on-Sea, will be pleased to send copies of the rules to any members of other societies who are interested. Visiting teams will be cordially welcomed. Reports on the transmissions are also invited and will be acknowledged. The wavelength used is 155.8 metres.

Wirral Amateur Transmitting and Short-wave Club

THE above club has secured new headquarters at Beechcroft Settlement, Whetstone-lane, Birkenhead, and it is expected that, as a result of this move, meetings in future will be held more frequently. At the next meeting, which will be held at the new headquarters on Wednesday, September 29th, a junk sale will be held, the last one having proved a great success. All interested readers residing in the locality are invited to attend.—W. Rogers, Hon. Publicity Sec., 12, Meadowside, Wallasey.

Slough and District Short-wave Club

NOW that summer holidays are over and the radio season has started in earnest, the club is making considerable progress. A club-room adjoining the "Nag's Head" has been acquired, and at our last meeting there was a display of apparatus constructed by members. At this session also the subscription was raised from 6s. to 7s. 6d. per annum.

New members are welcome, and should apply to the secretary, J. H. White, 20, Chalvey Rd. East, Slough, Bucks.

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	..	7½d. " "
Wireless Magazine	..	1/3 " "

The index letters which precede the Blueprint Number indicates the periodical in which the description appears: thus PW refers to PRACTICAL WIRELESS, AW to *Amateur Wireless*, PM to *Practical Mechanics*, WM 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

	Date of Issue.	*No. of Blueprint.*
CRYSTAL SETS.		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-Valve : Blueprint, 1s.		
All-wave Unipen (Pentode)	—	PW31A
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36B
The Signet Two	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-Range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-mark Three (SG, D, Pow)	12.6.37	PW41
Hall-mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans))	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	—	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans)	5.12.36	PW72
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW4
Fury Four (2 SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, H.F. Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.36	PW47
SUPERHETS.		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet Two-valve	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
F. J. Camm's Oracle All-wave Three (H.F., Det., Pen.)	28.8.37	PW78
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE

CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det., Pen)	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher; Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Economy-Pentode Three (SG, D Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM389
Certainty Three (SG, D, Pen)	—	WM393
Miniature Three (SG, D, Trans)	*Oct.* '35	WM400
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM396
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2HF Four (2 SG, D, Pen)	—	AW421
Crusader's A.V.C.4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each)	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
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), A.C.	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	—	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)	—	WM379
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	*Apl.* '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)	1.7.33	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-wave (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-valver Short-waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver Super	*Nov.* '35	WM397
Mains Operated.		
Two-valve : Blueprint 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 amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar.* '36	WM403
New Style Short-Wave Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jun.* 5, '35	AW462
Short-Wave Adapter (1/-)	*Dec.* 1, '34	AW456
Superhet Converter (1/-)	*Dec.* 1, '34	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 Converter (1/-)	—	WM408

QUERIES and ENQUIRIES

Grid Bias Difficulty

"Would you be good enough to explain to me the reason why the red wander plug (+) will not function when placed in the grid bias positive, but functions without it, with less output. I have a good three-valve set and could formerly get several stations but not now. Wireless on tap has been installed around this neighbourhood, and I am wondering whether that is the cause."—M. S. (E.3).

WE do not think the installation you mention will affect you in the manner indicated. The probability is that the H.T. battery has become partially discharged and thus a lower G.B. voltage is required. If the battery has run very low you may not require any bias at all, and therefore you should check the battery with a good voltmeter. If the H.T. battery is found to be in order, check the G.B. battery and also the valve.

Licence Requirements

"I should like to know if one has to have a special licence to make any of the sets you described in the paper. I do not want the Post Office people after me, if I should make one or two to see what results one can get. I have heard of people making a set and the secret seems to be: when is the set 'made?' Is there a wireless club near here?"—J. M. (Camelford).

NO constructional licence is required for a receiver made entirely for your own use for the reception of broadcasting. A Post Office licence must however, first be obtained before you can construct a receiver or erect an aerial and this is the standard 10s. per annum licence. If you wish to make receivers for re-sale, then you should get into touch with one of the licensing authorities, as a licence has to be paid upon each set you sell. You can make up as many sets as you like for your own use provided that you have the standard Post Office licence, but this does not, of course, cover transmitting apparatus. The nearest club which we can trace is at Bideford.

Experimenters' Receiver

"I should like to know if I can buy the completed coil for the two-valve set recently described by the Experimenters — from whom, and at what prices."—A. C. (Stornoway).

THE coil used by the Experimenters was home-made, and you should be able to construct this quite easily if you can obtain the necessary wire and former. As you may find some difficulty in getting the material at your address you could use any good modern dual-range coil such as is now readily available. Alternatively, if you wish to adhere strictly to the Experimenters' design you can obtain the coil, ready made from Messrs. Peto-Scott.

Chassis Construction

"I am sending a design I have worked out for a good short-wave set and should be glad of your criticisms. I am uncertain regarding the chassis and have quite a lot of material on hand with which I can make it. I have workshop facilities and wonder if I used steel plate, whether this would be better than a copper or aluminium one, both materials of which I have ample supplies in thicknesses up to 20 gauge."—G. W. T. (Exeter).

THE general circuit arrangements shown in your diagram are quite good and should work out satisfactorily. You must remember, however, that although theoretically sound you may find difficulty in obtaining a lay-out which will enable the circuit to deliver its best. Interaction between the H.F. and frequency changer must be avoided, and we think more adequate screening should be adopted. Probably the simplest plan would be to make partitions to erect on the chassis to divide each separate valve stage. A chassis of 20 gauge aluminium or copper would be too weak to hold all the parts needed and therefore steel plate should be employed, although this is not so efficient for a short-wave set as aluminium, owing to its higher resistance at high frequencies.

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.

Earth Returns

"I recently built a short-wave set using a metal chassis, but after some disappointment with the results I made careful tests and found that the failings were due to high resistances in the earth leads. All of these were taken to the nearest bolt holding down a component on the chassis, and in one or two cases I even put a special bolt with solder tag through the chassis to keep the wire short. I could not solder to the chassis as this was aluminium. Why should this method of construction have given poor results, seeing that practically all modern sets use this method of earth return leads. I only connected together all the bolts in question with a bare wire in order to give greatly improved results." F. R. (Cardiff).

YOUR chassis was probably dirty or oxidised and thus the actual contact formed by the wire or soldering tag was not efficient. If you had carefully cleaned or scraped the chassis before putting through the bolt you would probably not have experienced any trouble. A good tip, when using this method of making earth return leads is to drill the chassis and to leave the burr or rough edge thrown up by the drill. Then, when the nuts are tightened on the bolt the sharp edges of the burr will cut into the wire or soldering tag and ensure a good electrical contact.

Transmitting Licence

"I am keen to start transmitting experiments and have been told so many different stories concerning the licensing requirements that I should like to know the exact position. Is it true that you have to pass an examination in theory before getting a start in transmitting?"—H. R. (Alvaston).

AN examination in theory is not necessary, and the only test you have to pass is in sending and receiving Morse signals at a speed of 12 words per minute. This is only required, however, for the full transmitting licence and you must first obtain the A.A. or Artificial Aerial licence. This costs 10s. per annum and no tests have to be passed. You must supply details, however, of the experiments you intend to undertake, and a form must be obtained for the purpose from the Post Office. The full licence is only issued for experiments which cannot be carried out with the A.A. licence, and a fee of 5s. is charged for the Morse test. You are limited to the power you use and the wavelength upon which you can work. Further details are obtainable from the Engineer-in-Chief, Radio Section, G.P.O., Armour House, London, E.C.

The coupon on page 76 must be attached to every query.

(Continued in column three)

(Continued from column one)

LOUDSPEAKER REPAIRS

LOUDSPEAKER repairs, British, American, any make, 24-hour service; moderate prices.—Sinclair Speakers, Alma Grove, Copenhagen Street, London, N.1.

REPAIRS to Moving Coil Speakers, Cones and Coils fitted or rewound. Fields altered. Prices Quoted including Eliminators, Loudspeakers, Repaired, 4/-. L.F. and Speech Transformers, 4/- post free. Trade Invited. Guaranteed. Satisfaction. Prompt Service. Estimates Free.—L.S. Repair Service, 5, Balham Grove, London, S.W.12. Battersea 1321.

VALVES

AMERICAN Valves in sealed cartons, all types 5s. 6d. post paid.—Valves, 661-3, Harrow Road, N.W.10.

BUY VALVES DIRECT.—Save 50%; 2-volt, H2, L2, 2s. 3d.; power, 3s.; screen-grids, 4s. 9d.; H.F. and L.F. pentodes, 5s. 6d.; A.C. mains, 4-volt, general purpose, 4s. 6d.; power triode, 6s.; screen-grids, H.F. and L.F. pentodes, 6s. 6d.; full-wave rectifiers, 4s. 6d.; postage 3d. one valve, 4d. two, 6d. three and over.—Luminous Electric Appliances, Ltd. (Dept. 8), Phoenix Works, Tyburn Rd., Erdington, Birmingham.

SITUATIONS VACANT

WANTED.—Ambitious young men to prepare for well-paid posts in TELEVISION, the great career of the future.—Apply for free booklet from BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 18P, Stratford Place, W.1.

MISCELLANEOUS

CONSTRUCTORS' modern surplus. Guaranteed. Bargain lists free.—Austin, 33, Fitzroy Road, Whitstable.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

HEADPHONES.—Brown, Ericsson, G.E.C., B.T.H., Standard Telephones, Nesper, Western Electric, Sterling, etc. 2,000 ohms, 2s. 6d.; 4,000, 5s. Postage 6d. SPECIAL. Ericsson, 4,000 ohms, as new, 7s. 6d. Telefunken, lightweight, adjustable, 7s. 6d.

CRYSTAL SETS. Burne-Jones. Complete, Guaranteed, 5s. 6d. Ditto, double circuit, 8s. Sensitive permanent detectors, 1s. 6d. Crystal Detectors, complete, 1s. Crystals with silver cat's-whisker, 6d. Postage 1½d.—Post Radio, 2, Copenhagen Street, London, N.1.

VAUXHALL. Polar Midget condensers, 2-gang, 6s. 8d.; 3-gang, 8s. 9d.; 4-gang, 13s. 6d. Polar full vision horizontal drives, 5s.

VAUXHALL. Hivac valves, entire range, full discounts. Polar station-named scales for horizontal drives, 1s.

VAUXHALL. T.C.C. electrolytic condensers, 8 mfd. and 4 mfd. 500 volt, 2s. 6d.; 50 mfd. 50 volt, 1s. 6d.

VAUXHALL. Iron-cored coils, 3-gang, on base, with circuit, 17s. J.B. drives with station-named scale, 5s. 6d.

VAUXHALL. Magnavox and Rola P.M. speakers, 7in. cone, 16s. 6d.; 10in. cone, 22s. Energised models, 2,500 field coils, 7in., 12s. 6d.; 10in., 17s. 6d.

VAUXHALL UTILITIES, 163a, Strand, W.C.2. Temple Bar 9338. Send postcard for free list. Post paid, 2s. 6d. and over, or C.O.D.

SOUTHERN RADIO'S Wireless Bargains—all guaranteed and sent post paid.

CELESTION Soundex Permanent Magnet Speakers, 10/-; Telsen speaker units, 2/6; Telsen (1937) iron cored coils, W349, midget size, 3/6; W478 (twin ganged), 9/-; W477 (triple ganged), 14/6; W476 (triple ganged superhet), 14/6; I.F. transformer coils, W482, 4/-; Telsen dual range coils, 2/9, with aerial series condenser incorporated, W76, 3/9; Telsen A.C./D.C. multimeters, 5-range (tests anything radio or electrical), 8/6.

HEADPHONES, 4,000 ohms, 3/-; Ace (P.O.) microphones, ready for use with any receiver, 4/6.

GARRARD Record Changers, A.C. 200-250 volts, changes eight 10-inch or 12-inch records, £6; Garrard A.C. motors with pick-up, 42/-.

A FULL Range of Valves for all American Receivers, 6/- each; bargain parcels of radio components, including coils, chokes, condensers, circuits, etc., etc., to the value of 21/-, 5/- per parcel.

SOUTHERN RADIO, 323, Euston Rd., London, N.W.1; and 46, Lisle St., W.C.
All mail orders to Southern Radio, 323, Euston Rd., London, N.W.1 (near Warren St. Tube). 'Phone: Euston 3775.

FORD Components—Finest value obtainable. Ford Bankrupt Bargains. Unrepeatable opportunities. Lists Free.
Ford "Trident" Kit exact to specification, 66/6. "Oracle" 75/-. "All-World" Ace 7 gns. Lists Free. Ford "Acme" Guaranteed Kits. "Trident" 48/6. "Oracle" 57/6.—Ford Radio, 10, Queen's Place, Hove. Lists Free.

3/- each, D.V.S., D.V.S.G., D.S./pen., D.P./pen. D.D.T.16. Hallicrafters all models in stock, including New Super Skyrider. Remember, our receivers operate from 110-250-volt mains. Transmitting components and tubes from stock. We solicit your enquiries for anything American. Radiographic, Ltd., 66, Osborne Street, Glasgow, C.1.

BANKRUPT Bargains. List free. Decca battery 1937 3-pentode sets, 77s. 6d.; Decca 1937 5v. battery superhets, £4 18s. 6d.; Decca 1937 6v. A.C. superhets, £6; Decca 6v. A.C. superhet radiogram, 12gns.; Burgoyne table model 5v. superhet radiogram, £8 10s.; Altham 3v. all-wave battery, M.C. speakers, 70s.; Halcyon A.C. S.W. converters with valve, 20s. Ferguson and Truphonic 1938 all-wavers stocked. Large stock replacement valves and all types components. Get my price first. Note that all goods are new.—Butlin, 6, Stanford Avenue, Brighton. Preston 4030.

NEW RECEIVERS, COMPONENTS AND ACCESSORIES

A CUSTOMER WRITES: "Many thanks for 'Silex' Eliminator received, the set is twice as loud, and much clearer than before." Prices: H.T. only, 4 tappings, 18s. 6d.; with ½ amp. charger, 25s. Full details: Brighton Radio Service, 34B, Middle Street, Brighton.

CONDENSERS.—British manufacture, fixed paper in Metal containers. 800 volt Wkg., 4 mfd., 3/9; 2 mfd., 2/3; 1 mfd., 1/6. 500 volt Wkg., 4 mfd., 2/6; 2 mfd., 1/6; 1 mfd., 1/-. 400 volt Wkg., 4 mfd., 1/6; 2 mfd., 1/-; 1 mfd., 8d., postage 6d. or C.O.D.—Mentone Radio Stores, 364, Fulham Road, London, S.W.10.

BATTERY CHARGING PLANT

12-VOLT 2 amps., Model CG/122, 30s.; CG/206, 6v., 25s.; 2v., 2 amps., 18s. 6d.; 1 amp. 12s. 6d.; ½ amp., 8s. 6d. All complete in steel cases, metal rectifiers guaranteed. Also larger outputs. Details: Brighton Radio Service, 34, Middle Street, Brighton.

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FREE 1/- BLUEPRINT INSIDE!

Practical and Amateur Wireless

3D. EVERY WEDNESDAY

Edited by F.J. CAMM

A GEORGE NEWNES Publication

Vol. 11. No. 264. October 9th, 1937.

AND PRACTICAL TELEVISION

Building F.J. CAMM'S ALL-WAVE "CORONA" Four

Simple Formulæ for Beginners—

See page 86.

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. XI. No. 264. October 9th, 1937.

ROUND *the* WORLD *of* WIRELESS

The Corona All-wave Four

THE success of the all-wave receivers described in our Show numbers has led to a demand for a more powerful receiver for battery use, designed on somewhat similar lines. In the past we have described several receivers of this type, but it has been necessary to utilise standard broadcast coils for tuning on the medium and long-wave bands, with special short-wave coils for the short wavelengths, and this has necessitated special switching. Such an arrangement is quite satisfactory provided that the switches are well designed and that the wiring from coils to switches is efficiently carried out. Many constructors who have tried to build a receiver on these lines have found that the short-wave performance has been poor, and in the majority of cases this has been definitely traced to the use of a wrong type of switch, or bad wiring between the various components. The introduction of the modern three-range coils has removed these difficulties, and it is thus now just as simple to build an all-wave receiver as a standard broadcast set. The receiver described in this issue is a four-valver, having a single H.F. stage and two L.F. stages, and thus may be relied upon to provide not only a wide range of reception, but also a really good volume which will enable many short-wave stations to be received at worth-while strength on the loudspeaker. In addition, the performance on the broadcast bands will also be such that the receiver may be regarded as a standard for domestic purposes.

Short Waves Again

TO add to the already numerous applications of the short waves in normal commercial undertakings, it is now reported that the rate of growth of seeds may be measured by ultra-short wavelengths. It is stated that a Californian farmer measures the hidden capacity for growth in his lettuce seeds by means of a special ultra-short-wave receiver, and is thus able to sort his seeds into groups which will mature at definite periods. He believes that in a short time all seeds will be thus tested by radio.

Nottingham B.B.C. Studio

IT is stated that the B.B.C. have not given up hopes of eventually finding a site in Nottingham for a broadcast studio. Difficulty has been found in obtaining a site which will provide the necessary amenities of a broadcast studio, but the Midland Regional director states that a further inspection is shortly to be undertaken with a view to obtaining a suitable site.

Stagshaw Transmitter

THE Stagshaw transmitting station, designed to improve listening conditions in Northumberland, Durham, Cumberland, Westmorland and North Yorkshire, is to be opened by Her Grace the Duchess of Northumberland on Tuesday, October 19th.

ON OTHER PAGES

Quality and Superhets

IT is interesting to note that this season several firms are introducing all-wave receivers in which the circuit has been designed to perform a dual function. For long-range work the circuit performs as a superhet, but a switch cuts out certain stages or makes circuit changes so that when the local or quality reception is desired, a straight T.R.F. circuit is employed. This is no doubt a beginning of the general return to straight circuits.

Variety from America

AN interesting sample of American variety will be heard each week by English listeners through the medium of a new programme, which has been arranged in conjunction with the Columbia Broadcasting System. Listeners will, on October 18th, and on each subsequent Monday at 8.30, hear a programme of American variety, broadcast by the Columbia System.

Mr. Felix Greene, the B.B.C. representative in America, is arranging that this programme shall contain each week a first-class band and some of Columbia's star variety artists. It is yet too early to announce the names of the artists taking part in the first programme, but these will be available from week to week. English listeners are familiar with the names of American favourite radio artists, but except on gramophone records, have not, in many cases, had the opportunity of hearing them first hand.

For Housewives

AN important series of discussions will commence in the Midland programme on October 15th, under the title "How to Get Your Money's Worth." Margot Smith, speaking for the housewife, will interview J. C. Tranter, President of the Birmingham and District Retail Beef and Pork Butchers' Association, with a view to providing guidance for shoppers on points about quality and value to look for when buying meat.

"Crying the Neck"

LISTENERS who are interested in surviving ancient customs should listen to the West of England programme on October 12th. A commentary on the ceremony of "Crying the Neck," at Trelowarren, Cornwall, will be broadcast by Peter Sandry. This ceremony marks the conclusion of the harvest, but there are only a few places where it has survived. The "Neck" is a sheaf of corn—it may be either the last sheaf cut on the estate, or it may be composed of the finest ears selected from the various fields. In the olden days, after the last sheaf had been cut, all the labourers on the estate gathered round while one of their number would raise the sheaf three times in the air, the rest bowing or kneeling. In some places it is given to the best horse on the estate, in others it is hung up in the farm kitchen until the next harvest. At Trelowarren the ceremony is held in front of the house of the landlord and concludes with an old Cornish harvest hymn, before everyone goes in to the harvest supper.

ROUND the WORLD of WIRELESS (Continued)

Here's To the Next Time!

WHEN Henry Hall and his Dance Orchestra finished the late dance music programme a fortnight ago it marked the severance of the official connection Henry has had with the B.B.C. for the last five years. Although the B.B.C. Dance Orchestra was disbanded some months ago, Henry has been under contract to the B.B.C., but this is now terminated. He has begun a music-hall career with his new orchestra.

Applications for Auditions

THE B.B.C. recently announced that, owing to an already overlong waiting list, no new applications for general drama auditions can be considered before the end of March, 1938. As yet there has been no chance to give parts to many applicants who were successful at auditions last autumn and winter. During the summer months auditions were suspended and hundreds of would-be broadcasters who have since applied must be heard before a new list can be formed.

Meanwhile, drama auditions will be given at regular intervals to those who have already applied. In turn each gets a summons to Broadcasting House for an individual microphone test. This process takes time, but only in this way can the B.B.C. be sure that no type of talent is overlooked.

"In Town To-night"

HERALDED once again by the "Knightsbridge March," its well-known signature tune, "In Town To-night" will be revived by the B.B.C. on October 30th. It will be the same "In Town To-night" that listeners have always known, bringing to the microphone each Saturday night the personalities, celebrities and colourful characters visiting, or working in, the Metropolis.

INTERESTING and TOPICAL NEWS and NOTES

Judy Shirley, well known radio favourite, as she appears in "Thunder in the City," with Maurice Winnick's Band. Conducting the band can be seen the star of the picture, Edward G. Robinson. The picture was produced at the Denham Studios.

A. W. ("Bill") Hanson will again regularly produce the programmes, which will be reintroduced three weeks after the end of Alan Keith's alphabetical miscellany, "The B.B.C. Presents the A B C," letter "Z" being reached on October 9th.

A new picture of Henry Hall at the piano. He has delighted thousands with his solos which have sometimes been included in the dance-orchestra programmes.

A Manchester "Tuesday Concert"

THE second broadcast concert of the Manchester Tuesday Midday Society's weekly programme will be heard from the Houldsworth Hall, Manchester, by Northern and London Regional listeners on October 12th. The soloists will be Carmen del Rio (soprano) and Muriel Taylor (violoncello). Albert Hardie will be at the pianoforte.

A New Radio Revue

"YOU Never Know," a new revue by Muriel Levy, who is one of the best known broadcasters in the North, is to be broadcast on October 14th. This promises to be a show full of bright burlesque. David Porter, who is the producer, has written the lyrics, and the music is by Henry Reed. The artists will include Marjorie Westbury, who is best known to listeners in the Midland region. The Colunio Male Voice Choir will also be heard. Some of the sketches of this show are sidelights on life in a big department store.

"How To Get Your Money's Worth"

A SERIES entitled "How To Get Your Money's Worth," which will run weekly—probably on Fridays—will be introduced on October 8th by F. C. Hooper, a director of a multiple departmental store. In subsequent broadcasts, to be given from the Midland Regional, Miss Margot Smith, of Birmingham, will interview trade experts with a view to finding out the difference between goods sold at different price levels.

SOLVE THIS!

PROBLEM No. 264.

When King's home-designed A.C. receiver was first switched on the quality of reproduction was poor. Voltage tests were made and it was found that the heater voltage was 3.5 volts instead of the required 4 volts. What was the fault? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 264 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, October 11th, 1937.

Solution to Problem No. 263.

The field winding was short-circuiting to the speaker chassis and this was directly connected to the set chassis.

The following three readers successfully solved Problem No. 262, and books are accordingly being forwarded to them: A. B. Tollerton, 1, Nevill Rd., Crowborough, Sussex; R. R. P. Lee, 22, Heathfield Rd., Acton, W.3; J. de Moras, 6c, Grosvenor Terr., Liverpool, 8.

The Amateur Set Designer

Further Notes on Resistance-Capacity Coupling, and Transformer L.F. Coupling are Given in this Fifth Article of the Series

(*Continued from page 58, October 2nd issue*).

THERE is no peculiar virtue arising from the fact that a transformer winding is involved. Similar phase splitting could be done with the aid of a centre-tapped resistance, provided that the centre point is held constant in potential and connected to cathodes.

Thus, if there is a signal voltage developed by a valve across the whole of R, Fig. 18, then the points A, E and B of Fig. 17 could be connected to those similarly marked in Fig. 18. The main practical problem arises in connection with the getting of R into the circuit of one valve. Obviously R of Fig. 18 could not be connected between the anode of a triode or pentode and H.T.+ because of the centre earth. It could not be placed between cathode and negative H.T. because the negative H.T. line will itself be at constant potential, and we want the middle of R to be constant, not the end of R. One could, however, split R into two equal parts and place one half on the anode side of the valve, and the other on the cathode side.

Fig. 19 shows a workable arrangement with a diode detector (H.F. filtering omitted). Note that a direct earth connection cannot be taken to the input tuned circuit.

A very useful method of phase splitting, although it involves an extra valve, takes

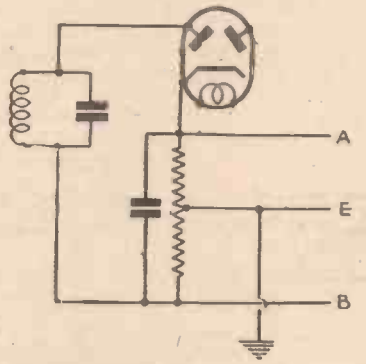


Fig. 19.—Obtaining a split output from a single valve for an R.C. push-pull stage.

advantage of the fact that, with a resistance load in the anode circuit of a triode valve there is 180 degrees phase difference between the grid and anode signal potentials. One of the first push-pull valves is fed direct while the other receives its input via an extra valve which is provided to give the necessary phase reversal. Fig. 20 shows the idea schematically. V is the extra valve mentioned and points A, E and B could be joined to those of Fig. 17.

The reader is bound to see at once the possibility that the amplification of V might upset the equality of grid signal voltages at A and B, i.e., might upset the balance of the two push-pull valves. The prevention of this is simply that of sufficiently reducing the input to V by potentiometer control. (See Fig. 21.)

Fig. 22 shows two push-pull output valves, V3 and V4. V3 is fed direct from V1, while V4 receives its input via the phase-reversing valve V2.

An alternative to the way in which V2 picks up its input voltage as shown in Fig. 22 would be to connect the grid of V2 to a suitable tapping on R1, the grid leak resistance of V3. (See point X in Fig. 22.) In this case the grid leak and condenser CR (Fig. 22) would be omitted.

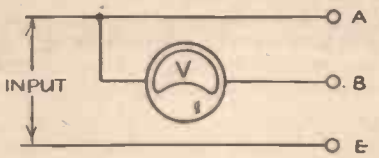


Fig. 20.—Diagram illustrating one method of phase-splitting.

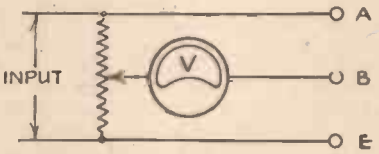


Fig. 21.—Reducing input by potentiometer control.

With R.C.C. push-pull systems very great care must be taken in connection with the matter of electrical balance between the two sides of the system.

Transformer L.F. Coupling

Fig. 23 shows the simplest method of employing an L.F. transformer for inter-valve coupling.

The fact that the output voltage of V1 goes through the voltage step up action of the transformer before operating V2 indicates that here we have the type of coupling to be used when comparatively high stage gain is necessary.

It is important for the receiver designer to be familiar with certain basic facts about inter-valve L.F. transformers. Ratio is not everything where the transformer is concerned, and any idea of obtaining a colossal stage gain by using a transformer with an exceedingly high turns ratio is foredoomed to failure. The transformer can step up only the voltage that is operating directly in its primary, and a vital point is that in series with the primary (see Fig. 23) we have the valve impedance (anode A.C. resistance, if you prefer that term). If the primary reactance is low the proportion of the effective signal e.m.f. that will be available at the primary will be small. This means that a comparatively large primary inductance is required, particularly where the lower frequencies are concerned. Ignoring the resistance of the primary

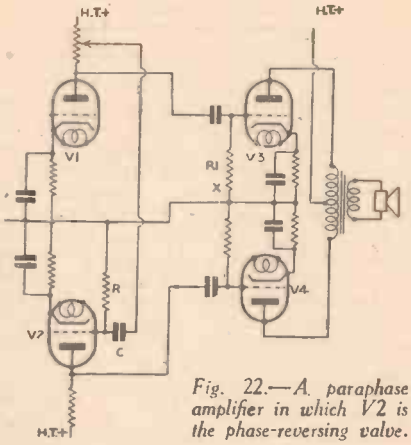


Fig. 22.—A paraphase amplifier in which V2 is the phase-reversing valve.

winding, the ratio of voltage across the primary to the total signal e.m.f. acting in the anode circuit is at the lower end of the frequency scale:

$$\frac{\times}{\sqrt{R^2 + X^2}}$$

where R = valve impedance
X = reactance of the primary

It is easy to see that if the reactance of the transformer primary is made equal to the valve impedance the above ratio resolves to $\frac{1}{\sqrt{2}}$ i.e., the primary gets 70.7 per cent. of the total e.m.f. This would be reasonably satisfactory but it is going to mean a primary with a large number of turns. How about the secondary winding? Obviously, a very high turns ratio would mean a transformer with an enormous secondary which would lead to difficulties in connection with the magnetic leakage on the one hand and a self-capacity on the other. An alternative way of getting the high ratio would be to use a very small primary winding, but that is just what we do not want to see in the transformer. It will be appreciated, therefore, that there are very good reasons for the common use of inter-valve transformer ratios of the comparatively low values of 1 : 2, 1 : 3, and 1 : 4.

The frequency response of the transformer is a very important consideration. A transformer of poor design might show a bad falling off in the lower register, due to insufficient primary inductance, or it might, due to effects concerned with the self capacity and leakage inductance, have a nasty resonant peak followed by a severe falling away in response at the upper frequencies.

Makers of good quality transformers are generally pleased to supply the frequency

(*Continued on next page*)

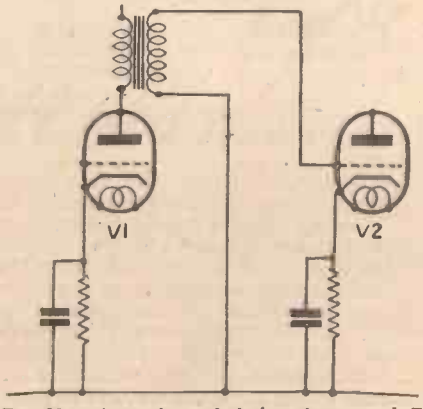


Fig. 23.—A simple method of employing an L.F. transformer for intervalve coupling.

THE AMATEUR SET DESIGNER

(*Continued from previous page*)

response curves and it is advisable when studying the curve of any particular transformer to note all details given as to the operating conditions under which the specified response will be obtained.

With the transformer connected as in Fig. 23 the D.C. component of anode current must necessarily pass through the primary winding of the transformer. Any given transformer will only take up to a certain value of direct current before distortion will be caused by core saturation. It is therefore useful to know the maximum permissible D.C. value for the transformer, and extremely important to see that the D.C. component of anode current does not exceed this value.

The shunt feed method of using a transformer will, of course, overcome all difficulties in connection with D.C. in the primary.

Shunt Feed Transformer Coupling

By keeping the primary of the transformer out of the series anode circuit and feeding it *via* resistance-capacity coupling as shown in Fig. 24, there is gained the considerable advantage that no D.C. passes through the primary, the primary inductance is consequently at its maximum and there is no possibility of trouble due to D.C. core saturation. The stage gain will not be quite so high as with direct transformer connections, assuming that the transformer is used in the manner shown in Fig. 24.

It will be observed that both the secondary and the primary winding run to earth on one side. In the battery operated receiver the secondary will generally go to earth *via* the G.B. battery. Auto-transformer connections, therefore, become possible, and Fig. 25 shows the transformer of Fig. 24 connected up as an auto transformer. Note that although the primary winding still acts as such, the secondary now consists of the two windings in series, since both windings come between grid and earth. Thus the effective ratio of the transformer has been raised. Alternatively, by reversing the connections of one of the windings the resulting voltage opposition would have the effect of bringing down the working ratio. As a matter of fact, with a 1 : 4 transformer having separate primary and secondary terminals there would be a choice of effective ratios of 1 : 3, 1 : 4, and 1 : 5.

The possibility of using auto connections with the shunt feed system has, of course, led to the introduction of transformers definitely built as autos, and having three terminals only.

The anode resistance, R (Fig. 24), will have a bearing upon the stage gain. There should be no need, however, to make it unduly high, in view of the step-up action of the transformer, and thus difficulties due to severe loss of anode volts at V1 should not arise. If V1 is a triode, a value for R of about two or three times the specified valve impedance will meet the average case.

As regards the coupling condenser there will be no risk of grid blocking effects so the way is clear to use a large capacity. If so desired, however, it is possible, by a careful choice of capacity for the coupling condenser, to exert some control upon the audio-frequency response characteristic of the stage. By making the capacity of such a value that it resonates with the primary inductance near the lower end of the frequency range, it is possible to lift up an otherwise drooping bass response. There will be no irritating resonant peak in normal circumstances, the damping of R will see to that. Makers of transformers have their own ideas as to the best feed arrangements for their particular products, and the amateur designer will be well advised to note and to follow makers' instructions. A fairly wide range of values are used for coupling condensers in different cases, and

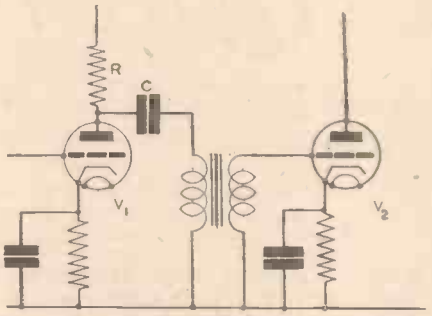


Fig. 24.—Shunt or parallel-fed transformer coupling.

anything from 0.1 mfd. to 1 mfd. may be suitable.

High Permeability Cores

The progress of transformer design has brought us the high permeability alloy cores, and the use of high permeability core material has enabled reduction of wire turns and of core size to be made. It is important to know that the high permeability cores are more easily saturated than ordinary transformer cores, although this does not mean that there are no high permeability transformers which can be used with direct primary connection into a valve anode circuit. Certain transformers are specified as being suitable either for direct or for shunt feed connections, but if direct connections are to be used it is extremely important to ascertain the maximum permissible value of primary D.C., and to take care that this is not exceeded. Incidentally,

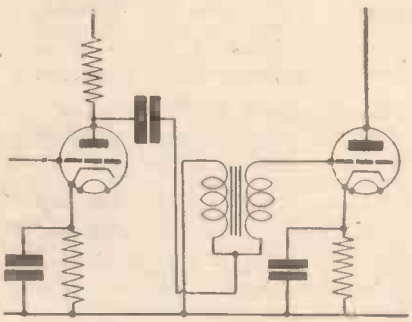


Fig. 25.—Auto-transformer coupling.

since the effective primary inductance will fall with decrease of permeability it is always wise (with direct transformer connections) to make sure that with the primary carrying the anode current of the valve the effective inductance will not be less than the minimum value to be tolerated in the design.

Certain high permeability transformers are definitely intended for shunt feed operation only, and some of these are of remarkably small dimensions. The amateur should not allow himself to be prejudiced against these transformers just because they are midgets and may perhaps appear to be too small to be useful. Actually, the use of a high permeability core gives the transformer manufacturer the opportunity of making considerable compression of dimensions and still provide us with a useful article.

On no account should a transformer specifically designed for shunt feed be used with direct connections.

The stage gain with shunt fed transformer coupling can be taken as approximately equal to :—

$$\mu \frac{R}{Ra+R} N$$

where μ = amplification factor of valve.
Ra = valve impedance.
R = anode coupling resistance.
N = transformer ratio.

The above does not take into account the fact that the anode load is actually made up of R in parallel with the joint impedance of the transformer primary and the coupling condenser in series, but it is a simple formula, useful when making rough estimate of gain.

A very commonly used arrangement is that of the H.F. battery-operated pentode grid detector coupled by a shunt fed transformer to the output valve.

A coupling resistance of 50,000 ohms is normally satisfactory. This can be looked upon as a resistance of comparatively moderate value, and the fact that it is not necessary to use a very high value is particularly welcome in view of the precious nature of anode volts with the battery-operated detector.

The Anode-bend Detector

Not much is heard of the anode-bend detector at the present time for the reason that the greater sensitivity of the grid detector on the one hand and the freedom from distortion and overloading of the diode detector on the other hand has made the latter two the popular detectors of to-day.

The anode-bend detector has one point in its favour and that is that it imposes upon the preceding tuned circuit a damping load which is comparatively small in value. A grid load resistance is not required and the valve is biased back to an operating point on the lower bend of the anode current—grid volts characteristic. The detection action arises by virtue of the asymmetry of the characteristic about this operating point.

The biasing back of the valve necessarily makes the working value of valve impedance much higher than the value appropriate to amplifying conditions and, as a consequence, resistance-capacity coupling to the next valve is generally the most suitable form of coupling to use.

One big disadvantage of the anode-bend detector, although it must be observed that the grid detector gives the same trouble in a different way, is represented by the fact that it overloads easily. The grid voltage swings, during reception, are centred on the negative bias voltage, and as soon as the grid alternating component of voltage has a peak value equal to the bias voltage, pulses of grid current start. Grid current introduces bad distortion and limits the output, so the maximum permissible input signal voltage must be kept short of the value that causes grid current to be set up. For the sake of sensitivity it is out of the question to use a valve that requires a big negative bias at a reasonable anode voltage, but it will pay to use as much H.T. voltage as conveniently possible, as will be understood when it is remembered that the greater the anode voltage the greater will be the negative bias which is required.

(*To be continued*)

Two New G.E.C. Receivers

Technical Details and Test Reports of G.E.C. Models BC.3836 and BC.3850

IN the new range of G.E.C. receivers, there are two outstanding models, appealing to the battery and to the A.C. mains user. The first of these is a simple battery three-valver and it is illustrated below. Externally, this presents something new in design, and it will be noted from the illustration that a plain two-colour scheme is adopted. The cabinet is finished in a dark tone, with cream-coloured control knobs. The surround round the speaker and dial opening is of plain whitewood, polished, and

Note the novel cabinet design of Model S.P.3, the Battery 3-valver.

the edges of the cabinet are bevelled very slightly to reveal the plain white of the wood. The result is very striking, and the cabinet may take its place in any modern home without contrasting vividly with furnishing schemes as do so many modern sets. Internally, the design is just as simple, a straightforward three-valve chassis being employed, with an all-metal construction. The three valves—H.F. pentode, pentode detector, and output pentode, are used in a conventional circuit with two screened coils and a two-gang condenser.

The three controls operate the main tuning condenser, the H.F. volume (by varying the bias), and the third control is a combined on/off switch and wave-band selector. Attached to this switch is a cord connected to a sliding metal panel behind the centre of the tuning scale in which a small rectangular aperture is cut. The dial is calibrated in station names and wavelengths, those for the medium-wave being marked in green and those for the long-waves in red. The sliding indicator bears the word "Off" on a white background, MW on a green background and LW on a red background, so that all doubts are removed as to the condition of the set at any moment. To avoid resonance or microphonic difficulties the chassis is mounted on rubber.

Battery Supplies

An important point for the user is that no grid bias battery is required, the grid voltages being supplied automatically. Thus only four battery leads are fitted, and it is a very simple matter to plug the two H.T. leads into the positive and negative sockets of the H.T. battery and to connect the two spades to the L.T. accumulator, both batteries being supplied with the receiver at an inclusive price. A single aerial terminal is fitted, and thus the receiver may be installed with the greatest confidence even by the merest novice.

The set was tested on our standard aerial system and proved just as simple to use as was expected from the design. The volume control operated in a perfectly smooth manner, and the absence of a reaction control, which was thought at first to be a bad point, proved to be of use in ensuring maximum performance without the usual howl which results when reaction is turned too far. The selectivity was very good indeed on the medium waves, and the long-wave performance was much better than on the majority of simple three-valvers of this type. Luxembourg could be separated from Droitwich, and on the medium-wave band two or three stations could be tuned in between the two London stations. The H.T. consumption was just over 7 mA, thus providing long life from the battery supplied with the set. The accumulator should provide approximately 45 hours listening before requiring to be re-charged. Extension loudspeaker sockets are provided, and it should be noted that when such a speaker is employed it must be of the low-impedance type — with an impedance of between 2 and 4 ohms. This model costs £6 15s. 0d.

Model 3850

This is an A.C. 5-valve (including rectifier) model of the three-band type, the short-wave range being from 16 to 50 metres. Again, only three controls are provided, the first combining the functions of on/off switch with volume control, the centre being the tuning control, and the third the waveband selector switch. The tuning dial in this receiver is of the "Chromoscopic" type, in which the station names are engraved in colours, and the dial lights are situated at the sides, the light being thrown through the length of the glass and making the names and wavelengths stand out in bold colour relief. Two indicators are fitted at the top of the dial, one showing the setting of the volume control and the second the waveband to which the set is adjusted. The tuning control is of the two-speed type, where a partial movement is carried out at very slow speed, after which it picks up at a much faster speed. If the knob is then turned in the reverse direction the slow speed mechanism comes into action again for a short travel. This greatly facilitates searching.

The circuit utilises the superhet principle with which is incorporated fully delayed A.V.C., and the speaker is of the energised type, delivering between 2 and 3 watts from the output pentode.

Test Report

On the medium- and long-wave bands, the performance was up to the standard expected from a circuit of this type, and on the short waves sufficient sensitivity is present to provide programme strength from a number of stations. The most important of these are indicated on the dial and the reduction drive is sufficiently smooth to enable the stations to be located without difficulty. No hum could be heard, and the incorporation of a power line noise shield seemed to be quite effective in preventing interference from being carried into the set from the mains supply. The cabinet is built of substantial wood, preventing resonance troubles, even at full volume, and the speaker tone is really very good for a small table model receiver of this type. At the price of 9½ guineas this represents real value for money, and is a splendid receiver for normal domestic use.

The A.C. all-wave 5 also incorporates a novel cabinet design, making for easy tuning.

SIMPLE FORMULÆ—2

Further Applications of Simple Formulæ to Constructors' Requirements are Given in this Second Article of the Series. By L. ORMOND SPARKS

BEFORE passing on to calculations connected with capacity and inductance, it is necessary to consider one more item most closely related to current and voltage, namely, power. To enable a better understanding to be obtained of what is meant by "power," when speaking in an electrical sense, it is worth noting the close connection of the three following units. The coulomb (Q) is the unit of quantity and represents a current flow of 1 *ampere* for a period of 1 *second*. It can also be expressed as 1 *ampere-second*.

The joule can be thought of as the amount of work done in creating 1 coulomb against an electrical pressure of 1 volt. To put it another way: a joule is equivalent to the work done by 1 ampere flowing for 1 second between two parts of a circuit having a potential difference of 1 volt.

The third unit concerns the *rate* at which the work is done, and it is referred to as "power," the unit of measurement being the watt.

One watt is equal to work being done at the rate of 1 joule per second which, from the above, can be written as 1 ampere flowing between two points having a P.D. of 1 volt. It will be seen that this expression is nothing more than power (watts) equals current multiplied by volts.

$P = I \times E$, but from Ohm's Law we have seen that $E = I \times R$; therefore, it can be written $P = I^2 \times R$, i.e., $I \times (I \times R)$ or $P = \frac{E^2}{R^2} \times R$ which, when simplified becomes $P = \frac{E^2}{R}$

From the above, therefore, it is possible, providing the current and voltage, current and resistance, or voltage and resistance is known, to calculate the wattage which will be dissipated or applied across a given load.

Example :—

What wattage will be dissipated across a resistance of 10,000 ohms when a current of 10 milliamps is flowing in the circuit?

$P = I^2 \times R = (.01 \times .01) \times 10{,}000 = .0001 \times 10{,}000$ which equals exactly 1 watt.

Example :—

If a resistance of 10,000 ohms produces a voltage drop of 100 volts in a circuit, what wattage will be dissipated?

$P = \frac{E^2}{R} = \frac{(100 \times 100)}{10{,}000} = \frac{10{,}000}{10{,}000} = 1$ watt.

It sometimes happens that the power and resistance of a circuit is known, but not the current or voltage, so it should be noted that it is quite easy to find the value of the current or voltage providing P and E are known.

From the previous equations we get

$E = \sqrt{P \times R}$ and $I = \sqrt{\frac{P}{R}}$

Example :—

A loudspeaker having a resistance of 2,500 ohms requires 12 watts to energise it; what current will have to flow in the speaker field?

Applying

$I = \sqrt{\frac{P}{R}}$ we get $I = \sqrt{\frac{12}{2{,}500}} = .0048$

which to the nearest whole number equals .069 amps, or 69—say, 70 milliamps. This figure can be back-checked by applying $P = I^2 \times R$.

Capacity

The most common requirements connected with condensers is that of determining the total capacity of two or more condensers when they are connected in series or parallel.

Unlike the examples given for resistance—in the first article of this series—the resultant effect of connecting condensers in parallel (Fig. 3) is to increase the total capacity, which can be stated in the following manner. The resultant capacity of condensers connected in parallel is equivalent to the *sum* of the capacities so connected.

C (total) = C1 + C2 + C3 + C4 + etc.

Example :—

What will be the total capacity if the following condensers are connected in parallel: .0005, .002 and .00006?

Answer: C = .0005 + .002 + .00006 = .00256 mfd.

Example :—

What condenser must be connected across a .1 mfd. to increase its capacity to .25 mfd.?

Answer: .25 − .1 = .15 mfd. Therefore,

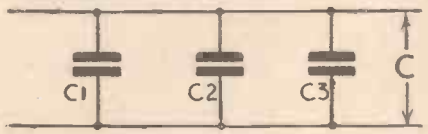


Fig. 3.—Condensers in parallel.

connecting another condenser of .15 mfd. across the .1 will give the desired figure or, if a .15 mfd. is not handy, a .1 mfd. *and* a .05 mfd. will produce the same result.

When a series arrangement is used, the result is again opposite to that produced with resistances; the total capacity is smaller than any of the individual condensers used in the arrangement.

$C = \frac{1}{\frac{1}{C1} + \frac{1}{C2} + \frac{1}{C3} + \frac{1}{C4}}$ or, if only two values are concerned, it can be written :—

$C = \frac{C1 \times C2}{C1 + C2}$

Example :—

What will be the resultant capacity of the following condensers connected in series? .25mfd; .5mfd., and .05 mfd.

Answer:

$C\ (\text{Total}) = \frac{1}{\frac{1}{.25} + \frac{1}{.5} + \frac{1}{.05}} = \frac{1}{26}$

which equals .038 mfd.

Example :—

Two condensers, .01 mfd. and .002 mfd. are connected in series, what is the resultant capacity?

Answer: Applying the other formula $C = \frac{C1 \times C2}{C1 + C2}$ we get $C = \frac{.01 \times .002}{.01 + .002} = \frac{.00002}{.012}$ = .0016 mfd.

It will be noted that the total capacity is always smaller than that of the smallest individual condenser.

Capacitive Reactance

It is well known that a condenser will allow the transference of alternating current from one part of a circuit to another and will not allow the passage of direct current. It is not always appreciated, however, that a condenser offers a certain impedance—or think of it as resistance—to an alternating current, and that it is of great importance that the resistance offered by any condenser must be borne in mind when selecting a condenser for any particular part of a circuit.

The resistance of a condenser is usually referred to as its *reactance*, the measurement of which is quoted in ohms. To give a very brief idea of the importance of reactance, suppose, for example, anode decoupling is being employed. The decoupling resistance connected in the anode circuit having a value of, say, 20,000 ohms, its object being to trap or stop H.F. currents from getting through into the H.T. supply, and thus interfering with other anode circuits. To allow the trapped H.F. currents to get away to earth, it is usual to connect a condenser between the anode side of the decoupling resistance and earth, but, if the condenser has a reactance of, say, 50,000 ohms, then the H.F. currents will take the easiest path which, in this imaginary case would be through the anode circuit, just where they are not wanted.

The reactance of a condenser is given by the formula :—

$X = \frac{10^6}{6.28\ f\ C}$ when "f" equals the frequency of the current, C the capacity in *micro-farads*, and 10^6 another way of writing 1,000,000.

If the capacity is in "farads," which is *not* usual with radio circuits, the formula can be written $X = \frac{1}{6.28\ f\ C}$

Example :—

What reactance will a by-pass condenser of .01 mfd. offer at frequencies of 1,000,000 cycles (300 metres) and 150,000 cycles (2,000 metres)?

$X = \frac{1{,}000{,}000}{6.28 \times 1{,}000{,}000 \times .01}$

which equals 16 ohms.

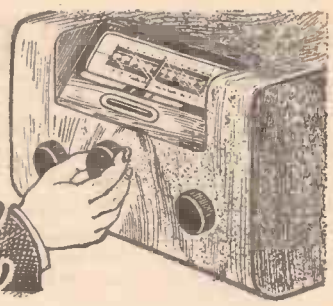
At the other frequency,

$X = \frac{1{,}000{,}000}{6.28 \times 150{,}000 \times .01} = 106$ ohms.

These two examples show how the reactance is affected by the frequency, and, if one or two cases are worked out, particularly with currents of a lower frequency, i.e. audible frequency, the effect will be shown in a most striking manner.

(To be Continued)

On Your Wavelength



By Thermion

Those Free Components

I PUBLISHED the details of a generous offer by one of my readers who had some wireless components to dispose of. I received a large number of applications, and I have forwarded those on to the donor who by this time has disposed of them to what he considers to be the most deserving case. I mention this to indicate that the offer is now closed and I cannot entertain further applications.

Offers of Back Issues

VERY often a reader who for reasons of space has to dispose of his back issues asks me to publish a paragraph indicating that he would be glad to dispose of them for a reasonable sum. I am unable to do this, for such readers are likely to be put to such considerable expense if a demand for one issue exceeds the supply. The reader would be compelled to return the money. If you have issues for sale they must be advertised in the Miscellaneous columns. If you have issues to dispose of free, such parcels should be sent carriage forward, otherwise dozens of readers will send remittances for carriage which will have to be returned.

Important Dates

DO you know the date on which Marconi was born, or when the first patent was granted for wireless telegraphy, or when the first signal was transmitted across the Atlantic, or when wireless was first used for life saving at sea? There are a lot of important dates in wireless which you should note in your diary, and I give a list of them herewith. As I have been to considerable trouble to dig out these dates, they are worth setting on record, and so that I may make the list more complete if there are any which occur to you, I shall be glad if you will drop me a card.

January 1st, 1894, Professor Hertz died.
January 20th, 1904, First Press message across the Atlantic.
January 31st, 1926, Rugby Telegraph Station opened.
February 2nd, 1896, Marconi came to England.
February 11th, 1847, Thomas Alva Edison born.
February 14th, 1922, Writtle (2MT) Transmitter opened.
February 19th, 1745, Alessandro Volta born.
February 22nd, 1857, Professor H. R. Hertz born.
March 3rd, 1899, First use of wireless in life saving at sea.
March 3rd, 1847, Dr. Alexander Graham Bell born.
March 5th, 1827, Alessandro Volta died.
March 9th, 1930, First dual transmission from Brookmans Park.
March 16th, 1787, Georg Simon Ohm born.
March 20th, 1727, Sir Isaac Newton died.
March 30th, 1930, B.B.C. commence television broadcast.
April 27th, 1791, Samuel F. B. Morse born.
May 30th, 1927, Baird Television by wire between London and Glasgow.
June 2nd, 1896, Marconi's first British Patent granted, No. 12039.
June 12th, 1851, Sir Oliver Lodge born.
July 20th, 1937, Marchese Marconi G.C.V.O., died.
August 1st, 1922, Dr. A. Graham Bell died.
September 9th, 1737, Luigi Galvani born.
September 22nd, 1918, First messages transmitted by wireless to Australia.
September 16th, 1929, First Regional Station, Brookmans Park, opened.
September 30th, 1922, First Radio Exhibition at Horticultural Hall.
October 18th, 1931, T. A. Edison died.
November 16th, 1904, First Fleming Valve Patent granted.
November 25th, 1642, Sir Isaac Newton born.
December 12th, 1901, Marconi succeeded in transmitting and receiving signals across the Atlantic Ocean from Poldhu, Cornwall, to St. John's, Newfoundland.
December 15th, 1922, British Broadcasting Company, Ltd., registered.
November 14th, 1922, London (2LO) First British Broadcasting Station commenced.

I observe that many of the wireless diaries do not include these important dates, although I understand that one to be produced this year will do so.

Component Shortage

ALTHOUGH matters are improving, I am still receiving complaints from readers who find difficulty in obtaining components. They seem to think that I can wave a magic wand, for quite a number of them are expecting me to do their shopping for them. A number of others dash off a letter written in vitriol, and when I come to investigate the matter I find that their complaints are not justified. The facts are usually on the side of the manufacturers in those cases of complaint regarding delivery or overcharging for repairs. You will remember that in a recent case a reader complained that he had been charged heavily for the repair of an earpiece. When I investigated the matter with the makers I found that two earpieces had been repaired. Also, that the invoice shown to me by the makers differed by 1s. from the amount which the reader said he had been charged. It was less by 1s. Before writing letters of complaint to me, don't allow your annoyance to colour your statements. Where I find them inaccurate I can do nothng further.

Televising the Cenotaph Ceremony

I AM informed that the Home Secretary has given permission for the televising of the Cenotaph service on Armistice Day. It is hoped

to begin transmission at 10.30 to enable viewers to see the waiting crowds and to watch the assembly of troops and the arrival of members of the Cabinet and His Majesty the King. Three cameras will be used, two of which will be mounted at first-floor level in Richmond Terrace to give scenes near the Cenotaph, and it is probable that telephoto lenses will be used. The third camera will give comprehensive views of Whitehall and, if lighting permits, a distant view of Big Ben.

Experiments in Science

THE cycle bell of an ice-cream vendor which seemed to be ringing itself attracted the attention of Professor Mary Waller, of the London School of Medicine for Women. She investigated on the spot and discovered that the "trick" was due to the action of the solid carbon dioxide used as a freezing mixture. Experiments with solid carbon dioxide are to be televised in the first of a series of "Experimental Science" transmissions in the afternoon programme on October 7th. Professor Waller will show how this substance can be used to test the genuineness of diamonds and pearls, which give ringing tones of varying quality when touched by solid carbon dioxide. Perhaps the most spectacular experiment in front of the television camera will be the making of patterns in silver sand. Beautiful shapes are made simply by waving the solid carbon dioxide over the sand.

"Padded Cells"

I UNDERSTAND that the "padded cells" in the Philco Radio factory at Perivale might spin tales as romantic as any ever created by Aladdin and his magic lamp. There are four of these "silent" rooms, and each has its own use in the tests performed on wireless receiver components and finished sets.

The incoming inspection room is one "padded cell" in which all radiogram motors are tested for quietness of operation. In the "Sales Acceptance" room finished sets are tested from every angle to be sure there is nothing the matter with them which will prevent satisfaction for the owner after it is sold. Every speaker is tested in another "padded cell" and the fourth "silence chamber" is located in the research laboratories, where new designs are tested for acoustical properties and general performance. The silence achieved in the speaker test-room is typical of the others. It is so perfectly silenced that the quietness actually "hurts" the ears.

The insulation and construction of this, and other "padded cells," prevent reflection of any sound, whether of 30 or 20,000 oscillations a second, although speakers usually are geared and tested for top range of something like only 10,000 vibrations a second. Many persons are unable to hear sounds in such high frequencies as 20,000 to the second. While that is the limit, Philco Radio has a sound pressure measuring instrument capable of measuring frequencies considerably higher than can be detected by the most sensitive human ear. In fact, the apparatus can detect sounds audible only to insects.

Notes from the Test Bench

Microphone Howl

READERS using a microphone for the first time generally experience instability in the form of a howl. This can be due to the use of an unsuitable amplifier—lack of decoupling in the anode circuits can cause instability. When the decoupling is inadequate the howl is set up on radio as well as on gram., however, and therefore if the howl occurs only on gram. it will be due to the close proximity of the microphone and loudspeaker. The microphone is actuated by the speaker's voice as well as by the output from the loudspeaker. The cure for this is to screen the microphone from the loudspeaker.

Pick-up Hum

ANOTHER trouble commonly experienced is excessive hum when a pick-up is connected to a receiver of the mains-operated type. In most cases this is due to the pick-up leads being unscreened, and if the leads are passed through a screening cover the hum will be eliminated. The metal screening should, of course, be connected to the chassis. Hum can also be due to interaction between the gram. motor windings and the pick-up winding, but this can generally be eliminated by earthing the motor casing.

H.T. Supply from 110 Volts

WE often receive inquiries from readers living in country districts or aboard ship concerning a suitable unit for supplying H.T. to their sets from 110 volts D.C. mains. The normal type of D.C. mains unit, such as the one described in the issue of PRACTICAL AND AMATEUR WIRELESS *dated 23rd November, 1935, may be used for this purpose, but as the voltage is 110 volts instead of the normal 220-250 volts the main dropping resistance will not be required. The smoothing choke resistance should also be kept as low as possible in order to keep the voltage as high as possible. Optimum results cannot be obtained even from battery type valves with a voltage of 100 volts, but as this voltage is steady it is preferable to a dry battery, as most listeners allow their dry batteries to drop well below 100 volts before renewing them. It is a simple matter to increase the mains voltage to the permissible maximum by the addition of a low voltage dry battery, of course, but if a push-pull output stage is used this should not be found necessary.*

The New Transmitter at Stagshaw

THE afternoon of October 19th brings an event of major importance in the history of broadcasting in the North of England; a day specially to be noted and remembered by listeners in the North-East. As mentioned elsewhere in this issue, the new station is to be opened by the Duchess of Northumberland.

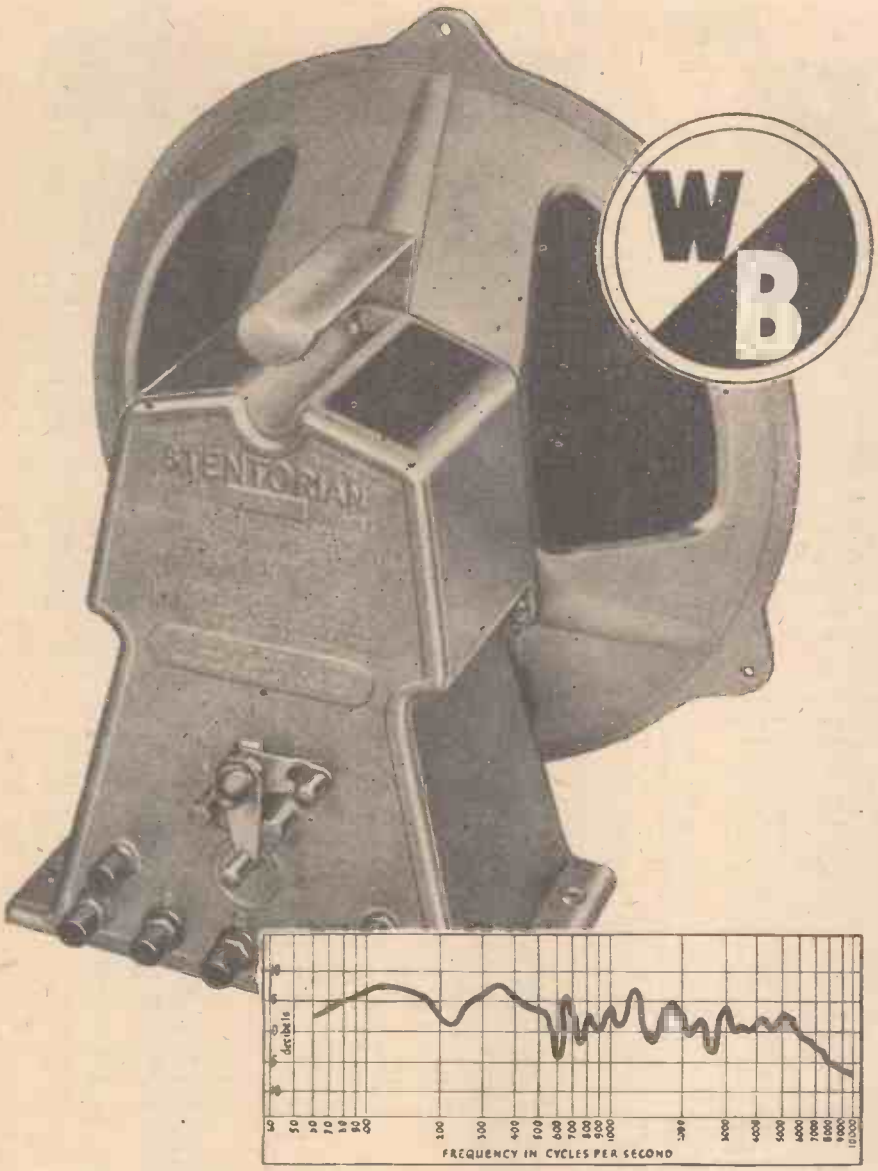
This giant transmitter, whose one huge mast (towering skywards for 480 feet on a hill which stands 700 feet above the sea) is itself the aerial, is to improve listening conditions in Northumberland, Durham, Cumberland, Westmorland and the North of Yorkshire. The station, situated in a lonely but lovely district, which many Northumbrians know as Bewclay, is almost on the line of Hadrian's Wall, and the grand views which it commands include a fine prospect to the Cheviots in the North, and an outlook over the Tyne valley to the South.

Hawaii Listens-in to Insects

WITH the proper sensitivity in microphone construction, the Hawaiians find it possible to detect the presence of insects in growing crops.

Sound Systems, Inc., of Cleveland, recently received an order from Honolulu for sound equipment to serve this purpose. The specifications called for a contact microphone and amplification of at least 100db. The unit is portable and battery operated. It includes a small high gain amplifier operated by dry cell batteries. It is built in a compact and durable carrying case, and among the accessories are a contact microphone and the highly sensitive crystal headphones.

With the low signal input produced by insects, it is not advisable to use a loudspeaker. With the highly sensitive crystal contact microphone, crystal headphones and the high gain amplifiers, the faintest sounds are audible.



PRACTICAL WIRELESS (25/9/37) SAYS:—

"Better on the score of sensitivity . . . . better tone-characteristic . . . . smoother . . . . thousands will be highly pleased with the extra quality which results from fitting this new speaker."

And here is the personal opinion of Mr. F. J. Camm:—

"Good and bad sets will be improved by it. It is an important advance in speaker technique."

F. J. Camm

HEAR WHAT THE *NEW* Stentorian CAN DO FOR *YOUR* RECEIVER!

WHITELEY ELECTRICAL RADIO CO., LTD. (Technical Dept.) MANSFIELD, NOTTS.

Practical Television

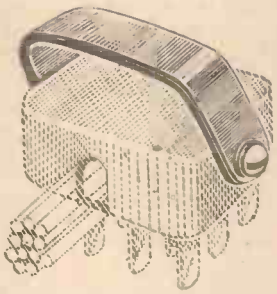
October 9th 1937. Vol. 3. No. 69.

TELEVISION CONSTRUCTOR AIDS

Details of Some of the Main Television Constructor Accessories which may Now be Obtained.

By W. J. DELANEY.

NOW that more amateurs are becoming interested in the television transmissions it is worth while discussing the various accessories which are available for experimental purposes. The modern television receiver may be divided up into four separate sections—the Mains unit, the Time-base Generator, and the two Radio units, one for Sound and the other for Vision. Into each of these sections components and valves such as are normally used for broadcast apparatus may be incorporated, but there are many special parts and valves which must be utilised. The radio section for sound may be dismissed, as this follows normal ultra-short-wave practice, whilst the time-base generator will also employ only standard components and valves except where a special gas-discharge tube is employed. This may be considered, however, as a valve and presents nothing out of the ordinary in its connection or mounting. The first consideration among the unusual or special parts required for the complete apparatus is the connection between the various chassis. The mains unit may be built to develop all of the voltages required in every section, and thus multi-cables will have to be employed for inter-connection. Apart from the fact that some interaction may be experienced if all of these cables are run in a single "bunch," there will also be difficulty in providing adequate insulation. The supplies for the cathode-ray tube will, therefore, be kept separate, and for the various leads high-quality flex or rubber-covered V.I.R. cables should be used.



Figs. 2 and 3.—On the left is the Belling-Lee 10-point socket and plug, which is ideal for television purposes, and on the right is the 12-point Bulgin plug in its new form, with a leather strap for easy removal.

Connectors

Multi-contact connectors will be needed on each chassis, and for these the Bulgin or the Belling-Lee components illustrated on this page may be used. Large diameter insulated sleeving may be slipped over certain leads to provide increased insulation, or rubber tubing such as is used in player pianos may be employed. Care will have to be taken to keep the various leads separated according to the voltage differences existing between them. When mounting the sockets on the chassis adequate spacing must be allowed between the sockets and the chassis if this is of the metal pattern, although with a metal-surfaced wooden chassis this difficulty will not arise.

Mains Unit

On the mains unit special transformers will have to be employed for the tube supply voltages and there are several of these now obtainable from B.T.H., Sound Sales, Haynes Radio, Heayberd, and other firms. Although ordinary valveholders may be used for the rectifiers, if the H.T. is obtained from valves for the tube, special top-cap connectors of the insulated cowl type should be employed to avoid the risk of shocks. Special metal rectifiers are, however, now available for this purpose and are preferred by some experimenters. There are several advantages in the use of this type of rectifier for the very high voltage-low current supply which is required.

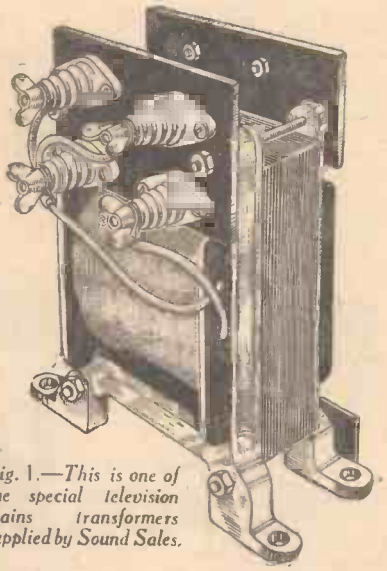


Fig. 1.—This is one of the special television mains transformers supplied by Sound Sales.

Special Valves

For the vision-radio chassis certain special valves are now on the market, amongst these being special diodes for the second-detector stage. Special I.F. transformers to provide the requisite band-width, or special chokes where choke-coupling is employed, are also now available from such firms as B.T.S., Eddystone, Bulgin, etc. Very elaborate screening is needed in this particular section of the receiver, and it is almost impossible to avoid the use of metal for the construction of the screens and chassis. Remember that aluminium is the best material for these, not only on account of the ease of working the soft metal, but on account of its low H.F. resistance. Standard resistors and condensers may be employed in the normal circuit wiring, but a special output transformer may be required, according to the type of circuit which is adopted.

Fixed Condensers

A special point which should receive attention is in the selection of the fixed

(Continued overleaf)

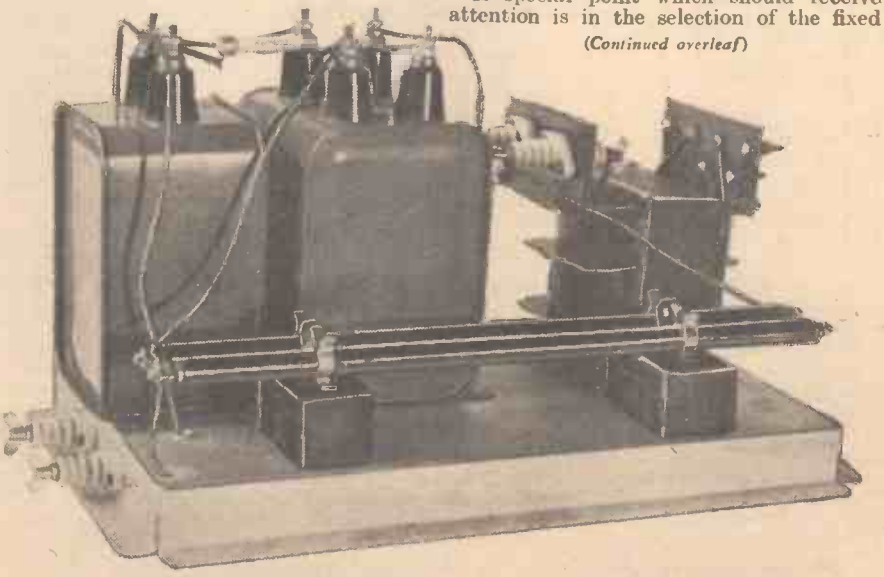


Fig. 4.—This complete television power pack shows the special high-voltage metal rectifier, and special high-insulation fixed condensers.

PRACTICAL TELEVISION

(Continued from previous page)

condensers. On the radio units the highest insulation from an H.F. point of view is needed and where possible mica dielectric should be adopted. For the high-voltage circuits, the special oil or petroleum jelly condensers should be used and the peak voltages must be carefully calculated in order to avoid damage to these. The problem of insulation is probably one of the most important items met with in the general constructional design and thus no risks should be taken in the wiring, or in the mounting of the individual parts. Thick wire should be employed for connection, and insulated sleeving should be used over every lead, with additional sleeving of larger diameter (or the rubber tubing previously mentioned) where leads pass through holes in a metal chassis. In certain cases it may even be found necessary to drill a very large hole—say, ½in.—in the chassis so that the lead passing through it may be given sufficient spacing to avoid arcing to earth.

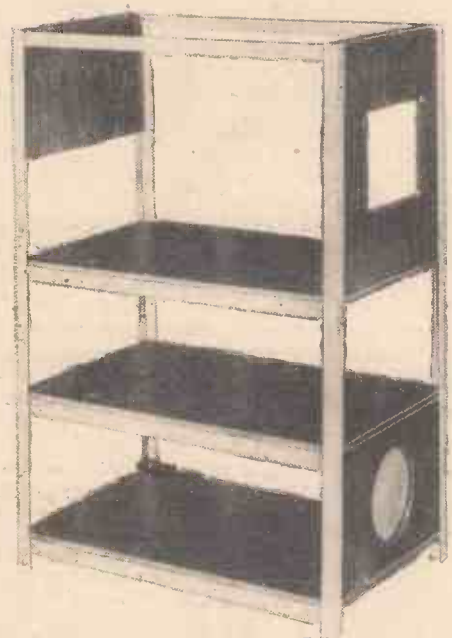


Fig. 5.—The complete television equipment may be housed in this "rack" type cabinet as supplied by Messrs. Peto-Scott.

Ventilation

Owing to the large number of valves employed in the complete equipment a considerable amount of heat may be expected, and thus each chassis should be well spaced from its neighbour and adequate air circulation should be provided. The mains unit should be kept clear, for instance, of the underside of a radio unit so that no damage can arise to insulation on leads or components.

Many experimenters may prefer to obtain ready assembled units for certain parts of a television receiver, and in this connection it should be remembered that Messrs. Peto-Scott can now supply a complete television receiver in kit form in a series of separate units. Where any doubt exists as to a suitable layout or suitable components one of these units may be obtained, thus leaving the experimenter a smaller field in which to work and avoiding considerable experimental work. These kits are available as follows:

Sound and Vision Receiver Unit, £6 17s. 6d. (less valves).

Time-base Generator, £7 15s. (less valves and cathode-ray tube). This unit utilises a gas-discharge triode and a pair of paraphase amplifiers for each set of deflector plates, and is of the electrostatic type.

Receiver Power Pack, £3 10s. (less valve). This delivers 250 volts at 120 mA, 4 volts at 8 amps, and 4 volts at 4 amps.

Time-base Power Pack, £3 15s. This is also less valve and it delivers 1,000 volts at 20 mA, 4 volts at 6 amps, and 250 volts at 5 mA.

Tube Exciter Unit, £4 17s. 6d. This is for the high tension and heater supplies for the cathode-ray tube and provides an output of 3,000 volts H.T. and 2 volts 1.5 amps for the heaters. Metal rectification is employed.

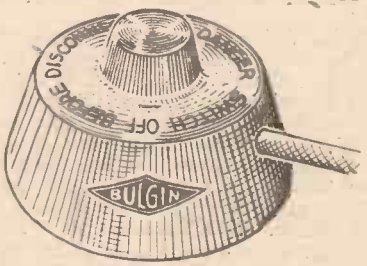


Fig. 6.—The high-voltage rectifying valves should be fitted with insulated connectors of this type to avoid risks.

In addition, a large metal framework is obtainable for £1 7s. 6d., which enables each unit to be mounted rigidly, and which will fit into a large radiogram type of cabinet. It is complete with shelves, tube mask and panel, speaker panel, control panel, and foot blocks with domed castors. It may thus be used, if desired, without any external cabinet.

The Telephone Linked with Television

AS far back as 1929 when the first television exhibition was staged in Berlin in conjunction with the annual radio exhibition, the German Post Office demonstrated two-way vision and sound between two booths over a short length of line. A large spiral apertured disc was used at each end, the scanning section for transmitting operating on the spot-light principle and being located at the top section of the disc with simple photo-electric cells picking up the reflected light to generate the television signals. The bottom section of the disc acted as reproducer, giving a small and rather indistinct low-definition picture with the aid of a flat plate neon lamp. While admitting quite freely that the results obtained were crude, it showed a special form of development as far as the telephone associated with television is concerned, and this German appreciation of the ultimate domestic, commercial and political future for such a scheme has never been allowed to lapse. Nearly three years later two-way vision and telephony was demonstrated to a higher degree of perfection in Paris between a studio in the Galeries Lafayette and the offices of the French newspaper *Le Matin*. The pictures seen by the persons talking were much clearer and brighter, the head and shoulders appearing as a back projected picture on a translucent screen 10in. by 5in. A crater type neon lamp functioned as the source of light modulated by the television signals with a mirror drum as the scanner. The transmitter still worked on the light-spot principle, but for the first time infra red rays were used to scan the sitter's face, and in consequence not the slightest trace of discomfort was experienced by those using the telephone in this way. The equipment for this French installation was designed and built by the Baird Company.

Later Developments

LITTLE more was heard until March, 1936, when the Germans brought into service a well-designed installation to operate between Berlin and Leipzig. The standard of definition employed was 180 lines per picture and 25 pictures per second, and this service has functioned continuously and become quite a profitable "side issue" of the German Post Office activities. Still not content with this, the co-axial cable has been extended to Nuremberg, a distance of approximately 300 miles, and very shortly an additional section between Nuremberg and Munich will be opened for public use. Apart from regular television telephone calls, the direct relay of Nazi Party rallies will be undertaken over the public lines, and these later pictures will be shown in the public viewing rooms in some of the German cities. At the moment the repeater stations associated with the co-axial cable are positioned at approximately 21-mile intervals. This limits the signal frequency fed over the line to a figure capable of reproducing with the minimum of distortion the 180 line picture standard.

Steps are now being taken, however, to double the number of repeater stations and so enable the cable to pass the picture frequencies involved in Germany's new television standard of 441 lines, interlaced, 50 frames per second. The 180 line scanner for transmitting the head and shoulders of the person telephoning is a highly efficient mechanical one employing a lens drum in lieu of the more simple apertured disc. To increase the peripheral spacing of the highly corrected lenses in the drum a double spiral is employed with a cam operated shutter and in this way a complete picture frame is scanned in two revolutions. This was the arrangement used in the light-spot scanner installed at Alexandra Palace prior to the decision to employ electron cameras only. The picture of the person telephoning from the other end of the line is reproduced on a cathode-ray tube receiver so positioned that it can be watched in comfort by the person making the call. With all the modern developments of television which are now taking place so rapidly there is surely ample scope for the British Post Office to give careful consideration to a television telephone in this country. It would bring Britain abreast of Germany in this particular sphere, while maintaining the leadership now enjoyed by this country in the realm of a public broadcast television service.

Televiews

Improved Make-up Technique

READERS who saw pictures of the artists taking part in television transmissions twelve to fifteen months ago were amazed at the amount of make-up required. Blue was a very predominant colour, red lip stick was barred, while the extent of the powder and paint gave each individual a very grotesque appearance. This was necessary, however, owing to the colour responses of the photo-electric surfaces then employed either in in the photocells or camera electrodes, coupled with the relatively low degree of sensitivity. The maximum degree of contrast was essential if the resultant television picture reproduced on the cathode-ray tube receiver was to embody sufficient depth of light and shade to give pictorial value. Then again, studio lighting was very intense, with the result that artists felt very uncomfortable when endeavouring to lose any degree of nervousness on the occasion of initial broadcasts. Technical improvements have now removed this "terror," however, and the conditions under which studio televising is carried out have changed considerably. Vivid colouring is no longer necessary, only delicate shading. Men are given a healthy tan with a liberal sprinkling of powder to reduce any beard effects. A careful study of lighting both from the standpoint of candle power and distribution, coupled with improvements in the design of the cameras, particularly in connection with mosaic sensitivity, has been instrumental in bringing about these welcome changes. In many cases people have been televised without any make-up on at all, a step which becomes essential when well-known public personalities are persuaded to appear before the television camera either inside the studio or in the open air. Much remains to be done, however, but the progress made in twelve months is a happy augury for the future.

A Range Extension

THE extension of the B.B.C. television service area well beyond the original predicted range is now an established fact, but many have conjectured as to the results that could be obtained if the Alexandra Palace Station power was increased and the aerial raised higher than at present. Answers to these questions will no doubt be forthcoming when the French station at the Eiffel Tower is in full swing. At the moment it is working at half its 30 kilowatt rating, while the aerial is about 60 per cent. higher than the mast at Alexandra Palace. It is not beyond the realm of possibility that the Paris station may be seen and heard on the South Coast of England. If so, viewers in that region will have an alternative programme, while if the French adopt the British picture standard the B.B.C. could relay by cable or directional micro-wave links of any of these programmes so that they could be re-broadcast from the London station. A directional aerial system with beamed reflectors may be essential at first, and experiments for reception are already in hand.

Miss Beryl Orde, the famous broadcasting star, amused while watching a television performance on the General Electric Company's table vision set, which can be plugged into any existing radio set on A.C. mains. Priced at 35 gns. it will bring television within the means of tens of thousands of listeners within 30 miles radius of Alexandra Palace and from other stations when they are established.

Cinema Television

DURING the last few weeks much has been said concerning the installation of large-size television screens in cinemas. This is a certain indication that big pictures, comparable in detail and brightness to that seen in any modern cinema, are making satisfactory progress. At present two widely different schemes of development are being made. One is electro optical, and the other is mechanical optical, and the absence of a side by side demonstration prevents any direct comparison between the results so far achieved. Another scheme about which little has been said of late is the intermediate-film receiver. For some reasons this appears to be a really sound idea, for it merely means the installation of a piece of equipment next to the standard film projector. This receiver would develop, wash, fix and dry standard 35 mm. film on which television pictures and the accompanying sound had been recorded, so that it could be fed straight into the projector head. The fact that there is a delay of some seconds between the televised event taking place and its subsequent portrayal on the cinema screen is negligible, and all the problems of picture brilliance and size would be solved at once. The main problem as far as cinema television is concerned at the moment does not appear to be a technical one, but is associated with the source of transmitted signals.

An experiment unique in the history of television and of football was made at the Arsenal ground recently when one half of the team watched by television the other members undertaking their routine training. From the mobile television unit in the Stadium, the pictures were transmitted to the Alexandra Palace, and from there were re-radiated on the normal television wavelength and picked up on a Marconiphone television receiver in the Directors' room in the East Stand.

Our Radiolympia Competition Result

What are the Most Important Features of the Modern Receiver?

In the Competition which was published in our issue dated August 28th last only 15 readers successfully forecast the order of the popular features of modern receivers as shown by the entries on the coupons submitted. Fourteen readers had one mistake each, and thus we have decided to add four more speakers to the 25 originally intended as prizes, and the following 29 readers will therefore each receive one of the latest W.B. Stentorian speakers in due course.

The following readers gave all-correct results:

F. Chilton, 37, Ewart Street, Saltney Ferry, Chester.
H. Cramp, 63, Arragon Gardens, Streatham, S.W.16.
G. H. Gresswell, 35, Silver Street, Bradford, Yorks.
A. M. Hawkins, 11, Claverdale Road, Brixton, S.W.2.
S. Holden, 12, Lulworth Avenue, Marton, Blackpool.
A. S. Hughes, 3, Pelham Square, Brighton, 1, Sussex.
C. Lapthorn, 3, Brampton Road, Harringay, N.15.
Basil New, 12, Eastholm, Golders Green, N.W.11.
F. Ogden, 22a, Coronation Street, South Reddish, Stockport.
G. Renton, 3, Dunlop Terrace, Penicuik, Midlothian, Scotland.

G. Randall, Royal Horse Guards, Windsor, Berks.
H. A. Smith, Cambridge House, Stanley, Perthshire.
R. A. Turner, 21, Stewardstone Road, South Chingford, Essex.
J. Wann, Balmullo Leuchars, Fife, Scotland.
V. J. C. White, Primrose Cottage, Llangrove, Herefordshire.

The following readers had one mistake each:

O. Adams, 34, Dollis Hill Avenue, Cricklewood, N.W.2.
R. Boyd, 77, Knutsford Drive, Cliftonville, Belfast.
C. S. Brown, 31, Whitestile Road, Brentford, Middx.
L. Burman, 35, Green Lane, Lofthouse, Yorks.
R. Chamberlain, 2, Cardigan Street, Canton, Cardiff.
F. Helm, 3, Swan Road, Harrogate.
J. F. Hitchcock, "Brierley," Farm Close, Fetcham, Leatherhead, Surrey.
R. F. Jones, 26, Pagefield Road, Liverpool, 15.
J. Little, 26, Wilson Avenue, Kilmarnock, Scotland.
C. Raines, "Faith Haven," Newton Road, Tankerton, Whitstable, Kent.
V. Neil Taylor, 13, Spring Gardens Terrace, Cardiff, Glam.
W. R. Taylor, "Glenlivet," Spot Lane, Ashford Road, nr. Maidstone.
L. J. Tearney, 23, Oakfield Lane, Dartford, Kent.
A. S. Woodley, 18, Duke Street, High Wycombe, Bucks.

Important Broadcasts of the Week

NATIONAL (261.1 m. and 1,500 m.)
Wednesday, Oct. 6.—Princess Flavia, musical comedy programme.
Thursday, Oct. 7.—Death at Newtownstewart, a reconstruction of a famous Ulster crime in the 'Seventies, by Denis Johnston.
Friday, Oct. 8.—Contemporary Music Concert.
Saturday, October 9.—Music Hall programme.

REGIONAL (342.1 m.)
Wednesday, Oct. 6.—Instrumental programme.
Thursday, Oct. 7.—Princess Flavia, musical comedy programme.
Friday, Oct. 8.—A Farewell Flight over Blackpool: Organ recital from the Tower Ballroom; excerpts from concert parties from Feldman's Theatre and the South Pier; Dance music from the Tower Ballroom and a variety act from the Palace Theatre and Pleasure Beach.
Saturday, Oct. 9.—Death at Newtownstewart, a reconstruction of a famous Ulster crime in the 'Seventies, by Denis Johnston.

MIDLAND (296.2 m.)
Wednesday, Oct. 6.—The Brass Band Movement in the Midlands—1, The Leicester Imperial Band, preceded by a short account of the history of the Band.
Thursday, Oct. 7.—A Symphony Concert from the Town Hall, Birmingham.
Friday, Oct. 8.—Mary Webb, a programme based upon her life and work.
Saturday, Oct. 9.—The Musician at the Gramophone: A. Brent-Smith.

WELSH (373.1 m.)
Wednesday, Oct. 6.—A Choral and organ recital from St. Asaph Cathedral, St. Asaph.
Thursday, Oct. 7.—Nothing is New—1, Music.
Friday, Oct. 8.—Blodwen, a dramatic cantata by Joseph Parry, from Tabernacle Chapel, Cardiff.
Saturday, Oct. 9.—Labour Management and its Problems, a talk.

WEST OF ENGLAND (285.7 m.)
Wednesday, Oct. 6.—Variety programme, from the Empire Theatre, Swindon.
Thursday, Oct. 7.—Song recital.
Friday, Oct. 8.—Concert in Camera—first rehearsal for a performance to be given in the year 1897.
Saturday, Oct. 9.—Orchestral programme from the Pump Room, Bath.

NORTHERN (449.1 m.)
Wednesday, Oct. 6.—Orchestral programme.
Thursday, Oct. 7.—Variety programme from the Alexandra Theatre, Hull.
Friday, Oct. 8.—Farewell Flight over Blackpool: Organ recital from the Tower Ballroom; excerpts from concert parties from Feldman's Theatre and the South Pier; dance music from the Tower Ballroom and a variety act from the Palace Theatre and Pleasure Beach.
Saturday, Oct. 9.—Running commentary on the second half of the Rugby League match, Salford v. St. Helens Recs., from the Salford Football Ground.

SCOTTISH (391.1 m.)
Wednesday, Oct. 6.—Scottish Dance Music.
Thursday, Oct. 7.—Dance Music programme.
Friday, Oct. 8.—Meal and Ale, a By-Ordinar' Nicht at Braeside, a play.
Saturday, Oct. 9.—Recital of Scots Songs.

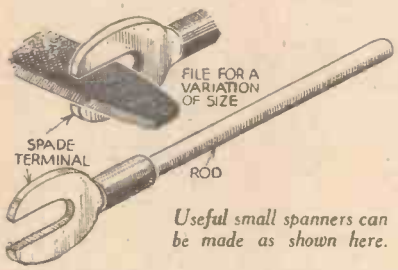
NORTHERN IRELAND (307.1 m.)
Wednesday, Oct. 6.—Dance music.
Thursday, Oct. 7.—Song recital.
Friday, Oct. 8.—Organ recital from the Ritz Cinema, Belfast.
Saturday, October 9.—Death at Newtownstewart, a reconstruction of a famous Ulster crime in the 'Seventies, by Denis Johnston.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

Making Small Spanners

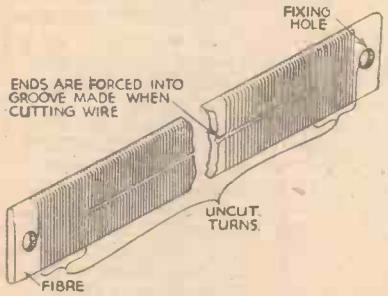
THE constructor is often in need of one or two small spanners, and very useful ones can easily be made as shown in the accompanying sketch. An ordinary spade terminal is taken, and the insulation removed, after which a metal rod of suitable length is fitted tightly into the terminal stem. The opening in the spanner can be widened to the required width by means of a file.—M. TIPON (Middlesbrough).



Useful small spanners can be made as shown here.

Home-made Potentiometers and Resistances

EFFICIENT variable potentiometers and resistances of high value can easily be made from the wire-wound, five and four hundred ohm types, which were much used some years ago. After taking the resistance strip from the circular holder, straighten it out on a flat metal surface. Then, with a not too sharp chisel, cut the turns of wire along the centre, leaving about ¼in. uncut at each end. The wire, after cutting, will not loosen, but will hold fast to the groove made in the fibre when cutting the turns. Fix one end of the strip to its holder—groove inside—then, as the strip is bent round, fill the groove with powdered black-lead or graphite. When the other end of the strip is fixed in position, the powder will be forced into the groove to make good contact with the ends of the cut wires. By experimenting with the amount of powder used, various values can be obtained. Also, a "graded track" potentiometer can be made by suitable distribution of the powder along the groove.—ALEC DAVIE (Edmonton).



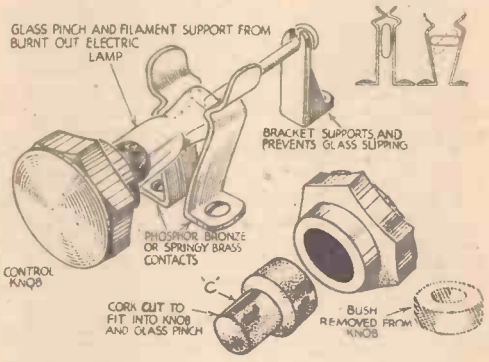
A method of making neat resistances.

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.

Low-loss Switching

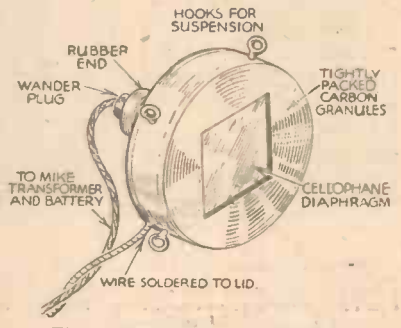
THE efficient switch, shown in the accompanying sketch, can easily be made with a control knob and a cork, together with the filament support and glass pinch from a burnt-out electric lamp. A few screws, and a brass strip will also be required, and as these parts are usually found in the junk box, the switch can be made in a very short time. By carefully breaking away the glass globe the pinch can be removed quite easily and the rest of the job is just a case of fitting together and screwing the parts into position.—A. CARR (High Wycombe).



Details of a simple low-loss switch.

A Small Microphone

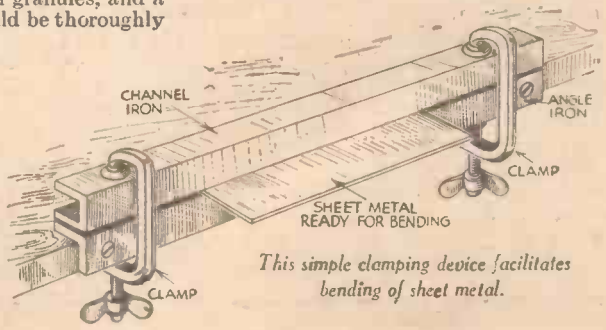
THE accompanying illustration shows a simple and efficient microphone which I have constructed. It is made from an empty dentifrice tin, a rubber end used for gas tubing, and a cellophane jam cover, together with some carbon granules, and a wander plug. The tin should be thoroughly cleaned and a ½in. hole drilled in the centre of the lid. In the base a hole 1¼in. square can be cut, and this can easily be done with an old wood chisel. Take the rubber end and cut it about ½in. from one end; push this piece of tubing through the ½in. hole in the lid. Damp the cellophane cover slightly, place it between the lid and base, and allow it to set for an hour or so; the cellophane will by then have stretched tightly, forming an excellent diaphragm. The carbon granules can be poured through the rubber end in the lid, until they are packed tightly against the diaphragm. Insert a wander plug in the rubber end, so that it touches the carbon granules, and solder a wire to the lid. Take a wire from the wander-plug and connect the two wires, *via* battery and transformer, in the usual way to the p.u. terminals on the receiver. Lastly, four hooks can be soldered on the lid so that the microphone can be slung on a stand.—W. E. CAUGHEY (Belfast).



This small microphone can easily be made from odds and ends.

A Novel Sheet-metal Bender

THE accompanying sketches show how a novel sheet metal bender can be contrived. The materials needed are 1 length of ½in. channel iron, ⅛in. thick; 1 length of ½in. angle iron, ⅛in. thick, 2 small clamps, 1¼in. inside measurement, and two screws, to hold the angle iron to the bench. The two holes should be drilled near the ends of the angle iron to avoid having to bend the metal sheet over screw heads. Note that the ends of the screws for the clamps should not be pointed. By this means you have a convenient and inexpensive method of completing what might have been a difficult job.—J. S. TAYLOR (Lincoln).



This simple clamping device facilitates bending of sheet metal.

"PRACTICAL & AMATEUR WIRELESS" BLUEPRINT NO. P.W. 79. PRICE-ONE SHILLING

F.J.Camm's ALL-WAVE "CORONA" 4

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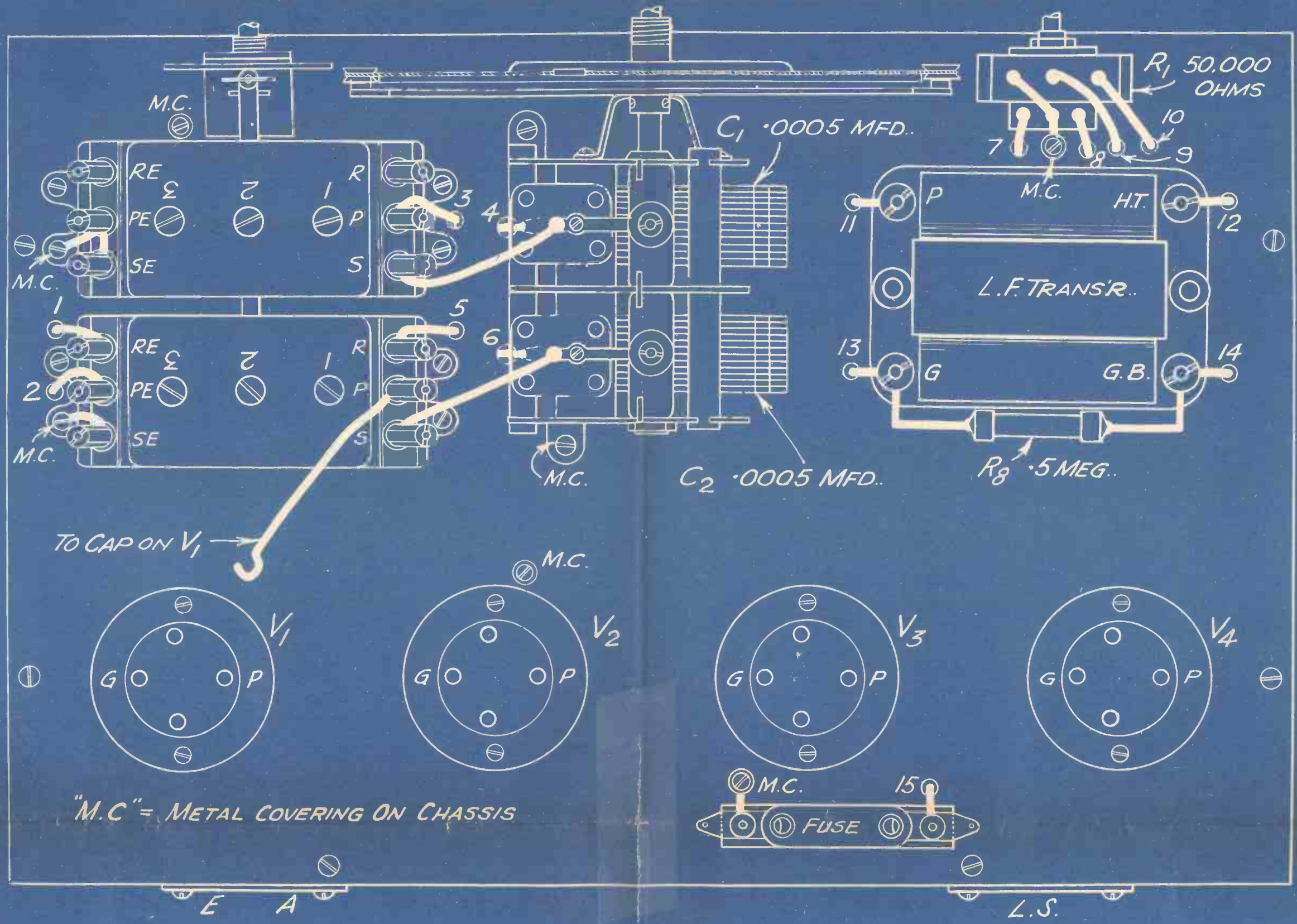
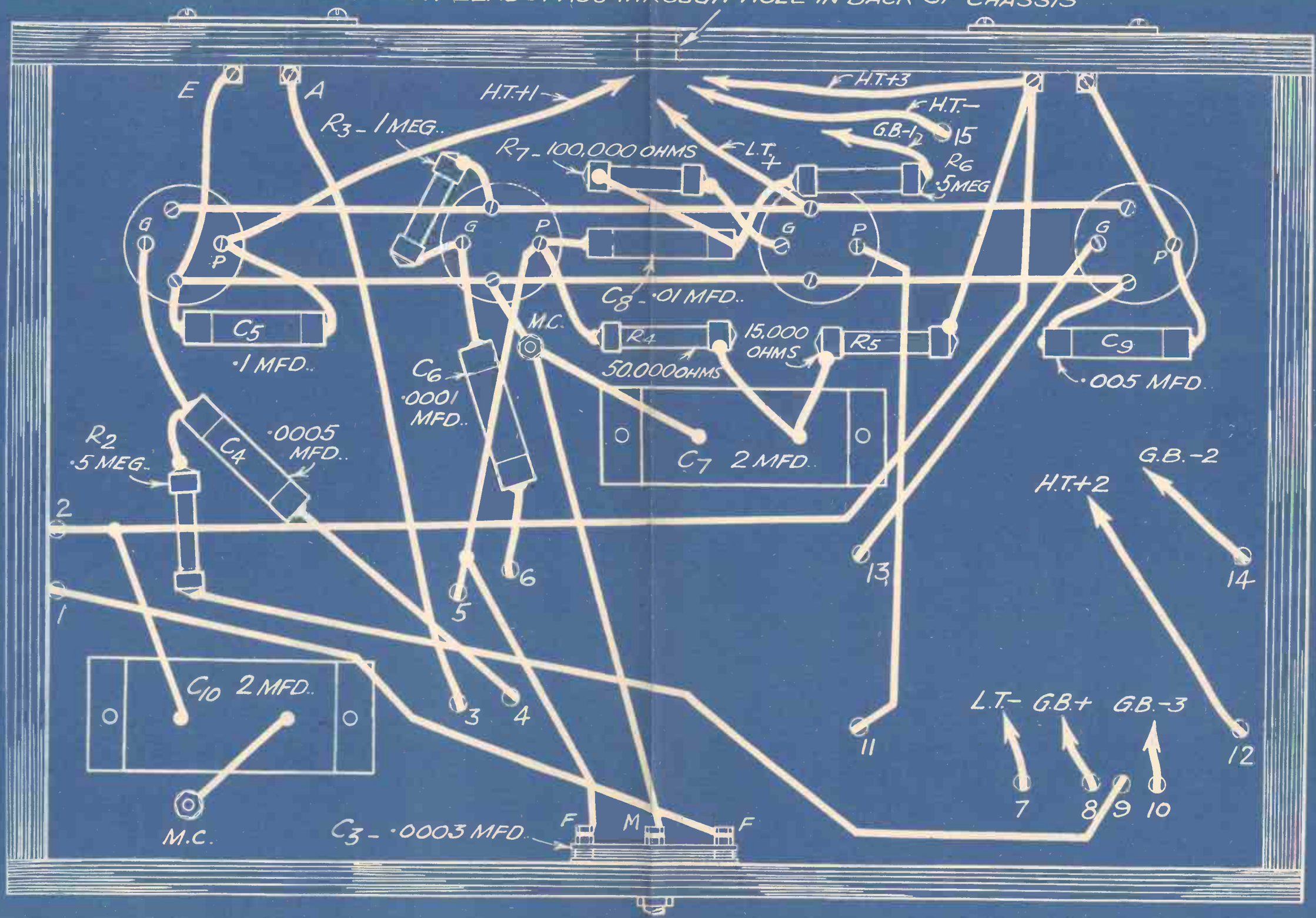
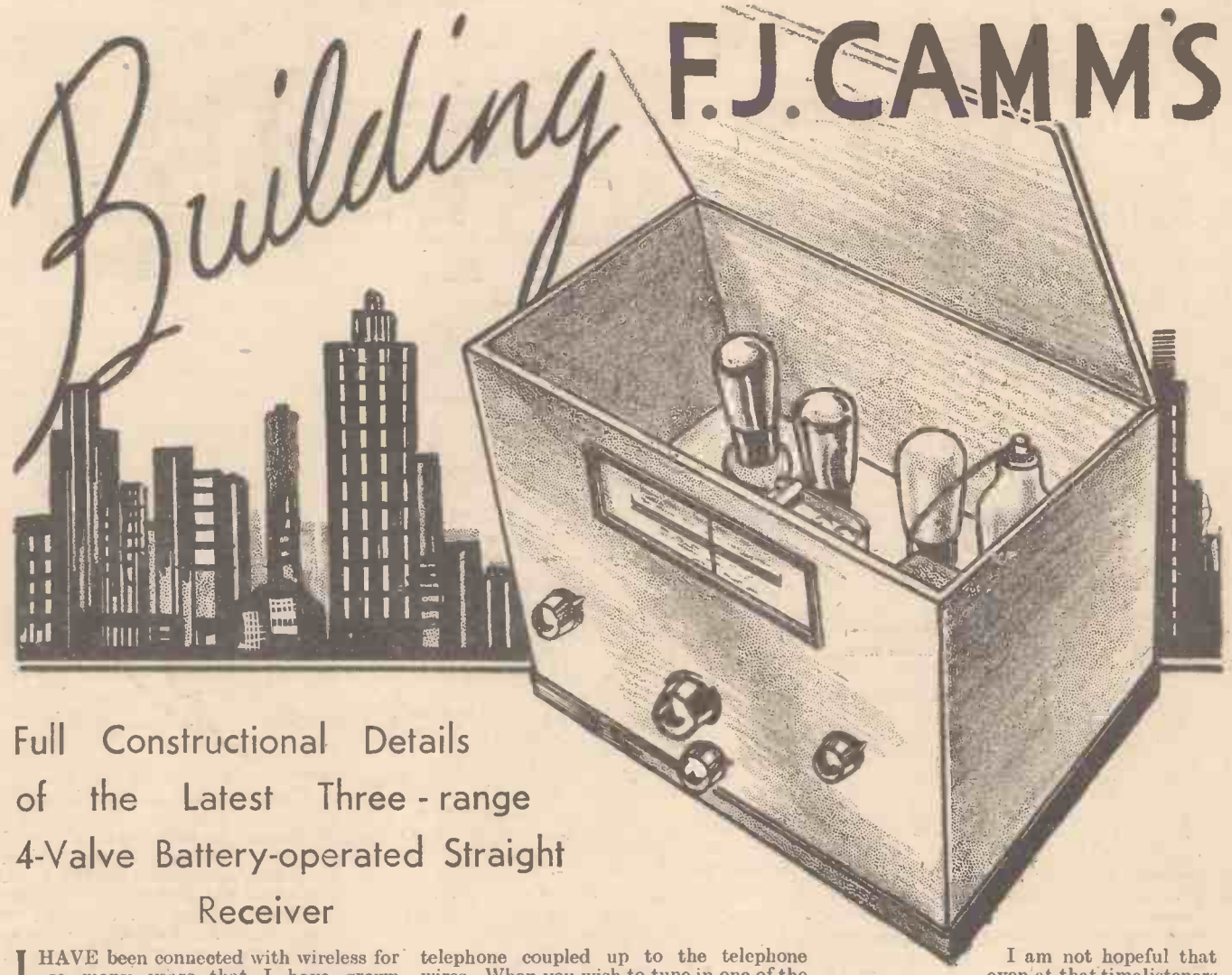



BATTERY LEADS PASS THROUGH HOLE IN BACK OF CHASSIS
E
A
H.T.+1
R3 - 1 MEG.
R7 - 100,000 OHMS
H.T.+3
H.T.-
G.B.-½
15
L.T.+
R6 .5MEG
G
P
C8 - .01 MFD.
C5 .1 MFD.
M.C.
R4 50,000 OHMS
15,000 OHMS
R5
C9 .005 MFD.
C6 .0001 MFD.
C7 2 MFD.
R2 .5 MEG.
C4 .0005 MFD.
G.B.-2
H.T.+2
2
1
5
6
13
14
C10 2 MFD.
3
4
11
12
L.T.-
G.B.+
G.B.-3
7
8
9
10
M.C.
C3 - .0003 MFD.
F
M
F

Building F.J.CAMM'S



Full Constructional Details of the Latest Three-range 4-Valve Battery-operated Straight Receiver

I HAVE been connected with wireless for so many years that I have grown tolerant of those whose job it is to write a few odd notes in the daily papers on wireless, and who sign themselves "The Radio Experts."

There was a time when their outpourings were the cause of a rise in temperature beneath that band of linen which encircles that portion of my anatomy in which are located the larynx, the epiglottis, the uvula, and the odontoid peg. If the readers of daily papers are so critical, and so helpfully critical, as the readers of my journal, those journalists have heard all about their peccadilloes, and I hope that with such multitudes of counsellors, these experts eventually obtain wisdom. Time and experience mellow the outlook, and ultimately—sooner or later—we learn to tolerate fools gladly. A statement I read in the paper the other day, however, both irritated and amused me. It irritated me because no one with a grain of grey matter within their cranium could possibly have thought of anything so fantastic. Experts seem to rush in where designers fear to tread, and I can only presume that the main qualifications of some experts is that they know nothing of the subject upon which they claim to be experts. It amused me because it is just possible that the expert was pulling his readers' legs. His suggestion was that no one should require to listen to more than three stations, and that every listener should be satisfied with a receiver with a dial similar to an automatic telephone coupled up to the telephone wires. When you wish to tune in one of the three stations you should tune in to No. 1, 2 or 3, as the case may be.

In the same issue of this paper a letter to the Editor was published suggesting that radio would be far more enjoyable, now that all-wave receivers were bringing the voices and the dialects of every race in the world into our homes, if a universal language such as Esperanto were taught and that all programmes were broadcast in Esperanto. These two impossible suggestions, or suggestions impossible of fulfilment, cause me to reflect upon the vast number of requests I receive for a design incorporating some specific feature not to be found in previous designs I have sponsored. I know

:: Single Knob Tuning ::

that every design I publish will not please every one of my readers. I try to please the majority of them. I also know that there will still be requests for a particular circuit not yet published when Gabriel sounds his last rally at the crack of doom. Yes! And I expect that when I am ascending—descending!—to greet St. Peter I shall be confronted with an enormous volume of complaints he has received from readers whose requests have been unsatisfied. Or, maybe, I shall be in the goodly company of those who have built my portable, and who may wish to tune into a transmission from the Styx or the refrains from Paradise.

I am not hopeful that even at that time listeners will be satisfied with one programme!

These thoughts are engendered by the fact that when I publish a three-valve circuit I receive many requests for a four-valve design, and when I publish the latter many readers require a three or a six. It is quite right that they should express their wishes, for they are filed and when they reach sufficient volume the design is produced. One such design which has been accumulating a steady demand during the past six months is the receiver which for want of a better name I have termed the Corona All-Wave Four.

Among the Romans a Corona was a crown bestowed for distinguished services, and it is my hope that you will award it your praise for the excellent service it will render to you. I do not subscribe to the belief that it is more difficult to christen a set than it is to design one, and sets are given titles more for convenience of reference than to epitomise their design or performance. The Corona Four is a receiver, which, as I have said, has been designed at the express request of many readers. It is a great improvement on the very successful Limit Four produced last year. This bowing to popular demand had only one tuned circuit on the short-wave band, and publication of the design was followed immediately by a request for a four-valver covering the three wavebands, but having two tuned circuits on the three

All-Wave "CORONA" Four

wavebands. Accordingly, this has been incorporated in the Corona.

An examination of the circuit reveals that the four valves employed include an H.F. pentode as H.F. amplifier, a triode as detector, and triodes as L.F. amplifier and output valve respectively. There are two tuned circuits with H.F. transformer coupling between H.F. valve and the detector to ensure a high degree of selectivity. The receiver covers three wavebands—19 to 48 metres, 200 to 550 metres, and 900 to 2,100 metres. Two tuned circuits on the three wavebands are employed as stated, whilst resistance-capacity coupling between the detector and L.F. valve is employed to ensure high quality. You will observe that the detector anode circuit is adequately decoupled to avoid L.F. instability, whilst a Ferranti transformer couples the L.F. and output valves. The output feeds a permanent-magnet speaker which may be instantaneously and accurately matched to the impedance of the output valve. The coil unit has the wave-change switch incorporated, a further improvement on the Limit Four.

Construction

It will be noted in the list of components that the metal-surfaced chassis is supplied with the holes ready drilled for the valve-holders. This removes the most difficult part of the preliminary constructional work, and the remaining holes required (for the inter-connecting wires) may easily be drilled with an ⅛in. twist drill. There is only one small point which requires to be mentioned when dealing with the construction of this receiver, and that is concerning the holding-down screws for the condenser, coils, transformer, etc. The metal surface of the chassis is of fairly thick aluminium, and unless a clearance hole is first drilled to accommodate the plain shank of the screws it will be found that the screw head will be twisted off. Therefore, mark out the positions of the screws carefully by pricking through the lugs on the various parts, and then with an ⅛in. drill cut through the aluminium only. As soon as the wood appears, cease drilling and an ordinary awl may then be used to start the screws into the wood.

Before mounting the coils, transformer, variable condenser and component brackets some of the wiring can be completed and, therefore, the most comfortable plan in building this set is to mount the valve-holders, fuseholder, and terminal strips in that order first, when the chassis may be inverted and will rest comfortably on the workbench whilst the various sub-chassis components are wired into position. Where leads pass through the chassis they may be cut off to sufficient length and led through the relative hole, and afterwards cut off accurately. Another plan, and one which is favoured by many constructors, is to mount every component first and then carry out the wiring. In this case, to enable the chassis easily to be inverted from time to time during wiring, two lengths of wood should be screwed to the side runners, of sufficient length to clear the condenser,

19-48 : 200-550 : 900-2,100 Metres

and the set will rest on these when inverted and thus stand firm.

Wiring

The wiring should be carried out with a fairly heavy gauge wire—say 18 or 20 bare tinned copper. Make certain that all leads are fairly rigid and stretch them from point to point to avoid difficulties on the short-wave band which might be introduced by wires which move when subjected to vibration. Where the leads pass through the chassis it may be advisable to take some precaution to avoid short-circuits and there are two methods of doing this. Firstly, lengths of insulated sleeving may be slipped over the wires of such a diameter that they wedge into the hole and thus prevent the wire from touching the edge of the metal. A simpler plan is to remove the metal round the hole, either with a countersink bit, or by scraping round with a penknife. The insulated sleeving is the most business-like method and lends a finished appearance to the set. The points marked M.C. on the blueprint indicate that the wires at that point are in contact with the metal chassis. The method of doing this is to take a long bolt and two fairly large washers which may then be used to hold in place the wires referred to. On the coil units the two M.C. points will be served by the screws used to hold down the coil screens. Remember, in all of these cases, that the ends of the wires should be turned in a clock-wise direction so that when the screws are tightened up the wires will not be pushed out. If the ends are turned in an anti-clockwise direction, as the screws are tightened the ends of the wires will be pushed out from between the washers or screw-head.

An Important Point

In the case of the ganged condenser, it is important to note that the two leads which come up through holes 4 and 6 are joined to the tags in contact with the *fixed* sets of plates. There are two contacts on the underside of the condenser chassis for this purpose, and they are in the same electrical relationship as the tags on top of the condenser, to which the leads from terminals S on the two coil units are joined. By making use of the lower tags you avoid the necessity of running long leads up from the chassis to the top of the condenser. It is also necessary, if this is your first attempt at receiver construction, to be on your guard when wiring the five leads to the combined volume control and on-off switch

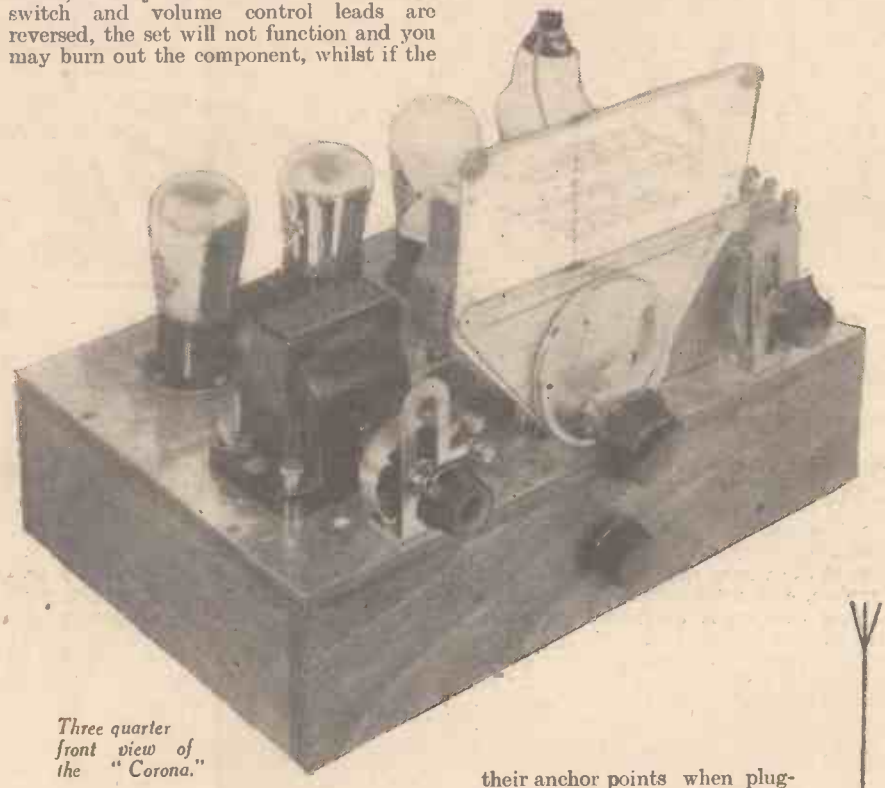
FREE BLUE PRINT IN THIS ISSUE!

It will be noted on the blueprint that three connections are made to the top and three to a lower part, and the leads from holes 7 and 8 and from the chassis (M.C.) are joined to the switch contacts. These appear on the raised ebonite portion attached to the centre of the component. Round the edge of the larger part of the component are three further lugs and these are joined to the volume control, and to them leads from holes 9 and 10 are joined, whilst the right-hand contact (viewing the component from the panel) is connected to the centre switch terminal and thus to the chassis. If this method of connection is not strictly adopted the control will either work backwards, or may not function at all. If the switch and volume control leads are reversed, the set will not function and you may burn out the component, whilst if the leads to the volume control only are reversed, the set will be at full volume the moment it is switched on. When correctly wired, the first part of the movement of the knob in a clockwise direction turns the set on, and probably no signals will be heard. Then, as the knob is advanced further the volume will gradually build up and will reach maximum when in its maximum clockwise position.

When mounting the two coils make certain that they are both the right way round before placing the switch control rod through them. The blueprint shows the position quite clearly, by the marking on the top of the cases. One further word of precaution is necessary, and that is to make certain that resistance R8, across the G and G.B. terminals of the L.F. transformer, is kept sufficiently high above the metal surface of the chassis to avoid the metal ends coming into contact with the metal. Cut off the ends of the resistance wires so that it is held quite tightly across the bakelite casing of the transformer.

Battery Leads

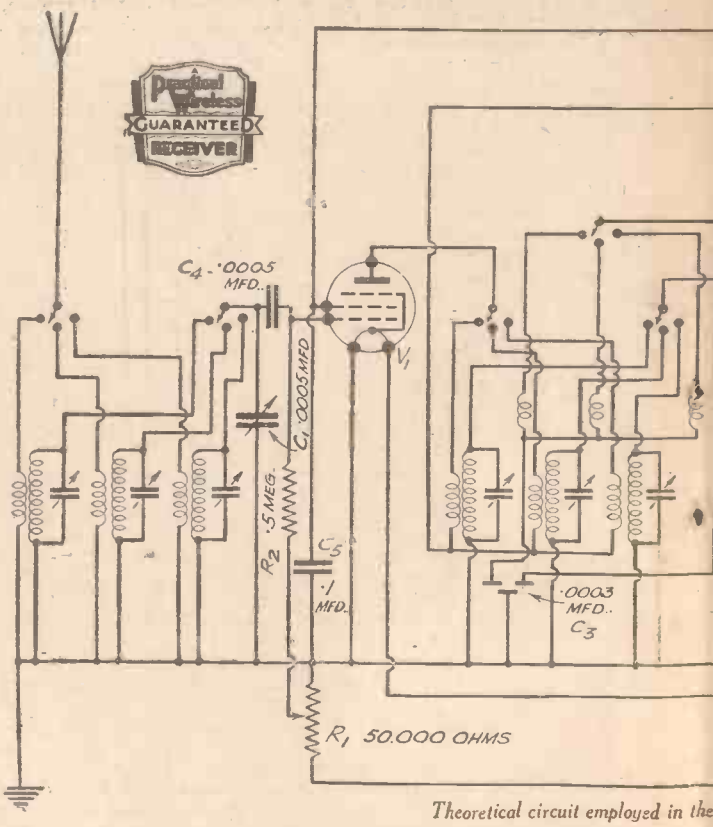
The battery leads are indicated on the under-chassis view by lines with arrow-heads, and these are passed through a hole in the rear chassis strip. To avoid the possibility of these wires being pulled from their anchor points when plugging in the ends, or when making adjustments, a good plan is to bunch them together and tie a knot before passing the ends through the hole. The knot should be in such a position that when it is pulled tight against the chassis the remaining portion of the lead is still slightly slack. This point is of particular importance in the case of the lead for G.B. negative 1, as a resistor is joined to it and may be broken away. In this particular case you may, if you are at all doubtful concerning the strength of your connection, drive a short screw into the underside of the chassis and solder the end of the resistor (R6) and of the G.B.—1 lead to the screw head. Obviously the screw should be so short that the point does not



Three quarter front view of the "Corona."

Another view of the completed "

FULL LIST OF COMPONENTS ON PAGE 100



Theoretical circuit employed in the

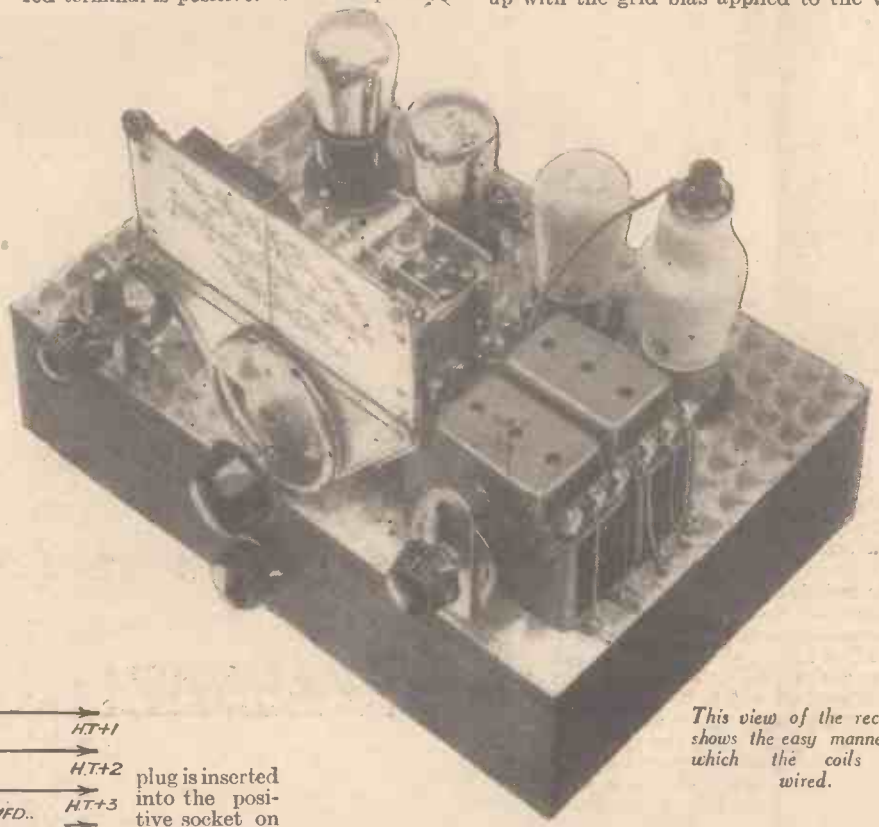
THE WORLD AT YOUR FINGER-TIPS!

"Corona" receiver.

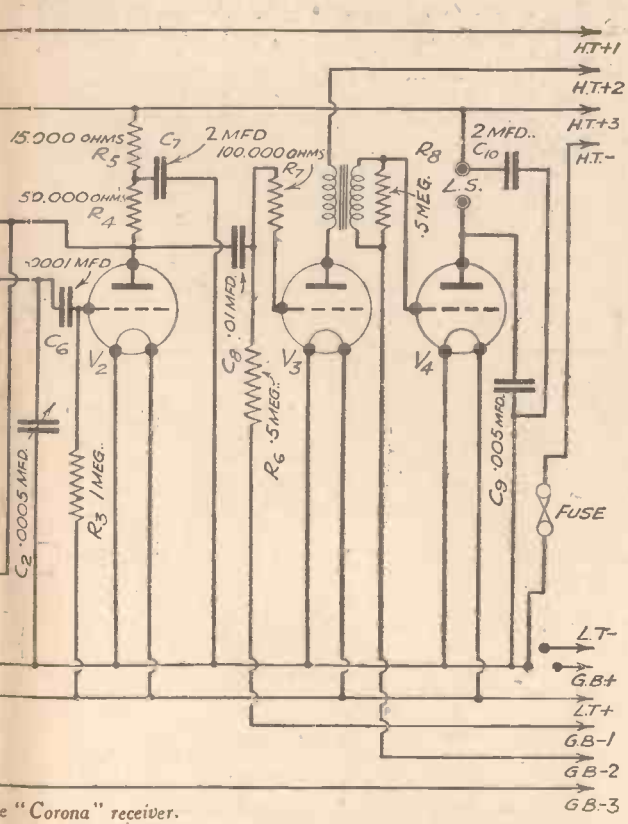
come into contact with the metal surface on the other side of the chassis, as this will result in the grid-bias for the first valve being short-circuited.

Operating Notes

The batteries required for this receiver are one L.T. accumulator of 2 volts for the filaments, one 120-volt H.T. battery for the supply of high-tension and a 9-volt grid-bias battery. The leads are clearly indicated on the blueprint and are inserted into the appropriate sockets in the batteries. Spade ends are fitted to the L.T. leads and these are joined to the positive and negative terminals on the accumulator. Remember that the black terminal is negative and the red terminal is positive. The G.B. positive plug is inserted into the positive socket on the G.B. battery, and the G.B. —3 plug is inserted into the 9-volt socket at the other end of the battery. G.B.—1 should be plugged into the 3-volt socket and the G.B.—2 plug into the 6-volt socket for the time being, although at a later date you might find that these can be modified to produce better working results. The consumption of H.T. depends upon the grid-biasing voltage which is employed and thus it is wise to use the highest value of bias consistent with good signal strength. The H.T. plugs are inserted in the following order: H.T.3 is the maximum voltage and should be connected to the 120-volt socket on the battery, whilst H.T.1 is the lowest voltage and should be inserted into a point somewhere between 60 and 80 volts. This position may be found critical and therefore experiments should be undertaken when the receiver has been found to function satisfactorily, with a view to finding the best working voltage for the screen of the H.F. valve. More will be said about this later. H.T.2 is the voltage applied to the first L.F. valve and this may be at a point round about 100 volts. This voltage will be bound up with the grid bias applied to the valve and thus the maker's data sheet, or published curves should be studied to make certain that the correct bias is employed with the H.T.



This view of the receiver shows the easy manner in which the coils are wired.



e "Corona" receiver.

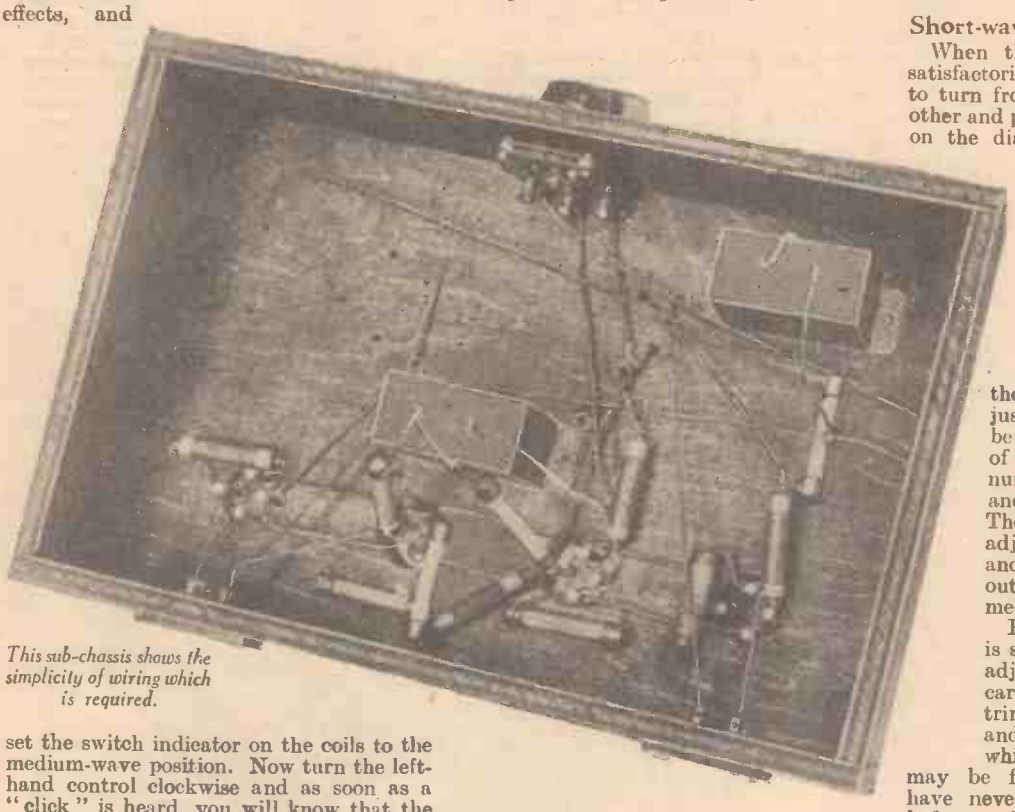
Tuning

So much for the application of the various working voltages and the receiver may now be tested out. Remember, however, that all preliminary tests will subsequently form a basis for the adjustment of such items as

A SELF-CONTAINED ALL-WAVE BATTERY RECEIVER OF MERIT

H.T. and G.B. and therefore do not expect at the first trial to pick up stations from every part of the world. To make certain that all wiring is correct, you can adopt the procedure of going over the blueprint with a pencil, marking out the wires as they are put in, or can check each wire individually when the receiver is ready for

test. Note the positions of the valves—the H.F. valve being on the right when viewing the set from the panel, the metallised detector valve coming next, then the clear valve and finally the output valve—type P. 220. Turn the reaction condenser anti-clockwise as far as it will go so as to remove all reaction effects, and



This sub-chassis shows the simplicity of wiring which is required.

set the switch indicator on the coils to the medium-wave position. Now turn the left-hand control clockwise and as soon as a "click" is heard, you will know that the valves are switched on, and that the volume control which forms part of this two-purpose component is at the minimum volume position. Turn the tuning dial to the point indicated for your local station, and then turn up the volume control. A rushing noise should be heard as this is advanced and the local station should then be heard.

Trimming Adjustments

Remember that the trimmers on the ganged condenser are not used with this particular coil assembly, and thus they should be opened to their widest position. Alternatively, you can unscrew them entirely, and open them out so that they have no effect at all on the inter-circuit wiring. By doing this you will make quite sure that the minimum wavelength on the short-wave band will be covered. The trimmers which have to be adjusted for the medium-wave band are in the coil unit and are identified by the number "2." Use a thin screwdriver or a pointed or sharpened slip of wood for adjusting this screw, so that no undue capacity effects are introduced. Turn each of the trimmers marked "2" until maximum volume is obtained at the dial setting given for your local station. Of course, it will be assumed that when mounting the dial you have first set the moving vanes of the condenser to either the minimum or maximum setting and have placed the point on the dial to a similar position. If this is not done, of course, the pointer will not travel completely across the scale and the station indications will be all out of position. As the signal strength of a local station is increased with the trimming adjustments, the volume control should be turned back so that a weak signal is maintained, as this enables the adjustments to be more easily made. It is very difficult to notice an improvement in strength if the station is blaring out on the loudspeaker, but if turned so that only a very weak signal is heard, the slightest improvement or loss of volume will be noticed.

Short-wave Trimming

When the medium waves have been satisfactorily trimmed it should be possible to turn from one end of the scale to the other and pick up stations at various places on the dial, the stations heard in your particular locality depending upon local conditions. For this reason, we do not publish a list of the stations which are likely to be heard. The direction of your aerial, its height above ground, any screening which might be introduced by surrounding buildings, trees, hills, etc., will all affect results and, therefore, it is not possible to say just what you will hear. It should be possible, however, in most parts of the country, to pick up quite a number of stations, both English and Continental, at good volume. The long-wave band is trimmed by adjusting trimmers numbered "3," and the same procedure is carried out as has been mentioned for the medium-wave band.

For the short-waves the process is slightly more difficult, and all adjustments must be made very carefully indeed. This time the trimmers used are numbered "1," and the location of a station upon which to make the adjustments may be found rather difficult if you have never used a short-wave receiver before. In spite of the reduction gearing on the tuning control, the very slowest adjustments should be made, and you will probably find that the reaction condenser may now be used as an aid to trimming. Advance the reaction condenser until the receiver is brought to the verge of oscillation. This will be indicated by a rushing sound in the loudspeaker, and if carried too far, a whistle will be heard. When a station is tuned, a rising whistle will be heard, and this may fall as the condenser is turned still further. Slacken off the reaction control until the whistle ceases and re-adjust the tuning condenser.

LIST OF COMPONENTS

Two all-wave coils, type Triogen, with 2-gang spindle (Wearite), 20s. 6d.

One 2-gang condenser, bar type .0005 mfd. (C1, C2) (Polar), 12s. 0d.

One S.M. drive, V.P. horizontal, with station names (Polar), 6s. 6d.

One differential reaction condenser .0003 mfd. (C3) (B.T.S.), 2s. 6d.

One potentiometer, 50,000 ohms, with 3-pt. switch (R1) (B.T.S.), 4s. 6d.

One L.F. transformer, type AF8 (Ferranti), 11s. 6d.

Seven fixed condensers: Two 2 mfd. (C7, C10) (type 65); One .0001 mfd. (C6); One .0005 mfd. (C4); One .005 mfd. (C9); One .01 mfd. (C8); One .1 mfd. (C5) (tubular) (T.C.C.), 10s. 8d.

Seven fixed resistances: One 1 meg. (R3); Three .5 meg. (R2, R6, R8); One 100,000 ohms (R7); One 50,000 ohms (R4); One 15,000 ohms (R5) Type F½ (Dubilier), 3s. 6d.

Four valve-holders, 4-pin chassis mounting type (Clix), 2s. 8d.

Two socket strips, A.E. and L.S. (Belling and Lee), 1s. 6d.

Two component brackets (Peto-Scott), 8d.

One Plymax chassis, 12in. by 8in. by 3in. (ready drilled for valveholder) (Peto-Scott), 5s. 9d.

Eight plugs: H.T.—, H.T.1, H.T.2, H.T.3, G.B.+, G.B.—1, G.B.—2, G.B.—3 (Belling and Lee), midget type, 1s. 4d.

Two spades, L.T.—, L.T.+ (Belling and Lee), 4d.

One fuse and holder, 100 mA (Microfuse), 1s. 6d.

Four valves: 210VPT (met.), 210DET (met.); 210DET (plain), 220P (Cossor).

One speaker, Stentorian Junior (W.B.).

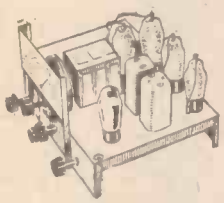
One H.T. battery, 120v.; One G.B. battery, 9v.; One accumulator, 2v. (Exide).

PETO-SCOTT EVERYTHING ALL-WAVE

PETO-SCOTT'S 1938 Range of ALL-WAVE and SHORT-WAVE APPARATUS is again unsurpassed for RELIABILITY, QUALITY and VALUE. This all-round supremacy is the natural outcome of PETO-SCOTT'S long experience in Direct-to-the-Public Radio. You knew in 1919 . . . you know TO-DAY, that you may order from PETO-SCOTT in the knowledge that you will receive BRAND-NEW GOODS, backed by a GUARANTEE of SATISFACTION. PILOT AUTHOR KITS are guaranteed to specification . . . build one and be SATISFIED. YOU ARE WARNED AGAINST CHEAP SUBSTITUTES—only PILOT AUTHOR KITS are EXACT to AUTHOR'S SPECIFICATION.

ALL-WAVE Battery 5-valve SUPERHET KIT

Save £1—buy a Complete Kit!



● Waveranges: 18-52, 200-550, 900-2,100 metres. New design and ganged and trimmed I.F. tuning unit simplifies building. Nearly 20 years' experience in superhet design has produced this super-efficient All-Wave Kit.

KIT "A," comprising all parts, with ready-drilled chassis, instructions and drawings, less valves, speaker, batteries. List Value - £5:19:6

OUR PRICE **£4:19:6**

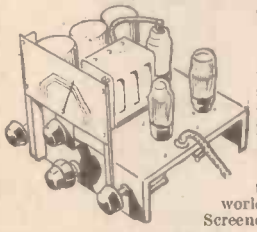
Or 9/- down and 11 monthly payments of 9/3

9/- DOWN

KIT "B," with valves, **£7:15:6,** or 14/3 down.

ALL-WAVE S.G.3 KIT

Save 26/- —buy a Complete Kit.



● 4 Wavebands, 14-31, 28-62, 200-550, 900-2,100 metres. Self-contained ready-assembled switched coil unit simplifies construction. New Peto-Scott Duplex Epicyclic slow-motion tuning system simplifies world-wide reception. Screened air-cored coils.

KIT "A." All parts including ready-drilled chassis, drawings and instructions, less valves, speaker, batteries. List Value £4/9/3.

OUR PRICE **£3:3:0**

Or 5/- down and 11 monthly payments of 5/9. Kit "B," with valves, £4.5.9, or 8/6 down.

5/- DOWN

1-valve ALL-WAVE KIT

Save 11/- —buy a Complete Kit!

● Waveranges 18-52, 200-550, 900-2,000 metres. ● A unique All-Wave single-valver combining simplicity of assembly with extraordinary efficiency and low cost. ● The ideal kit for the beginner in all-wave construction. ● Ready assembled tuning unit incorporates all windings and switching and needs only six simple connections for incorporation.

KIT "A" comprises complete kit of parts for building, including ready-drilled steel panel and chassis, drawings and instructions, less valves and cabinet.

List value, £2:0:10 Our Price **£1:9:6**

Or 2/6 down and 11 monthly payments of 2/9

KIT "B" with valve, £1/13/3 or 3/- down

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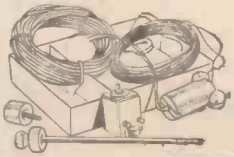
Peto-Scott Noise Suppressing ALL-WAVE AERIAL



Obtain utmost entertainment by using this aerial outfit, the first really economical solution for overcoming the noise of man-made static. Increases signal strength on all bands. Improves selectivity. Waterproof and Weatherproof. Two transformers. Aerial Outfit comprises Duplex lacquered aerials, insulators, waterproof "lead-in" wire, aerial and set transformers, assembled and ready with instructions and drawings illustrating the method of erection.

Cash or C.O.D. **17/6**

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PILOT AUTHOR KITS—Exact to Specification

CORONA ALL-WAVE 4

THESE ARE THE PARTS SPECIFIED and USED by Mr. F. J. CAMM and INCLUDED in KIT "A"

Any item supplied separately. Orders over 10/- sent C.O.D. and carriage charges paid.

	£	s.	d.
2 Wearite All Wave Coils type Triogen with 2-gang spindle	1	0	6
1 Polar 2-gang condenser Bar type, .0005 mfd		12	0
1 Polar S.M. Drive V.P. Horizontal, with station names		6	6
1 B.T.S. differential reaction condenser, .0003 mfd		2	6
1 B.T.S. potentiometer 50,000 ohms with 3-pt. switch		4	6
1 Ferranti Transformer type AF8		11	6
7 Dubilier fixed resistances (1) 1 meg, (3) .5 meg, (1) 100,000 ohms, (1) 50,000 ohms and (1) 15,000 ohms type Ff 1-watt		3	6
7 T.C.C. fixed condensers type 65 (2) 2 mfd, (1) .0001 mfd. (1) .0005 mfd, (1) .005 mfd, (1) .01 mfd and (1) .1 mfd (tubular)		10	8
4 Clix chassis mounting valveholders with terminals 4-pin type		2	8
2 Belling-Lee socket strips A.E. and L.S. with plugs		1	6
2 Peto-Scott component brackets			8
1 Peto-Scott plymax chassis 12" x 8" x 3" drilled for valveholders		5	9
8 Belling-Lee plugs Midget type: HT—, HT1, HT2, HT3, GB+, GB—1, GB—2 and GB—3		1	4
2 Belling-Lee spades LT— and LT+			4
1 Microfuse fuse and holder 100 m.a.		1	6
Wire, flex and screws		3	0
KIT "A" Cash or C.O.D. Carriage Paid	£4	7	6
Set of 4 specified Cossor Valves	£1	6	6

KIT "A" £4:7:6

Cash or C.O.D. Carriage Paid

COMPRISING complete kit of FIRST SPECIFIED parts, including Peto-Scott specified ready-drilled PLYMAX chassis, wire, flex and screws, less Valves, Cabinet and Speaker.

7/6 DOWN and 11 monthly payments of 8/-

KIT "B" As Kit "A" but with 4 specified valves, less Cabinet and Speaker. Cash or C.O.D. Carr. Pd., £5 14s. 0d., or 10/- down and 11 monthly payments of 10/6.

KIT "C" As Kit "A" but with Valves and Peto-Scott Walnut-finished Consolette Cabinet, less Speaker. Cash or C.O.D. Carr. Pd., £7 11s. 6d. or 12/6 down and 11 monthly payments of 14/-.

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	£	s.	d.
Peto-Scott Plymax Chassis, ready-drilled, 12" x 8" x 3"		5	9
2 Peto-Scott Component Brackets, per pair			8
B.T.S. Potentiometer with 3-pt. switch		4	6
B.T.S. Differential Reaction Condenser, .0003-mfd.		2	6
2 Wearite All-Wave Triogen Coils, with 2-gang spindle	1	0	6

IMPORTANT.—Any item supplied separately. Orders over 10/- sent C.O.D. and carriage charges paid.

Orders over £1 supplied on Easy Terms.

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MODEL 38J (illustrated), Specified for the CORONA All-Wave 4. Further improvement on the famous W.B Senior 37J. New higher flux density and increased sensitivity. Microlode device for matching any receiver. "Whiteley" speech coil, improved W.B. centring device. Cash or C.O.D., Carr. Pd. £1:12:6, or 2/6 down and 11 monthly payments of 3/-.

2/6 DOWN

MODEL 38S, with over-sized cone. Cash or C.O.D., Carr. Pd. £2:2:0 or 2/6 down and 11 monthly payments of 4/-.

MIDGET MODEL 38M. A new thoroughly efficient permanent magnet moving-coil speaker in extremely compact form. Complete with 3-ratio transformer. Cash or C.O.D. Carr. Pd., 17/6, or 2/6 down and 7 monthly payments of 2/6.

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. . . a booklet of 24 pages featuring 9 new PILOT Short-Wave Kits, one of which is illustrated. Each of these designs incorporates *standard chassis and panel.* Commencing with a 1-valve Adaptor-Converter, you may, when you please, build this up, *on the same chassis,* into varying forms of 1, 2, 3, and 4-Valve Short-Wave Receivers. Post the Coupon for your free copy of this 6d. booklet, together with a set of 9 Blueprints, for each of the sets described.

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Please send me entirely free (a) The Pilot "Short and All-Wave Experimenter," described above (priced at 6d.), together with 9 Blueprints, and (b) The Peto-Scott All-Wave and General Catalogue, illustrating the Complete Range of Peto-Scott 1938 Productions. I enclose 3d. (stamps) to cover postage.

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All Postal Orders must be crossed and made payable to Peto-Scott Co., Ltd. All currency must be registered.

IMMEDIATE DELIVERY—CASH—C.O.D. or H.P.

The Hivac Harries A.V.C. System

How it is Used with All-stage Valves

AUTOMATIC volume control using ordinary valves involves the use of a variable-mu grid in the valve. This grid has to perform two functions, namely, that of amplifying, and that of A.V.C. to decrease fading. The design of this grid is, therefore, a compromise.

The new method involves the utilisation of two separate grids in each controlled valve. One grid is used for amplification, and has what is known as a "straight characteristic," which is that most suited for distortionless amplification, and for the reduction of undesired noise level. The A.V.C. voltages are applied to another grid. That is, no compromise is involved. The A.V.C. performance can be made very considerably higher, and the otherwise unavoidable distortion and sensitivity to noise of variable-mu valves is avoided.

Delayed diodes and amplified A.V.C. circuits are rendered unnecessary.

The drawing Fig. 2 shows a comparison between the characteristics of ordinary A.V.C. and the new system of A.V.C. used with the Hivac Harries All-stage valve. The heavy line curves are those of the new valve. The dotted curves are those of receivers using corresponding ordinary valves. A change of output has to be of at least 4 dbs. to be audible. It will be seen that, over ordinary changes of signal strength due to fading, the resulting change of output with the new valve is inaudible. This is not the case with the older and more complicated type of A.V.C. circuit. With two of the new valves controlled in a five-valve receiver a very remarkable result is obtained of holding the output within small limits from 10 micro-volts up to 1 volt.

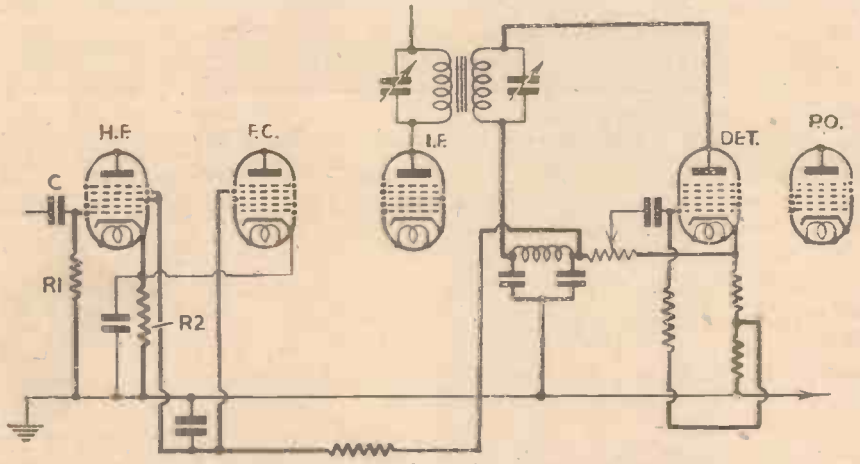
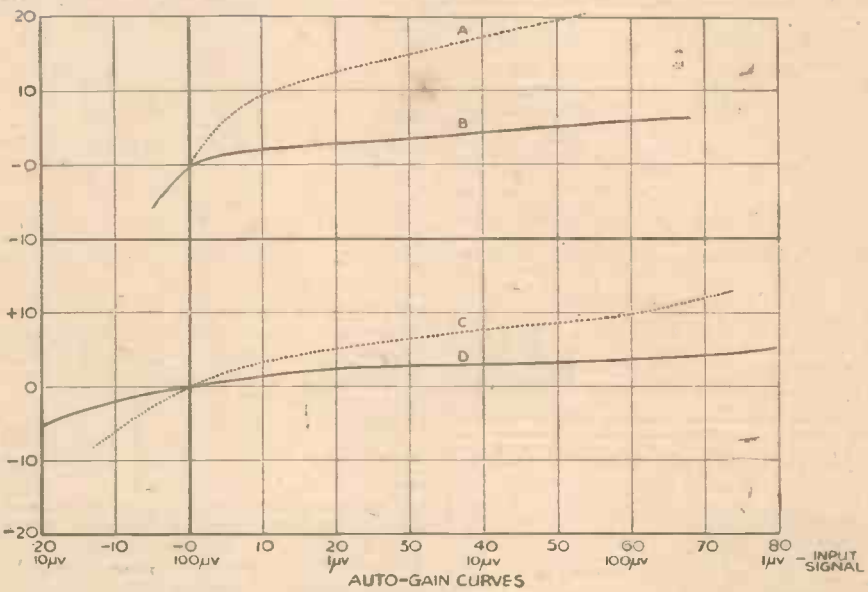


Fig. 1 above shows a circuit of the type referred to, and Fig. 2 (right) the auto-gain curves.

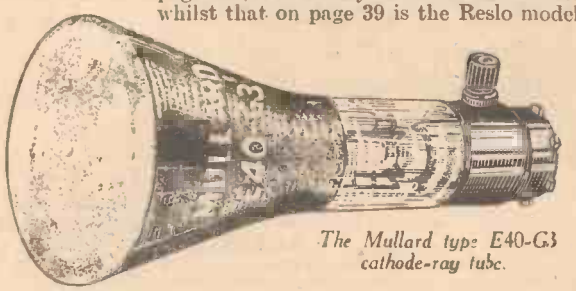


Automatic Local-distance Circuit

In Fig. 1 the new system of A.V.C. is combined with an automatic local-distance circuit. For the best amplification of weak and moderately strong signals the grid bias on the first valve is usually about —6 volts. When the receiver is tuned to a broadcasting station which is very near by, then a very large peak voltage will appear on the first grid of the valve, and the valve might overload. This overload is avoided by a grid leak and condenser R1 and C. The negative bias from R2 causes C and R1 to be inoperative unless the signal becomes very powerful. When it becomes strong enough the A.V.C. cuts down the anode current and changes the characteristic of the valve so that it will operate with a greatly increased negative bias. The valve will then draw a very small grid current, which, flowing through the resistance R1, causes an additional negative bias to be applied to the control grid enabling the valve to accept the very strong signal without distortion.

The Cathode-ray Oscillograph

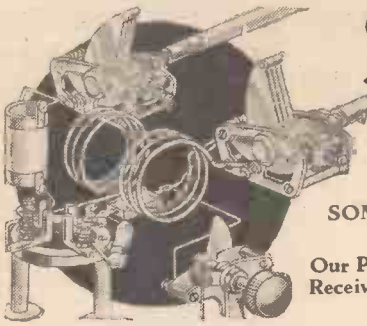
THERE is no piece of apparatus more valuable in radio testing than a cathode-ray oscillograph. This is a piece of apparatus employing a small cathode-ray tube, and by suitable design it is possible to measure such features as amplification, distortion in L.F. amplifiers, modulation depth of transmitters, distortion in valve stages, performance of L.F. transformers, voltages and many other factors which are necessary either in connection with the design or the performance of modern radio apparatus. Not only may these various factors be seen in a very clear manner, but it is possible to take photographs of the results and thus keep a permanent record of the tests. An ideal cathode-ray tube for use in this type of apparatus is illustrated, and is supplied by the Mullard Company. It has a 4-volt 1-amp. heater, and for the first and second anode potentials of 300 and 800 volts are required. The screen diameter is 7 cm. A valuable handbook is supplied by the Mullard Company giving full technical details of the tube and of the method of supplying the requisite voltages, together with the method of making many of the tests mentioned above. It also includes a few pages on the method of photographing the images thrown on the screen of the tube. The book may be obtained on application to the Mullard Company at Mullard House, 225, Tottenham Court Road, London, W.1.



The Mullard type E40-G3 cathode-ray tube.

P.M. or Energised?

IN our issue dated September 25th, 1937, we included on pages 38 and 39 illustrations of two public address loudspeakers. Unfortunately the captions for these two models were transposed, and it should therefore be noted that the speaker on page 38 is actually a Goodman model, whilst that on page 39 is the Reslo model.



Short Wave Section

SOME SHORT-WAVE PROBLEMS EXPLAINED BY THE EXPERIMENTERS.

Our Popular Contributors Reply to Some of the Inquiries Received from Readers Concerning Difficulties in Short-wave Reception.

WE are flattered to think that readers of PRACTICAL AND AMATEUR WIRELESS have taken an increased interest in short-wave reception since we began to devote more attention to this aspect of home construction. Letters received regularly tell us that new recruits have been gained for the ranks of S.-W. experimenters. This is a good sign, because short-wave work always provides an interesting change from normal broadcast reception, and gives real spice to experimental work.

On the short waves we are always coming up against new problems and new difficulties—and they make home construction worth while. Among recent letters there have been a few from readers who have built their first short-wave receivers, and who have met minor difficulties that they find rather confusing. For example, one reader has built a two-valve Det.-L.F. battery set, and finds that it is almost impossible to obtain oscillation at the "top end" of the tuning scale, although the detector oscillates very easily, with only about one-third of the reaction-condenser capacity, at lower tuning-condenser readings. Our friend concludes his letter with the word "why?"

Several Possible Reasons

We don't know, but we can make various suggestions, from which he can easily find out the reason. You see, unless a number of tests are made it is impossible to give a definite answer; that is because there are so many things which could produce precisely the effect described. You might think that increasing the capacity of the reaction condenser would overcome the trouble, but we doubt if it would. More likely, such a change would not make the slightest bit of difference.

If the coil is a home-made one, it might be that the number and arrangement of reaction-winding turns is unsuitable. Sliding the reaction winding down the former so that it is slightly nearer to the grid coil often cures a trouble of this kind. On the other hand, it might be better to add, say, a couple of turns to the reaction winding, and then to slide it a fraction of an inch further away from the grid coil. Another reason for the fault could be that the aerial is connected to one end of the grid coil, through a condenser of too great a capacity; a .0002-mfd. variable or pre-set condenser is often useful in this position, for then the most suitable setting can easily be found. An alternative method is to join the aerial to a tapping on the coil, or to use a separate aerial winding, as shown in Fig. 2.

Using a Doublet

The last-mentioned is the method that we prefer. You can place the aerial winding either over the grid coil, or near one end of it. In either case it is worth while to experiment with the number of turns, although it is generally satisfactory to use one-half to one-third the number on the grid coil. A great advantage of this method is that the size and self-capacity of the aerial become of little consequence. Another advantage is that you can use a

by The Experimenters

doublet aerial, which is ideal for short-wave reception. This consists, as many of you are aware, of two separate lengths of insulated wire arranged end to end, and

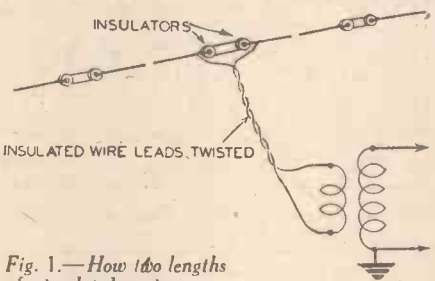


Fig. 1.—How two lengths of insulated wire are used to form a doublet aerial; also, how the aerial is connected to a separate winding on the tuning coil.

with the two leads-in twisted together, as shown in Fig. 1. Each horizontal portion of the aerial should be about 30ft. long whilst, theoretically, the down-lead should be half the wavelength long. That is, for 40-metre reception the lead-in should be approximately 60ft. Of course, it is rarely convenient to work to this, besides which you do not want to be restricted to any particular wavelength. In consequence, it is customary to make the lead-in of any convenient length, unless outstanding efficiency is desired on one particular band.

The two leads from the doublet are connected one to each end of the aerial coupling winding, the earth lead being joined to the "bottom" of the grid coil and to L.T.—in the usual way. Lest you should think that the aerial can be used only for short-wave work, it should be made clear that it is quite suitable on the broadcast bands if a separate coupling coil is used. If not, you can take both leads-in to the aerial terminal, using the aerial almost as if it were of the T type. We have spoken of the horizontal parts of the aerial, but this is not intended to convey the idea that the aerial should be placed in a perfectly horizontal position. In fact, it is not at all critical in this respect.

Unstable Reaction

Quite another reason for the trouble under discussion might be that there are long leads in the reaction circuit, which result in a peculiar form of damping. That is why, in the portable receiver described a fortnight ago, we included a 250-ohm fixed resistance in series with the reaction winding. It tends to reduce the tendency for oscillation at lower settings of the tuning condenser, but in doing so smooths out reaction over the tuning range.

One rather unusual form of reaction trouble was noticed recently in a simple type of single-valve-with-reaction set. Oscillation could just be obtained when the tuning condenser was set near to its minimum capacity and the reaction condenser fully advanced. At higher tuning positions, oscillation ceased completely. In this case the set had previously operated correctly, so it was evident that a fault had arisen. It was eventually found that one terminal of the H.F. choke was loose, so that a proper contact was not made with the end of the winding. Measurement with a milliammeter showed that only a small fraction of a mA was passing to the detector anode. The same fault can arise if the choke is defective, or if the L.F. transformer, coupling resistance, or de-coupling resistance has developed a partial open circuit.

Screening on S.W.

A letter which was received recently was from a reader who was rather surprised to find that we rarely advocate the use of screening in the simpler type of short-wave receiver. He pointed out that he had always found that hand-capacity effects, difficult tuning and unsteady reaction were experienced if use were not made of a metal panel and metal screens between the coils and the L.F. portion. Another point that he made was that he considered that condenser extension spindles were a practical essential.

We disagree. It has always been our view that if stability cannot be obtained without screening (in the simpler type of set, of course), the design is wrong, or the earth lead is inefficient. For that reason, we use screening only when it is absolutely necessary. It is not just pride that prompts this idea, but the fact that screening on short waves can produce far more losses tha...

(Continued overleaf)

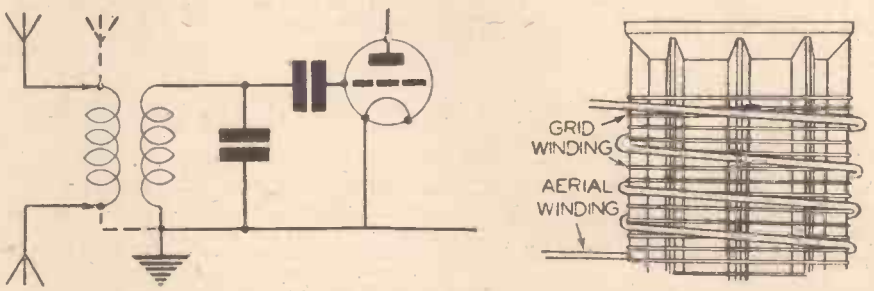


Fig. 2.—When using a four-pin aerial coil, it is often worth while to add a separate aerial winding. This may be connected to a doublet, or to an aerial and earth in the usual manner. If using aerial and earth, as in broken lines, try the effect of reversing the aerial and earth connections.

SHORT WAVE SECTION

(Continued from previous page)

are desirable in a simple set. If you earth the frames, and rotors, of the condensers mounted on the panel, and carry a few of the earth leads behind the panel and fairly near to it, the screening is generally adequate. Of course, if electrical interference is picked up in the set, it is a different matter, and there is then every justification for housing it in a screening box, of which a number of different makes are available. In that case, make certain that the box is earth-connected.

Hand capacity is more often due to a bad earth than to lack of screening. It might also be due to the 'phone or speaker leads running close to the aerial lead-in (except with a doublet, when the lead-in is "dead" for practical purposes), or to the absence of a .001-mfd. condenser between the anode of the output valve and earth.

Another "Portable" Idea

Apropos our recent discussion on the question of making a short-wave portable, we received a circuit diagram and a number of interesting "snaps" from K. G. Hammond, of Portsmouth. We received his letter after writing the article on our portable, which was published a fortnight ago, so we could not make reference to it in that article. It appears that Mr. Hammond used a circuit almost identical with ours, and he tells us that it works very satisfactorily. Unfortunately, the "snaps" are not quite clear enough to reproduce, so we have asked a PRACTICAL AND AMATEUR WIRELESS artist to make a sketch to show the form of construction employed. The set is neat and compact, being built on the "step" principle. Eleven flash-lamp batteries connected in series are used for H.T. supply and for G.B., whilst there is space for a fairly large two-volt accumulator. Other readers might like to try this form of construction if it happens to suit a carrying case which is available.

More Details, Please

Although it is not a short-wave matter, we must refer to a letter received from J. C., of Coventry, concerning the single-valve set which we described in the issue dated June 5th of this year. We should have replied by post—as we do to all our correspondence dealing with subjects not necessarily of general interest—were it not for the fact that J.C. omits to give his full name; why not tell us who you are, J. C.? We will not mention your name in these notes if you wish otherwise. This reader tells us, rather vaguely, that "when I tune in the stations I cannot get any sound at all without using a lot of reaction," and asks what is wrong. We suspect that either the detector valve is defective, or that his H.T. battery is run down, if all components are of the specified values.

We have had a few requests for details of a more advanced type of short-wave receiver preferably a superhet. What are your views on this subject, and what circuits or special features do you suggest? Drop us a line, you short-wave "fans."

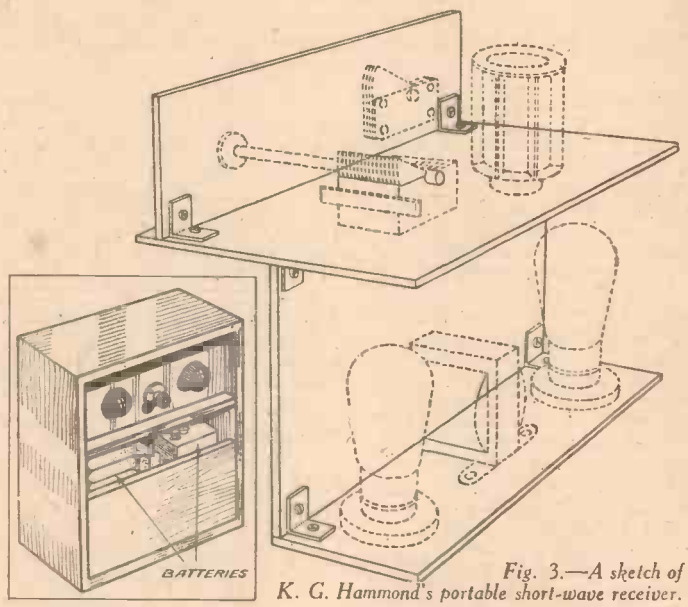


Fig. 3.—A sketch of K. G. Hammond's portable short-wave receiver.

Leaves from a Short-wave Log

New Australian Short-waver

AMERICAN listeners report good reception of experimental transmissions from VK5DI, Adelaide, on 25.42 m. (14.01 mc/s) relaying a programme from VK5AD, in that city. The station is owned and operated by the Adelaide Short-wave Club, and carries out its tests every Sunday between G.M.T. 03.15-06.45; occasionally 41.24 m. is used.

Panama on 25 m. Band

HP5A, Panama City, a 200 watt station owned by the Sociedad Publica de Radio, and calling itself *La Voz de Panama*, broadcasts daily on 25.64 m. (11.7 mc/s) from G.M.T. 16.45-18.15, and from 00.00-03.30; on Sundays from G.M.T. 15.30-18.15, and from 20.00-21.00. The call is put out every fifteen minutes coupled with an interval signal consisting of a two-note gong. Announcements are made in both Spanish and English. Transmissions open and close with the playing of a march, *The Black Horse Troop*.

Canada's Proposed 50 kW S.W. Transmitter

The Canadian Radio Corporation is seriously considering the installation of a high-power short-wave station for the relay of the Montreal programmes. The transmitter would be erected in the outskirts of either Ottawa or Montreal, but the former city is favoured, as it is suggested that the broadcasts should be heard throughout the world as *The Voice of Canada*.

The League of Nations Speaks

During the present session of the Assembly of the League of Nations special broadcasts will be made daily, from G.M.T. 19.00-19.15 (except Sundays), through HBO, Prangins, on 26.31 m. (11.40 mc/s), and from G.M.T. 00.30-00.45 (except Saturdays), through HBL, Prangins, on 32.10 m. (9.345 mc/s).

Radio Club of Zurich

A new transmitter working under call-sign HB9D, on 31.46 m. (9.535 mc/s), with a power of 100 watts, is being operated by the Zurich Radio Club twice weekly. The broadcasts will take place every Sunday, from G.M.T. 14.00-16.00, and on Thursdays from G.M.T. 18.00-20.00.

War News from China

JDY, Dairen, in the province of Kwantung, is a new station erected by the Manchuria Telephone and Telegraph Company; its wavelength is 30.33 m. (9.89 mc/s), on which channel a short programme of music and war news is broadcast daily from G.M.T. 12.10-13.15. XGOX, Nanking, on 43.99 m. (6.82 mc/s), 500 watts, is on the air every day with an official bulletin at G.M.T. 13.05, the transmission usually lasting about 15 minutes.

Broadcasts from Peru

During the past week transmissions from Peru have been logged in the British Isles. OAX4T, Lima, on 31.15 m. (9.63 mc/s), of which the call is given out by both male and female announcers, would appear to work from G.M.T. 23.00 until 06.30 daily. OAX4J, also in the Peruvian capital, operates on 32.12 m. (9.34 mc/s), uses a three-note interval signal somewhat similar to that of the N.B.C., and styles itself *Radio Internacional*; it is also on the ether until the early morning hours. Address: P.O. Box 1166, Lima (Peru). OAX4Z, a 10 kilowatt station located at Lima, calling itself *Radio Nacional*, may be found on 49.33 m. (6.082 mc/s) (just above the channel used by VQ7LO, Nairobi). The broadcast is a continuous one from G.M.T. 22.00-04.00. The studio habitually closes down with the *Good Night Song* (Ted Lewis) already adopted by several foreign stations. Address: Radio Nacional OAX4Z (S.A.), Avenida Abancay, 915, Lima (Peru).

Programme Schedule of JZJ and JZK, Tokio

G.M.T. 20.00-20.05, call in Japanese, English, German and French; 20.05, news in English; 20.15, music; 20.30, news in German; 20.38, news in French; 20.45, news in Japanese; 20.55, call and close down with Japanese National Anthem.

Odd Jottings

FZE8, Djibouti, French Somaliland (East Africa), on 17.38 m. (17.28 mc/s), works radio-telephony with Paris (France) on the first three days of each month, between G.M.T. 12.30-13.15.

HSE2, Bangkok (Siam), on 15.78 m. (19.016 mc/s) 20 kilowatts, will be found in radio communication with DFB, Nauen (Germany), daily at G.M.T. 14.00. The German station replies on 17.12 m. (17.52 mc/s).

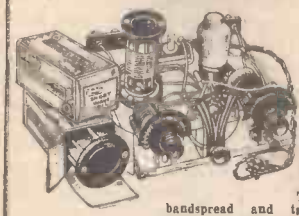
SAVE £1 ON YOUR CORONA KIT!

★ SHORT-WAVE KIT ★ BARGAINS

"3-in-1" SHORT-WAVE KIT

RECEIVER — ADAPTOR — CONVERTER

List Value 37/6 **BARGAIN 25/-**



ADAPTS or converts your battery set for short-wave reception, or may be used as one-valve Short-wave Receiver. Slow-motion bandspread tuning SIMPLIFIES WORLD RECEPTION! Air-spaced bandspread and tank condensers. SPECIAL ANTI-BLIND SPOT CONDENSER. 3 scales calibrated in degrees.

KIT "1" comprises every part for assembly, including 3 4-pin coils, wiring and assembly instructions, less valve only. Cash or C.O.D. Carr. Pd. 25/-, or 2/6 down and 10 monthly payments 2/6.
Kit "2." With 2-volt valve £1/8/9, or 2/6 down and 11 monthly payments 2/9.

2/6 DOWN

2-valve BANDSPREAD S.W. KIT

List Value 59/6 **BARGAIN 32/6**

ANOTHER amazingly efficient world-wide kit incorporating slow-motion bandspread tuning. Covers 12-94 metres.

KIT "1" comprises every part for assembly, including 3 4-pin coils, wiring and assembly instructions, less valves only. Cash or C.O.D. Carr. Pd. 32/6, or 2/6 down and 11 monthly payments 3/-.
KIT "2," with 2 British valves, £2/1/9, or 4/- down and 11 monthly payments 3/10.

2/6 DOWN

New 4-valve BANDSPREAD Battery SHORT-WAVE KIT

List Value £4:9:6 **BARGAIN 42/-**

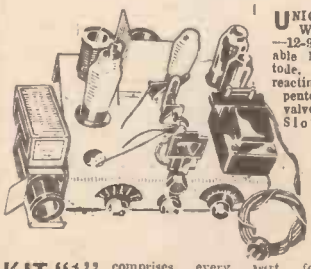
APERIODIC H.F. reacting detector, resistance and transformer L.F. Stages, Pentode Output. Slow-motion bandspread tuning SIMPLIFIES WORLD RECEPTION! Efficient low-loss reaction condenser. Air-spaced bandspread and tank condensers. SPECIAL ANTI-BLIND SPOT CONDENSER. 3 scales calibrated in degrees and tenths.

KIT "1" comprises every part for assembly including 3-pin coils, wiring and assembly instructions, less valves only. Cash or C.O.D. Carr. Pd. 42/-, or 2/6 down and 11 monthly payments of 4/-. KIT "2," with 4 British Valves, £3/9/0, or 5/- down and 11 monthly payments of 6/6.

2/6 DOWN

D.X. FANS' A.C.4 S.W. KIT

List Value £5:10:0 **BARGAIN 75/-**



UNIQUE All-World reception—12-94 metres. Variable Mu H.F. pentode, leaky grid reacting detector, pentode output and valve rectification. Slow motion bandspread tuning. 3 calibrated scales 0-180, 0-180, 0-10. For A.C. Mains 200-250 volts, 40-100cycles.

KIT "1" comprises every part for assembly, including 3 pairs 4 and 6-pin coils (12-94 metres), wiring and assembly instructions, less valves only. Cash or C.O.D., 75/- or 5/- down and 11 monthly payments of 7/-. 4 Valves 37/6 extra, or add 2/6 to deposit.

5/- DOWN

CORONA ALL-WAVE 4 KIT

Immediate Delivery

EVERY PART GUARANTEED
MATCHED — PROVED — TESTED

KIT "1" *CASH OR C.O.D. CARRIAGE PAID* **67/6**

Comprising all parts for Receiver, including Exclusively Specified WEARITE TRIOGEN COILS, POLAR V.P. DRIVE with station names, CLIX Valveholders, BELLING-LEE Terminal Strips, PETO-SCOTT PLYMAX Chassis and mounting brackets. Less valves, cabinet and speaker.

5/- DOWN

Balance in 12 monthly payments of 5/9.

THESE ARE THE ITEMS IN KIT "1"

Any part available separately. Orders over 5/- sent carriage and C.O.D. charges paid.

	£	s.	d.
2 Wearite Triogen coils with 2-gang spindle	1	0	6
1 Polar V.P. Drive with station names	0	6	6
1 Peto-Scott drilled Plymax chassis	0	5	9
2 Peto-Scott component brackets	0	0	8
1 Varley Niclet L.F. transformer	0	7	6
4 CLIX 4-pin valveholders with terminals	0	2	8
1 N.T.S. differential reaction condenser .0003 mfd.	0	1	6
1 N.T.S. New type 2-gang .0005 mfd. condenser	0	10	6
1 N.T.S. 50,000 ohms potentiometer with 3-pt. switch	0	3	0
7 N.T.S. fixed condensers of specified values	0	7	3
7 N.T.S. fixed resistances of specified values	0	2	4
2 Belling-Lee terminal strips with plugs	0	1	6
8 N.T.S. plugs, marked	0	1	0
2 N.T.S. spade terminals	0	0	3
1 Microfuse and holder	0	1	6
Peto-Scott Screws, wire and flex	0	3	6
KIT "1" Cash or C.O.D. Carr. Pd.	£3	7	6
Set of 4 Specified Valves	£1	6	6

KIT "2" as Kit "1," but with 4 Specified Valves, less Cabinet and Speaker. Cash or C.O.D. Carr. Pd. £4:14:0, or 7/6 down and 12 monthly payments of 8/-.

KIT "3" as Kit "1," but with Valves and recommended Peto-Scott walnut consolette cabinet. Cash or C.O.D. Carr. Pd. £5:11:6, or 10/- down and 12 monthly payments of 11/3.

AMPLIFIERS

For Public Address or Home Broadcasting.

7-watt A.C. MODEL Efficient 4-valve push-pull circuit. High-fidelity reproduction. Undistorted output 7 watts. For microphone or pick-up. Circuit: triode, resistance transformer coupled to 2 power amplifier valves in push-pull, valve rectifier, consumption 60 watts. Steel chassis. Size 7½in. high, 4in. wide, 10in. long. For A.C. Mains 200/250 volts 40/80 cycles. Complete with 4 valves, ready for immediate use.

List Value £4:19:6.

5/- DOWN

BARGAIN *Cash or C.O.D.* **£3:10:0**

Or 5/- down and 12 monthly payments of 6/-.

Energised Speaker of required handling capacity, 37/6 or 2/6 down and 11 monthly payments of 3/6.

4-watt BATTERY AMPLIFIER Q.P.P. Output, providing quality reproduction on gramo. and microphone. Dimensions: 7in. long, 5in. deep, 7½in. high. For use with ordinary H.T. Battery 135-150 volts. With 3 valves, full tested.

List Value £4:4:0. **BARGAIN** *Cash or C.O.D.* **£2:15:0**

Or 4/6 down and 12 monthly payments of 4/9.

Recommended Speaker. Goodman's P.M. Special Type, 19/6 or 2/6 down and 8 monthly payments of 3/6.

MICROPHONE. Transverse Current Carbon Type for use with above Amplifiers. Complete with transformer and grid bias battery. Cash or C.O.D. £1:12:6.
Or 2/6 down and 11 monthly payments of 3/-.

SPECIAL OFFER!

New light weight super-type HEADPHONES, recommended for short-wave work and testing.

List Value 15/-. BARGAIN 3/6

Postage 6d. extra.

SHORT-WAVE COILS Interchangeable plug-in coils. Low-loss material ribbed formers. N.T.S. coils are expertly wound with high-grade copper wire, to ensure accurate distributed self-capacity. 100% efficient. 4-pin: 12-26, 22-47, 41-94, 76-170 metres. List Value, 2/9. Bargain Price, 1/9. 6-pin wavelengths as for 4-pin types. List Value, 3/6. Bargain, 2/-.

VARIABLE CONDENSERS Short-wave tuning and band-spreading, all brass single-end, suitable for ganging. .000025 mfd., 2/6; .000045, 2/8; .00016, 3/6; .0002 (double-end), 3/6.

★ 1938 RECEIVER ★ BARGAINS

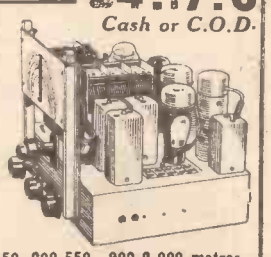
ALL-WAVE 5-valve A.C. SUPERHET CHASSIS

Amazing Offer! Limited Stock!

List Value 8 Gns. **BARGAIN £4:17:6**

Cash or C.O.D.

COMPLETE WITH 5 VALVES, KNOBS & ESCUTCHEON.



You must order NOW to secure this wonderful N.T.S. bargain. Stocks are limited. First come, first served. Send immediately.

●3 wavebands: 18-50, 200-550. 900-2,000 metres. ● A.V.C. bandpass on all bands. ● Input to triode hexode detector oscillator, V.M. H.F. pentode, double-diode-triode 2nd detector triode resistance capacity stage coupled to high-slope output pentode. ● Output 3 watts. ● Combined on-off switch and volume control. ● Separate tone control. ● 4-position wave-change and gramo-switch. ● Illuminated rectangular full-vision slow-motion dial, 80-1 and 9-1 reductions, scale engraved station names and wavelengths. ● Overall dimensions: 10" high, 11½" wide, 8½" deep. For A.C. mains 200/250 volts, 40/80 cycles. *10/6 down secures; balance 11 monthly payments of 10/6.*

10/6 DOWN

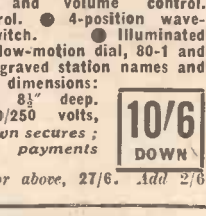
Moving-Coil Speaker for above, 27/6. Add 2/6 to deposit.

S.G.3 CHASSIS

with knobs and escutcheon, less valves.

LIST VALUE 60/- **BARGAIN 19/6**

Cash or C.O.D.



● Latest Screened Grid, H.F. Detector and Pentode output circuit. ● Screened coils. ● Only 9 m.a. H.T. Consumption. ● Illuminated and Wavelength Calibrated Dial. ● Wave-range 200-2,100 metres. ● Complete with escutcheon and all knobs.

Wide choice English and Foreign programmes with amazing tone and volume. 19/6, Cash or C.O.D. only.

COMPLETE WITH 3 BRITISH VALVES. List Value, £4/4/0. Bargain, £2/2/0. Cash or C.O.D. or 2/6 down and 12 monthly payments of 4/-.

2/6 DOWN

P.M. SPEAKERS. Goodmans. Limited stock for Power, Pentode or Class "B" (state which), 7/6. 8½in. for power, pentode, and terminals for low impedance matching for extension purposes, Similar speaker for Class "B" and low impedance matching, 13/6.

SPEAKERS, ENERGISED. Brand new, astounding offer. Celestion, 8½in., 2,500 ohms., Pent. Trans., 4-watt, 12/6.

VALVEHOLDERS. Chassis type paxolin. 4- and 5-pin, 2½d., 7-pin, 3½d., Octal, 6d. Baseboard 4- and 5-pin type, with terminals, 3½d.

New Times Sales Co.

56 (Pr.W. 35), LUDGATE HILL, LONDON, E.C.4.

Please send me CASH/C.O.D./H.P.:

.....

together with your Free Short Wave Booklet and 1938 Receiver and Component Bargain Lists.

NAME .....

ADDRESS .....

..... EST. 1924.

Please cross P.O.'s and register currency.

FREE!

SHORT-WAVE BOOKLET, describing in detail, with actual photographs, 5 entirely new N.T.S. Bargain Bandspread Short-Wave Kits, including those above, together with Complete General Bargain Lists—Receivers, Accessories, Components, etc. etc. Post the Coupon to-day. N.T.S. supply all leading makes Radio and Television.
Send us a list of all your Radio requirements for quotation by return.

BRIEF RADIO BIOGRAPHIES—20

By RUTH MASCHWITZ

Monte Rey

FANS of Monte Rey, the romantic singer of Geraldo's orchestra, may be interested to hear that he is single and that his age is thirty. Incidentally his real name is Montgomery Fyffe.

His parents are well-known amateurs in Scotland, and from early youth they trained him in singing and dancing. He was also taught the violin, and played and sang in a small country band. As a nigger minstrel he made his first public appearance at a Sunday school performance.

The family chose a business career for him so he went into an office, and passed many degrees for accountancy. However, while he was still in his teens he was singing grand opera in Glasgow in the rôle

Monte Rey in his Spanish gipsy costume.

of Radames in "Aida." Unfortunately, his clothes had been made for a very large man so that he had to be safety-pinned into them and take great care never to turn his back to the audience.

His firm transplanted him to London which gave him the opportunity to take lessons from a famous singer, and eventually he threw over his office job. The Duke and Duchess of Montrose, with other patrons, made it possible for him to study singing in Italy, and when he returned to London he began a professional career under the name of Fyffe. Through a serious operation he met the Italian singer Gaetano Loria, and continued his lessons in London. He gave recitals at the Wigmore and Albert Halls, and broadcast classics several times. He studied Italian, and went to Monte Carlo to appear in "Madame Butterfly," but a serious illness followed, and he returned to London a physical wreck.

Through an early broadcast he was offered an engagement at a Society function, and this led to an introduction to Geraldo for whom he still sings in his "Music Shop" programmes, as well as records and stage shows. He took the name of Monte Rey and the part of a Spanish tenor. Then Joe Loss engaged him as well for late night dance broadcasts.

Monte lives in a quiet village twenty miles from London. His hobbies are gardening, dog breeding, bird keeping—and going to bed early!

Sutherland Felce

SUTHERLAND FELCE, the radio joker and compère, was first heard over the air at the age of seventeen from 2LO. Since then he has had over 60 engagements to broadcast in variety and music-hall shows, and with dance bands. His most exciting bit of compèring took place in the air whilst doing a stunt for Gordon Selfridge when he took up Gloria and Dawn with six other mannequins in an Imperial Airways liner. He was one of the first artists to be televised, and has made several appearances since then.

Sutherland is the only boy of his family and lives with his mother—whom he declares is his best critic—at Wimbledon. As a child, though good at his studies, his chief interest was conjuring. He used to baffle his schoolmates and masters with his tricks until one sad speech-day when he appeared in a sketch called "Mirth and Mystery." It was a great occasion with 2,000 people present. Sutherland was supposed to finish his programme with a handcuff stunt à la Houdini, but at the critical moment of "Hey, Presto" he discovered that instead of being able to bow to the audience in triumph he was still struggling with the handcuffs!

Sutherland Felce in characteristic mood.

On a summer vacation from school he went to the South of France, and one day, while watching professional dancers, decided to appear in cabaret. He began as a silent magician, and proved so successful that he was booked for a further three weeks.

Henry Sherek, the theatrical impresario, gave him his first big break as compère at the London Pavilion, since when he has appeared at numerous restaurants, theatres and clubs all over the country.

SPIRIT MESSAGES AND THE LOST CONCERTO

WITH reference to the first performance in England of the recently-discovered Violin Concerto by Schumann, which will be played by Jelly d'Aranyi at the first B.B.C. Symphony Concert at the Queen's Hall on October 20th, we are now able to give the full story of the sensational circumstances which led to the discovery of the Concerto. Written in 1853 at the end of the composer's life, the manuscript, after being in the possession of Joseph Joachim and his heirs, was finally deposited in the archives of the Prussian State Library in Berlin. Not more than two or three people had ever seen it, and its whereabouts was unknown to anyone outside the Curators of the Library and one or two members of the Schumann and Joachim families. Moreover, it had been stipulated that the Concerto should on no account be published or performed until one hundred years after Schumann's death.

This was the position until some three years ago, when a message purporting to come from the spirit of Schumann was received by Jelly d'Aranyi, urging her to find and eventually play a posthumous work of his for the violin. The recipient and her sister, the well-known violinist Adila Fachiri, had for some time been experimenting with a view to establishing contact with the spirit world, and many "spirit" messages had already been received. No medium was employed, but the system adopted was the well-known one of allowing an inverted glass or tumbler, upon which three or four persons, including a "sensitive," lightly place their fingers, to spell out messages by pointing to the letters of the alphabet disposed in a circle round the table, and all those taking part were at all times fully conscious and awake. The information received in this mysterious way about an unknown work for the violin by Schumann came as a surprise to all concerned, but steps were immediately taken to discover what the work might be and where it could be found.

First of all, however, the question was asked: Was it really Schumann himself who had sent the message? The answer came promptly—and in German this time, although the language used habitually was English—"Ich war es selbst" ("It was I myself"). Fortified by this assurance (and by many others received during this period), the recipients of the mysterious messages began a serious search for the missing manuscript. Finally, after many disappointments, their efforts were rewarded and a score of the long-lost Violin Concerto was discovered in the Prussian State Library in Berlin. The manuscript, however, bore the inscription "Unfinished," and reports from other sources were received to the same effect. The sender of the "spirit" messages, however, denied this, and persistently asserting that the work was completely finished, suggested that the Berlin Library might not have got the right copy. As it turned out, this conjecture proved to be correct; for when Herr Strecker, of the firm of Schotts, the well-known music publishers (who by this time, had been acquainted with the facts), extended his investigations still further, he discovered that there were no less than four copies of the work extant, one of which was the manuscript score of the complete work.

Thus, the "spirit" messages proved to be accurate in every particular; and it is owing to them entirely that the missing Concerto was ever brought to light.

"A TECHNICAL HITCH!"

Interesting Details of How the B.B.C. Engineers Deal With Breakdowns Due to Lightning and Other Causes

IT sometimes happens that one of the B.B.C.'s many transmitters is "off the air" for a few minutes, a fact that is recorded in its technical nakedness in the log of transmissions at Broadcasting House.

But great technical progress has rapidly lessened the number of breakdowns, and also minimised the duration of any interruption to programmes that may be due to what engineers call a transmitter "shut down." To the ordinary listener, actual radiation of daily programmes is a mysterious process about which from time to time they ask many questions of the technical experts at Broadcasting House:

How many transmitters are operated by the B.B.C.? What is the commonest cause of breakdowns? Are masts used as aerials?

And many other questions of a similar nature.

Come, then, to an office near the Control Room, eight floors above Portland Place, and meet Mr. L. Hotine who, as Superintendent Engineer (Transmitters) knows all the answers.

"To-day," he will tell you, "the B.B.C. operates 23 transmitters at 13 different stations, including, of course, the Empire transmitters at Daventry.

Lightning Trouble

"The commonest cause of trouble nowadays is lightning; it strikes masts and aerials and creates terrific surges which damage the tuning circuits at the base of the mast. Of course, we see that these circuits are as well protected as possible by lightning arresters and other devices, but man knows so little about lightning that our safety measures do not always work. Lightning will sometimes ignore safety 'gaps' and prefer to jump through space for a distance of four or five feet. Only a colossal pressure of many millions of volts makes that possible.

"We have modified circuits so that surges get the best paths to earth, and lightning causes far fewer breakdowns than it did only a few years ago. Valve failures were once a frequent cause of trouble. Every station uses a large number of valves; there are about 30 in one transmitter at Brookmans Park. And they are all bound to 'die' eventually.

"Some of the valves we use are as small as those in ordinary receiving apparatus, and the biggest, at Droitwich, are the 'C.A.T.14' type. They are about five feet in length, water cooled, far too heavy for one man alone to lift, and cost hundreds of pounds each. The normal life of these big valves is about 8,000 hours; the smaller types have a useful existence of between 3,000 and 4,000 hours. At our more modern stations a valve failure does not cause the transmission to cease for more than a few seconds. Isolating switches make it simple to cut any particular valve from the circuit and continue the programme by slightly overrunning the others, replacing the faulty one at the end of a transmission.

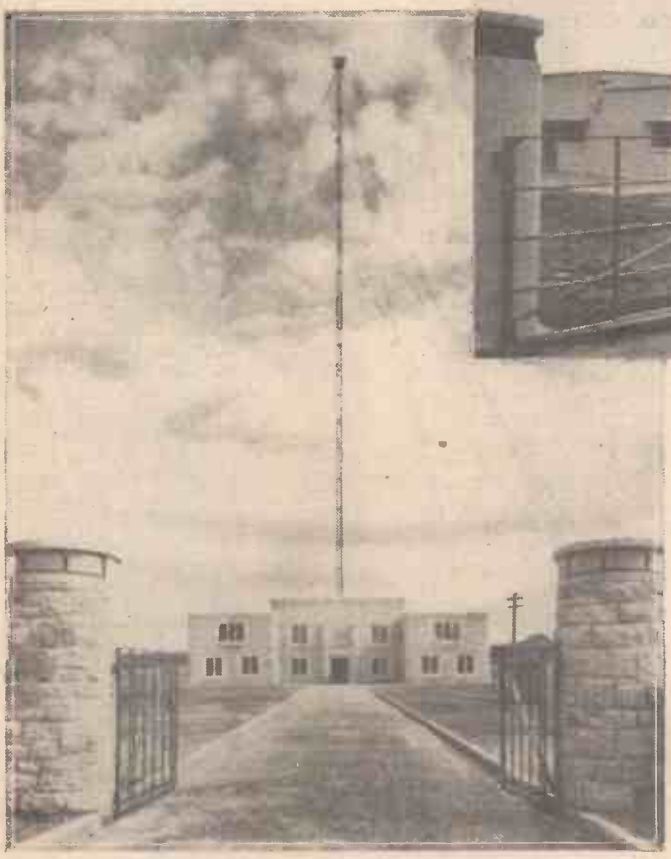
"It is very unusual, by the way, for an aerial to break; it has happened only once or twice since broadcasting began. But we always take the precaution of having sufficient spare wire at every station to replace an aerial within a few hours. Perhaps the time will come when aerials will be completely obsolete. Even now the B.B.C.'s newest stations—Lisnagarvey, Burghead and Stagshaw—do not use aerials in the old sense at all. The mast itself, sitting on a huge insulating pedestal, is the radiating element; a convenient arrangement, the main value of which, apart from obvious mechanical advantages, is that it reduces fading.

"Because enough wavelengths are not available a number of our transmitters are synchronised. The bare statement that the three National transmitters — London, North and Scottish —work on the same wavelength does not mean much to the ordinary listener. But it matters an enormous amount to broadcasting engineers.

Tuning Forks

"Each of those three stations has a tuning fork vibrating at the same speed in an oven kept strictly to a constant temperature. One of the three stations is a 'master'; it takes the output of its tuning fork, amplifies it, and puts it on a telephone line to the two others. They, in turn, multiply it to the correct radio frequency and drive their transmitters with the tone. This ensures that all three stations are perfectly synchronised. If anything goes wrong with the telephone line or with the equipment supplying those vital vibrations—we call them oscillations—the tuning forks at the two other stations automatically switch themselves in and continue to drive the transmitter, until the line interruption has been cleared.

"An immense amount of work has to be done at all transmitters every day, sometimes in the early hours of the morning. There are many things to be checked before transmitters begin, and everything must be scrupulously clean.



(Above) A general view of the Penmon transmitting station and mast-aerial. (Left) A front view of the Transmitting Hall at Burghead, showing the single mast aerial.

AUTUMN OUTSIDE BROADCASTS

The Provisional B.B.C. Programme of this Autumn's Outside Broadcasts will Introduce to Listeners Some New Ideas While Many Old Favourites Remain

The Lord Mayor's Banquet

The Lord Mayor's Banquet will again be a high spot of this autumn, and here the Outside Broadcast Director is investigating the possibility of introducing a new broadcasting procedure at this important function. As a rule, listeners have been transferred from the studio to the Mansion House just in time to hear the toastmaster proposing the Prime Minister's health. This year it is proposed to switch over to the Mansion House a few minutes before the speeches begin, to enable the observer to describe the rich setting and pageantry of this great civic function. It is here, in the person of the commentator, that a new idea will be introduced. It is hoped to find an "average listener" able to describe the brilliant scene and the appearance of the distinguished people doing honour to the Lord Mayor. The possibility of a woman commentator has not been ruled out.

Darts

As a change from the more serious outside broadcasts, it is proposed that the microphone shall visit, during the autumn, an Islington Dart Derby. The teams are drawn from well-known hostelries whose clients annually challenge each other. The enthusiasm and skill is of a high order, and the Outside Broadcast Department are trying to find two colourful commentators to do justice to what invariably proves an amusing occasion.

Boxing

Boxing has been carefully reviewed from the broadcast angle. London will see some big matches this autumn, and it is proposed to cover these whenever possible. It is felt that it might encourage amateur boxing if broadcast time were reserved for the more outstanding contests such as those between the Police and the Service, and Oxford and Cambridge. Similarly, the Outside Broadcast Director has been assisting county cricket this season by giving added publicity to the game.

Rugby

While dealing with this matter of commentators and observers, a very interesting suggestion is in hand with regard to the University Rugby matches. It is proposed to select a date shortly before the inter-university match when both universities are engaged. Captain H. B. T. Wakelam will visit one venue and Howard Marshall another, and a description of half of each match will be broadcast. By this means, the form of each university can be studied in the same afternoon, while listeners will have the added amusement of comparing the two styles of observers.

Skating

Ice Hockey has now a definite place in the radio programmes. It is a fast game which lends itself to radio description, and for it the B.B.C. has built up a small team of expert commentators who will again be in attendance. Besides the matches of the Ice Hockey League, the Outside Broadcast Director feels that there is the making of some excellent entertainment in the figure skating championships.

Military Spectacle

London is rich in military spectacle; that of the summer being the more familiar. Less known are the regimental tattoos which occur throughout the year at barracks and depôts. The Brigade of Guards, at all their barracks and at Windsor, carry out "Tattoo." with a splendid ceremony. It is proposed to listen to some of these with a view to introducing a short period into the radio schedule. The words of command, and the martial music drawn from such spectacles, have ever been popular with listeners.

Another great annual function, that of the British Legion Armistice celebration at the Albert Hall, is to receive a careful review to see how much it is possible to broadcast. This is a great national festival, occurring at a time when many are thinking of the first Armistice. It has a universal appeal, and as the Army springs from the people, a more careful study of the possibilities of this annual celebration is to be made.

The London Scene

The Outside Broadcast Department's offices contain many suggestions for utilising various happenings occurring in London's streets and parks. Many of these occasions are of sectional interest, but the majority have considerable entertainment value. Hyde Park, for instance, has several gatherings unknown to the general public, which have considerable charm. Some of these are unofficial meetings of musical people for the purpose of singing national songs. It is proposed to investigate these to see if, with the aid of an observer and commentator and the spontaneous singing, a broadcast of considerable colour could not be obtained.

One of the endeavours of the enthusiastic staff of the Outside Broadcast Department is to prove that the old tag, "There is nothing new in entertainment," is wrong. Listeners may rest assured that a large majority of the suggestions for outside broadcasts reaching the B.B.C. are explored. This, in itself, takes an immense amount of time and effort. The Outside Broadcast Department has to investigate possibility and availability before even a suggestion can be submitted. Quite frequently, after some weeks of work involving countless journeys and conferences, promising ideas have to be abandoned.

With regard to this autumn, it is safe to predict a most interesting and effective programme of broadcasts from outside the studios.

Ultra-short-wave Reception

Some Notes on Stations that are Well Received Below 10 Metres.

THE long-awaited moment when stations below 10 metres would once again entertain us has arrived. The dials of a 10-metre set are alive with stations, amateur, police, and broadcast.

Some idea of what to expect "down here" may be gauged by the fact that the following amateur stations have been coming in well upon the 10-metre amateur band: W4EIL, W5GGX, W6OIS, W6HKM, W6NDC, W6ERT, W6NTH, W6OAC, W7EMP, W9PWU, W9DRQ, W9KZN, VE2KX; a batch of stations including Colorado and Dakotan stations, a sure proof that ultra short-wave reception is thrilling.

Broadcasters

Numerous broadcasters are also being heard, and the following schedules and wavelength details will add much to your enjoyment.

On 9.494 metres many stations operate, the best heard being W3XKA at Philadelphia. Search for him between 2 and 4 p.m.

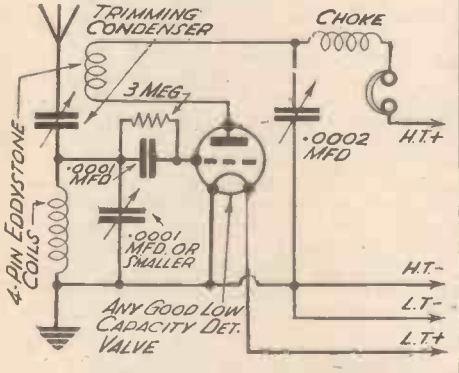
W1XKB, Springfield, relays WBZA from 11.30 a.m. to 6 p.m. daily on the same wavelength, whilst W3XEY, Baltimore, may be heard relaying WFBR around 3 p.m.

Other interesting stations are W4XCH, which relays WMC, Memphis, during the afternoons; W8XAI, Rochester—often a good signal between 3 p.m. and 8 p.m.; and W8XWJ, relay station of WWJ, Detroit. The schedule of this station is as follows: Sundays from 7.30 p.m. to 12.30 a.m., and from 11.55 a.m. to 5.30 p.m., and daily from 7 to 10 p.m.

W9XHW, Minneapolis, relays WCCO on Mondays to Fridays from 12.15 p.m. to 3 p.m., and on Saturdays from 7.30 p.m. to 5 a.m. Sunday transmissions are made between 2 and 3 p.m.

On 5 Metres

Although less lively, the 5-metre amateur band is well worth attention. In the London area G5WW, North London; G5RD, Watford, and G5KH, Wandsworth, are coming in well.



A simple circuit for use on 5 metres.

Occasionally a DX station will be heard, and in this connection it is well to remember that G6YQ and G6OK are transmitting regularly from the top of Snowdon. These stations have been heard over considerable distances, and careful searching may well add them to the Londoner's log.

RADIO CLUBS AND 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 Croydon Radio Society

THIS society's 1937-38 session having opened on Tuesday, October 5th, in St. Peter's Hall, Ledbury Road, South Croydon, members are now looking forward to some interesting programmes. All the old favourites are on the bill, but the society is increasing in intensity its campaign for realistic reproduction of broadcast music. Much has to be done in educating the great British public as to what is and what is not correct reproduction, and far too many wireless set owners are content with sounds from their loudspeakers which to the expert are distinctly distorted.

In this respect, the loudspeaker night on November 23rd is a date to be remembered, and an ever-popular pick-up night on October 19th is likely to be an instructive evening. Experts on loudspeaker design appear on October 26th and November 9th. Nor is television neglected, and a talk on "Cathode-ray Tubes for Television" is merely one evening devoted to this topic.

Above all, however, the society is as anxious as ever to welcome PRACTICAL AND AMATEUR WIRELESS readers to its ranks. Both have the same ideals, namely a better understanding of the science of radio, and fixture cards will gladly be sent to interested readers, together with full particulars of the society. Hon. Pub. Sec. : E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

Exeter and District Wireless Society

THE above society held their first meeting for the season on Monday, September 20th, and the balance sheet for the year was presented by the treasurer, showing the society to be on a sound financial footing. Mr. A. T. Batten gave a talk on the Radiolympia show, and also demonstrated the Murphy all-wave radio set. The society proposes building a high-quality amplifier for test and demonstration purposes, and members submitted designs for this piece of apparatus at the meeting held on Monday, September 27th. Further particulars can be obtained from the Secretary, Mr. W. J. Ching, 9, Sivell Place, Heavitree.

Bradford Short-wave Club

THE above club has great pleasure in issuing a permanent invitation to all enthusiasts to attend the meetings this session. The lectures arranged will undoubtedly be interesting and instructive, and one of these in the near future is that of Radio G6AZ, who will deal with "Aerials," both for receiving and transmitting.

A new philosophy has grown in the club. Members are unanimously agreed that even if no gear were available at the club, they would not miss the chance of conversation with fellow members every Friday evening. Come along and share the famous world-wide radio friendship. Hon Sec. : G. Walker, 33, Napier Road, Thornbury, Bradford, Yorks.

Tottenham Short-wave Club

THE extensions of this club's shack will be very soon completed, and with the extra room available experiments can be carried out on a much larger scale. The club is still open for a few applications from those interested in short-wave work. These should be sent to the Hon. Sec., Edwin Jones, 60, Walmer Terrace, Palmers Green, N.13.

THE BRITISH LONG DISTANCE LISTENERS' CLUB

Stationery for Members

MEMBERS should remember that we can supply pads of forms upon which reports of reception may be entered for submission to transmitters in order to obtain Q.S.L. cards. These pads contain 50 such forms upon which columns are provided for the entry of all the essential details of a transmission, and the price is 1s. 6d. Even if you do not wish to send out reports, it is worth while keeping a careful log of all signals received, and printed on these together with a space for the member's number, and you should always use this paper when writing for component parts to other members, or to stations regarding transmissions. A white manilla folder in which the log sheets may be kept costs 7½d., and badges are available for 1s. each.

As we have previously stated, we have had to discontinue the practice of forwarding on members' reports to various stations, owing to the difficulty which has been

RADIO STATION ..... LISTENER'S NAME .....

ADDRESS ..... ADDRESS .....

COUNTRY ..... COUNTRY .....

B.L.D.L.C.

Dear Sirs

I am very glad to confirm the reception of your station..... on a wave length of.....m (.....kc/s)

The following details of my reception will doubtless be of interest to you :

Date	Time (G.M.T. or E.S.T.)	Items and Announcements	Volume (R)	Fading	Statics	Interferences	REMARKS

I should be grateful for your confirmation of the above report.

Date ..... Signature .....

Member of the BRITISH LONG DISTANCE LISTENER'S CLUB.

This is a reproduction of one of the verification sheets which we supply. The full sheet is 8in. by 10in.

although an ordinary notebook can be ruled up for this purpose, it is much better to use a ready-printed log sheet, and a pad containing 50 sheets for this purpose may also be obtained from us for 1s. 6d. In addition to these two items, we can also supply printed writing paper at 1s. 3d. per packet of 50 sheets. The B.L.D.L.C. badge is experienced in obtaining replies in many cases. New readers who are anxious to join the Club, for which no membership fee is required, should complete the form on this page and address it to The British Long-Distance Listeners' Club, Geo. Newnes Ltd., Tower House, Southampton Street, London, W.C.2.

BRITISH LONG-DISTANCE LISTENERS' CLUB

ENROLMENT FORM.

I wish to enrol my name as member of the British Long-distance Listeners' Club, it being clearly understood that no financial obligation is thus incurred. I am interested in long-distance listening and have* a short-wave receiver at present in use. I am especially have not

interested in { medium wave* / short-wave / ultra short-wave } listening.

Full Name (Block letters) .....

Address .....

.....

*Strike out words not needed.

Optional.

Please forward me .....pads of 50 log-book sheets price 1s. 6d.

.....badge price 1/- each

.....pads of 50 verification forms price 1s. 6d.

for which I enclose { cheque / postal order } for £.....

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).

Progressive Superhet Construction

SIR,—Regarding M. H. Walters' letter, published in a recent issue, I should also like to see some articles on progressive superhet construction. Although I vaguely understand the superhet, I have never passed the H.F.-Det.-L.F. stage!

I think these articles should begin with the principle of the frequency-changer, then the I.F. transformers; and amplifier, following with constructional details of the oscillator coil.

As Mr. Walters suggests, a simple superhet using headphones would be preferable to begin with, expanding later to a 5 or 6-valver.—J. F. HITCHCOCK (Fetcham Park, Surrey).

Station COCM

SIR,—In your issue of September 25th, under the heading "New Cuban Stations," you publish details of the station COCM. Actually this is not a new station, as it was received here every morning during the week beginning October 22nd, 1936. It appears, however, to have altered its schedule, as when heard on that date, it closed down at 05.30 G.M.T. The receiver used was 0-v-0. A report was despatched but no reply has yet been received. In conclusion, let me adjure those listeners who expect cards by return of post to be patient. I sent several reports a year ago, and the replies are just beginning to roll in.—E. PARSONS (Luton).

A 20 and 40-metre Log from Wisbech

SIR,—I am enclosing a log of amateur 'phone transmitters on 7 mc/s and 14 mc/s in the hope that this will prove of some interest to other S.W.L.s.

This list was compiled on September 19th to 21st inclusive, and the receiver is a single-valver using a Mazda L2 two-volt triode detector with plug-in coils and capacity-coupled to an outdoor circular frame antenna, 30ft. high and 80ft. long, with lead-in.

On 20 metres: W1HKK, IFD, DHT, IED, DAY, BVS, BLO, DET, BCP, JFG; W2IXY, HCE, TY, DH, AWL, HFS, AD, HNA, JKQ, GIZ, EPD, ASA, HS, JRR. W3ASG, EKU, FII, FMY. FDS, EFS, PC. FAO. W4IS, EAV, CDG, HX, EHG. W5ASG, JC, EHM, BJO. W6BFC, NNR, MWD, ANU. W7FQK, DVY. W8MJT, FOD, NYP, NUB, GLC, RL, OAR, KQ, CNA, MDU. W9IPX, BBU, UOP.

Also on 20 metres: K6NZQ (R6), K6BNR (R4), K7FBE (R4), VK2XU (R6), NY2AE, HH5PA, YV5AA, CO6OM, 2OK, TI2AV, XE1LK, VO2Z, CN8AM, MB, VE1GP, SM5OI, ON4VK, CT1QG, HA4A, I1MX, MG, KS, SU1KG, etc.

On 40 metres: 57 G stations, including GW, GI, GM. ON4DZ, JN, KW, IS, ABA, WX, JC, CC, OM, TVS. F8XR, SD, GM, WF, QP, CG, BA, NB; F3DI, OS, NO, AI, FA, OM, EI9G, 8L, 9D, 8J, 2J, PAOJS, JA, DK, AU.

This brings my total for the three days to 195 hams, and I should like to compare results with any other reader using a similar receiver. All reception is, of course, on 'phone.—L. SINGLETARY (Wisbech).

A 10-metre Log from Swindon

SIR,—I enclose a log of 10-metre amateur stations received here between the 12th and the 22nd of September, and hope it may interest fellow readers:

W1	W2	W3	W4	W8	W9
GMT	TP	FYO	CYU	AAB	CPT
ADI	FGB	EET	DRZ	CLF	COO
ATC	JQS	FRH	GJ	HSP	FAA
AAK	BHY	GZN	GCX	CHB	VE2QXY,
JZS	FGV	CBT		HYY	and
ADR	FWJ	GUG		EBS	VE2KX
DLJ	ADR	GTN		GUL	
IAS	EUI			LGO	
HVS	KHR			CFU	
IAO					
COO					
KSA					

My receiver is an 0-v-1 (D. and L.F.) battery operated. The coils are home-made from 14 gauge copper, and fixed direct on the condensers. Tuning is carried out on a band-spread in conjunction with a .00004 mfd. main tuner. The antenna is an indoor one, 15ft. in length, and all stations were heard on 'phones.

May I take this opportunity to thank

(Continued on opposite page)

CUT THIS OUT EACH WEEK.

Do you know

—THAT the selectivity of an I.F. transformer may be modified by opening the coupling and connecting a few turns in series with the secondary, tightly coupled to the primary.

—THAT when the above modification is carried out the additional winding may be short-circuited as required for higher selectivity.

—THAT instability can be caused by screening which may link two circuits together.

—THAT in close proximity to a powerful station direct signal pick-up on the inter-circuit wiring may provide difficulty in cutting out the station.

—THAT when a D.C. set is operated on short waves it may be found desirable to connect all screening direct to a separate earth.

—THAT for the reception of the present B.B.C. television transmissions a di-pole aerial should be arranged vertically, not horizontally.

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.

you for such an interesting and instructive weekly.—F. L. ROBINSON (Swindon).

A Valve Tester

SIR,—May I make a few suggestions about the valve tester that has been proposed for the subject of an article in the pages in your weekly.

There are three things that are desirable in the way of types of tests: (1) to determine the emission of the valve in question, if a triode-hexode or other dual valve, the emission of each section independently from the other; (2) to determine the amount of leakage between elements, and (3) to determine whether or not any of the elements are open-circuited. Of these three the first two are necessary, and the third a desirable feature which would only be incorporated in an expensive instrument.

About the tester in general—it should be flexible and designed with an eye to the future, and it should be able to accommodate additions for future varieties. Above all, it should be able to take care of American as well as English valves. This brings up the question of the octal base, and in the majority of these the filament is brought out to pins numbered 2 and 7, but quite a few have been released using pins 2 and 8 for this purpose; later a 6P7 was brought out using pins 2 and 3, and several of the octal base valves have been brought out since using pins 8 and 7 for filament connections. The proposed valve tester should operate from the mains, and incorporate a rectifier so that D.C. can be used instead of the A.C. that is used in so many commercial models. A push-button arrangement would take care of whether a negative or positive voltage should be applied to the various elements, and thus it would enable the emission of both diodes and the triode of a double-diode-triode to be checked separately.—JOHN B. POLLOCK (Orpington).

"The Exide Mystery"

SIR,—The article in the September 18th issue of PRACTICAL AND AMATEUR WIRELESS, entitled "The Exide Mystery," has cleared up a mystery for which I have long sought the solution. Some time ago I had to overhaul a private lighting plant which was out of order. Instead of the full output of 100 volts, only 40 volts was registered. I at once suspected the storage batteries, and proceeded to test each cell individually. After testing four and getting the usual 2-volt reading from each, you can imagine my surprise when on testing the fifth cell the voltmeter read 10 volts! Something wrong here, I thought, and gave the meter a sharp tap; it still insisted on registering ten volts, however, and I began to wonder. Further examination of the cell (which incidentally was the one causing the trouble), showed that there had been leakage of electrolyte through a crack, the plates being uncovered about an inch at the top. There was some sulphation, and on trying to remove this, several of the plates parted from the positive lug.

I have often puzzled over the phenomenon, and when I have asked some of my learned electrical friends if they can explain it, I have been met with sceptical smiles and advised to take more water with it. Thanks to your article, I am now vindicated.—A. H. OLIVER (Hitchin).

Logged at Mill Hill

SIR,—As I have not seen a 20-metre log from my district lately, I enclose mine. All stations were received between August 15th and September 16th on an 0-v-2, receiver with an aerial 30ft. high and 40ft. long.

CE4AO, CO2EG, CO2JG, CO2JJ, CO2LY, CO2MT, CO2RH, CO2XF, CO7CX, CI8EC, CO8KJ, CO8YB, HC1FG, HC1JB, HC1JW, HH2B, HH5PA, K6NZQ, LU5BB, LU5FG, NY2AE, OA4AI, PK3WI, PY2ET, PY2FF, PY5AQ, TI1AS, TI1AZ, TI2AV, TI2KP, TI2RC, TI2RT, VE5EF, VE5JK, VK2RJ, VK2VB, VK2VV, VK2XS, VK2XU (25 watts), VK2ZZ, VK3AL, VK3KX, VK3PE, VK3XJ, VK4WV, VK5AI, VK5AW, VP3BG, VP5PZ, W5DYM, W5FDI, W5GIB, W5ZC, W6AL, W7FQK, XE1Y, XE2FC, YV5ABE, YV5AK, and also about 100 other W stations, and many Europeans.

Some of the best broadcasting stations which I have logged lately are XEWW, COCM, COJK, KZRM, COBC, COBZ and HJ1ABP.—DOUGLAS L. PELHAM (Mill Hill).

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.

R. W. (Dudley). We will bear your request in mind and if sufficient interest is displayed by other readers will describe a set of the type mentioned. We do not think, however, that it would be very popular with the majority owing to the cost of maintenance.

F. W. C. (Dunlavin). We cannot recommend a modern set to be constructed from the old parts mentioned. The condenser is not suitable for modern tuning owing to the crowding of the frequencies at the lower end of the dial, and the best plan is to dispose of the complete receiver and obtain modern parts with which to build a modern set.

J. B. (Edington). For short-wave work we think the best plan would be to obtain a good pair of Brown "A" type 'phones.

C. E. V. (Hall Green, Birmingham). We are unable to give details for rewinding the motor for your purpose.

A. C. (Stornoway). Messrs. Peto-Scott can supply the coil ready-made or in parts for home-construction.

P. J. A. (Sidcup). Probably one of the sets described in our Show numbers would prove more useful to you than the set mentioned in your communication.

G. B. P. (Ewell). There is no easy way of measuring the details you require to know, and the best plan is to obtain a good modern output-transformer of the multi-ratio type and replace the transformer fitted to your speaker. You can then make tests to find the best ratio and thus obtain maximum results.

R. I. (Dublin). We cannot supply a blueprint of the receiver in question, and the makers are no longer in business.

J. B. N. (Brighton). There were no tuning dials fitted to this portable, the condensers being controlled merely by ordinary knobs of the type having a small projecting pointer to provide an indicating point. You could, of course, fit small engraved dials if you desired, but they would have to be 2in. in diameter or less.

E. G. C. (Smethwick). The makers are Regentone Products, Ltd., Worton Road, Isleworth, Middlesex.

W. C. (Hull). We regret that we have no blueprints of a portable gramophone of the type mentioned in your letter.

H. G. S. (Hillingdon). You do not state whether you require battery or mains apparatus, but we have described three 2-valve A.C. mains sets which would meet your requirements. These will be found in our Blueprint list in this issue.

C. F. H. (Westcliff-on-Sea). The arrangement mentioned would be very unsatisfactory. Apart from the inefficiency of the arrangement, you would be wasting the remaining valves and these could well be utilised by connecting a short-wave converter to the input of the receiver. Any good superhet S.W. converter should work satisfactorily with the set.

D. G. (Glasgow, N.). The component is the H.F. choke, not a condenser. The runners are not metal covered. You can dispense with the component brackets. Foil could be used but we advise a thicker material.

E. N. (Rotherham). An ordinary 6-volt low-consumption bulb could be used, of the type generally employed for a dial light. Write to Messrs. Colvern, Mawneys Road, Romford, Essex, regarding the resistances.

C. H. G. (Bushey). The sodium silicate is added to ordinary acid as found in the accumulator, and the amount required will depend upon the size of the cell. It is simply dropped in at the vent until jellification is complete.

T. B. (Felixstowe). You could build a simple D.C. mains H.T. battery eliminator to deliver the voltages required for the receiver and this would entail no alterations to the receiver.

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	.. 7½d.	" "
Wireless Magazine	.. 1/3	" "

The index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus PW refers to PRACTICAL WIRELESS, AW to *Amateur Wireless*, PM to *Practical Mechanics*, WM 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	Date of Issue.	No. of Blueprint.
CRYSTAL SETS.		
Blueprint, 6d.		
1937 Crystal Receiver ..	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-Valve : Blueprint, 1s.		
All-wave Unipen (Pentode) ..	—	PW31A
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36B
The Signet Two	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-Range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow) ..	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-mark Three (SG, D, Pow) ..	12.6.37	PW41
Hall-mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2 LF (Trans)) ..	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen) ..	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P) ..	—	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen) ..	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen) ..	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans)	5.12.36	PW72
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P) ..	1.5.37	PW4
Fury Four (2 SG, D, Pen) ..	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl. B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P) ..	26.9.36	PW67
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen) ..	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow) ..	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen) ..	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen) ..	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wavo" A.C. Three (D, 2LF (RC))	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, H.F. Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
SUPERHETS.		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve) ..	5.6.37	PW40
F. J. Camm's 2-valve Superhet Two-valve	13.7.35	PW52
F. J. Camm's £4 Superhet ..	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve) ..	—	PW43
D.C. £5 Superhet (Three-valve) ..	1.12.34	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four ..	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans))	7.8.37	PW63
The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
F. J. Camm's Oracle All-wave Three (H.F., Det., Pen.) ..	28.8.37	PW78
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen) ..	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A
AMATEUR WIRELESS AND WIRELESS MAGAZINE		
CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver ..	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans) ..	—	AW388
Full-volume Two (SG det., Pen) ..	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans) ..	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW374
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans) ..	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher; Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans) ..	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans) ..	—	WM318
Simple-tune Three (SG, D, Pen) ..	*June* '33	WM327
Economy-Pentode Three (SG, D Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans) ..	*Mar.* '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen) ..	*June* '35	WM389
Certainty Three (SG, D, Pen) ..	—	WM393
Minitube Three (SG, D, Trans) ..	*Oct.* '35	WM400
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM396
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans) ..	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2HF Four (2 SG, D, Pen) ..	—	AW421
Crusader's A.V.C.4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each) ..	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen) ..	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
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), A.C.	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	—	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	WM380
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)	—	WM379
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	*Apl.* '35	WM385
PORTABLES.		
Four-valve : Blueprints, 1s. 6d. each.		
Midget Class B Portable (SG, D, LF, Class B)	20.5.33	AW380
Holiday Portable (SG, D, LF, Class B)	1.7.33	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-wave (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

QUERIES and ENQUIRIES

Class B and Mains Unit

"I have been using my Class B four with every satisfaction from a wet H.T. battery supply, but now the electric mains have been brought into the house. I have been told that it is difficult to run a Class B set from the mains, but if this is wrong I should like to take advantage of the mains supply. What is the snag in doing this? If you can recommend a design for a unit I should like to build it."—F. A. F. (Bristol, 5).

THE Class B valve operates with a fluctuating current, and in the ordinary type of mains unit the voltage output is dependent to a large degree upon the current load. Consequently, as the current from the receiver varies so does the H.T., and this causes distortion and other troubles. However, an ordinary type of mains unit may be used for operating the set, provided that it delivers a maximum current of at least 30 mA. To maintain a stable voltage output, a special Neon stabiliser is then joined across the output terminals. Alternatively, a mains unit may be built up with a special Westinghouse Metal Rectifier (Type 17) and the output valve is then fed through a separate smoothing choke with a separate feed through another choke for the remaining valves in the receiver. We cannot supply a blueprint for a mains unit for this particular purpose.

Station Name Dials

"I am looking for a good station indicator illuminated dial, similar to those fitted to commercial receivers—for the medium- and long-wave band. I would like to obtain one together with a three-gang midget condenser if possible."—J. H. W. (Loughborough).

A DIAL of the type you mention may be obtained either from Messrs. Jackson Bros. or Wingrove and Rogers. The former firm supplies a round or square dial calibrated in the names of medium- and long-wave stations in chrome or bronze and with a single or dual-ratio drive. The price is 5s. 9d. or 6s. 6d., according to the drive. The Polar dial has two ratios, 10 to 1 and 50 to 1 and costs 9s. 6d., or with single drive at 6s. 6d. Both firms can supply a midget three-gang condenser to suit.

Extension Speakers

"I have a well-known commercial receiver fitted with pick-up and extension loudspeaker sockets. I have tried several pick-ups with only moderate success, and have not been able to obtain any satisfaction from the extension speaker sockets. Is it possible that these have not been connected up inside, or what is the difficulty in obtaining good results in each case. The pick-ups I have tried are well-known modern components, and I have tried two existing W.B. speakers which give every satisfaction on a home-made set."—G. R. F. (Ilford).

IT is very unlikely that the sockets are not wired, and therefore your trouble must be due to the fact that the impedances are not correctly matched. With regard to the pick-up most receivers are intended for use with a medium-impedance component and, therefore, we suspect that the bias component or components in the valve circuit to which the pick-up is joined may be defective. This fault would not be noticeable on radio. With regard to the extension speaker your set is probably fitted with a low-impedance output circuit and thus a low-impedance speaker must be employed. No doubt you have tried ordinary speakers which are fitted with an input transformer, and, therefore, if you do not wish to write to the makers of the set for confirmation, you should try the speech coil only, joined to the extension speaker sockets.

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.

Modifying a Meter

"I have a .5 amp. meter which I took from an old charging board and wish to use this to make up a multi-range meter to give current, ohms and volts suitable for ordinary test work on the average battery and mains receiver. Have you published any details which would help me to work out the necessary shunts, etc., so that I could build a compact instrument for my purpose?"—H. P. (Bath).

AS the full-scale deflection of the meter is 500 milliamps, you cannot use it for the purpose outlined in your query. It is not possible to make the meter give a full-scale deflection with less than 500 milliamps, and thus any small current reading would be crowded to the bottom of the scale. When building a multi-purpose meter of the type you require you should use a meter which has a full-scale deflection at a very low current, and then shunts will enable you to obtain readings up to practically any value.

Using Headphones

"I recently bought an all-wave superhet and find that on the short-waves many of the stations are hardly of entertainment value on the speaker. I can just hear them by putting my ear close to the speaker, and I wonder if it would be feasible to use headphones connected to the extension speaker sockets. The set is operated from A.C. mains, and I wonder if this would render the phones dangerous to use. I should be glad of advice concerning this point."—D. T. (Shrewsbury).

IT is quite in order to use headphones for the purpose mentioned, and, in fact, the use of 'phones is becoming increasingly popular with all-wave sets on account of the much greater enjoyment which can be obtained on the short waves. There are other advantages in the use of 'phones for tuning, etc. You must first ascertain whether the extension speaker sockets are designed for a low or a high impedance, and then obtain a low or high resistance pair of 'phones. Alternatively, you can use standard high-resistance 'phones, but volume will be reduced unless the output is for high resistance. A step-up transformer may, of course, be used to feed high-resistance 'phones from a low-resistance output and vice versa.

Accumulator Connections

"I find difficulty in obtaining satisfactory connection to my accumulator due to the effects of the acid. The ends of the battery cord have already been cut and joined three times and are now getting too short to reach down to the shelf on which the battery is placed. The thin copper wire of the flex seems to be eaten away in a very short time and I should like to know whether there is any way of preventing this."—L. C. E. (Morpeth).

THERE are several ways of overcoming the difficulty you mention. The simplest is to slip lengths of rubber tubing (cycle valve rubbers) over the ends of the leads and to smear with vaseline. A much better plan, of course, is thoroughly to clean the terminals and to place on them the special lead-coated connectors sold by Clix. The ends of your battery cords are then fitted with bakelite tube connectors which push over the other portion fitted to the terminals and thus give good contact and keep the leads free from the effects of the acid. Make certain that your accumulator terminal is tightened up.

FREE ADVICE BUREAU

COUPON

This Coupon is available until October 16th, 1937, and must be attached to all letters containing queries.

PRACTICAL AND AMATEUR WIRELESS, 9/10/37.

(Continued in column three)

(Continued from column one)

ADVERTISEMENT INDEX

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

RYALL'S RADIO, 280, High Holborn, London, W.C.1, offer new goods at knock out prices.

3-GANG Tuning Condensers, fully screened, ex Cossor, 2/9; new Plessey 3-gang piano type, small, 4/6, or less two trimmers, 2/9; all straight types and screened; Plessey Midget 2-gang, semi-screened, 2/9, post 6d.

B.I. Electrolytics, 12 x 8 mf., 350v., plus 50 mf., 12v., 1/6 per block; N.S.F. 25 mf., 25v., 3/- for six; N.S.F. non inductive tubulars, 0.1 and 0.15, tag ends, 1,000v. test, 2/6 per dozen. Sold only in above mentioned quantities.

MALLORY-PLESSEY Tubular Can Type Electrolytics, 8 mf. dry, 450v. working, 525v. surge, 1/6 each; ditto, 12 x 12 mf., 300v. working, 400v. surge, 1/6 each.

PAIRS Ferranti Screened Coils, 2/6; Ferranti 3-range coils, 1/3; with circuits, chassis types.

FERRANTI Mains Transformers, as used in their commercial sets, 350-0-350v., 70 m.a., 4v. 4-5a. C.T., 4v. 2½a. input, 200-250v., brand new; 6/6.

CONVERSION UNITS for operating D.C. Receivers from A.C. Mains, improved type, 120 watts output at £2/10/0. Send for our comprehensive list of speakers, resistances and other components. WARD, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

THE largest stock of components in England, over 500 lines, new catalogue now ready 1½d.—J. Bearfield, 105, Upper Street, London, N.1.

BANKRUPT Bargains. List free. All brand new goods. Decca 1937 3 pentode battery sets, 77/6. Decca 1937 5v. superhets, 98/6. Decca 1937 AC 6v. superhets, £5/10/-. Altham 3v. battery allwavers, 70/-. Burgoyne AC mains 5v. superhet table radiogram, 1937, £8/10/-. Plessey 5v. AC/DC chassis with Mullards and MC, all fittings, 90/-; battery ditto, 4v. superhet, 80/-. Few left Halcyon SW AC converters, 20/-. Ferguson, Pilot and Truphonic 1938 receivers in stock. Large stock valves of all types at keenest prices. Speakers, gramophone motors, components, etc. Get my prices first.—Butlin, 6, Stanford Avenue, Brighton. 'Phone: Preston 4030.

RADIO BARGAINS

ALCO Eliminators and Chargers. 4 H.T. taps, 18/-. Standard outputs. With ½ amp. charger, 25/-. Charger 7/6. Year's Guarantee. Details free.—P. & D. Radio, 1, Goodinge Rd., N.7.

MISCELLANEOUS

REVOLUTIONARY principles and circuits. New detection theory, system and circuits. Booklet 1/1.—D'Arcy Ford, Gandy Street, Exeter.

SITUATIONS VACANT

WANTED—ambitious young men to prepare for well-paid posts in TELEVISION, the great career of the future. Apply for free booklet from BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY, 18P, Stratford Place, W.1.

LOUDSPEAKER REPAIRS

LOUDSPEAKER repairs, British, American, any make, 24-hour service; moderate prices.—Sinclair Speakers, Alma Grove, Copenhagen Street, London, N.1.

REPAIRS to Moving Coil Speakers, Cones and Coils fitted or rewound. Fields altered. Prices Quoted including Eliminators. Loudspeakers, Repaired, 4/-. L.F. and Speech Transformers, 4/- post free. Trade invited. Guaranteed. Satisfaction. Prompt Service. Estimates Free.—L. S. Repair Service, 5, Balham Grove, London, S.W.12. Battersea 1321.

VALVES

AMERICAN Valves in sealed cartons, all types 5s. 6d. post paid.—Valves, 661-3, Harrow Road, N.W.10.

BUY VALVES DIRECT.—Save 50 per cent.; 2-volt, H2, L2, 2s. 3d.; power, 3s.; screen-grids, 4s. 9d.; H.F. and L.F. Pentodes, 5s. 6d.; A.C. Mains, 4-volt, general purpose, 4s. 6d.; power triode, 6s.; screen-grids, H.F. and L.F. Pentodes, 6s. 6d.; full-wave rectifiers, 4s. 6d.; postage 3d. one valve, 4d. two, 6d. three and over.—Luminous Electric Appliances, Ltd. (Dept. 8), Phoenix Works, Tyburn Road, Erdington, Birmingham.

BATTERY CHARGING PLANT

2-VOLT, ½ amp. Charger, 8s. 6d.; 1 amp., 12s. 6d.; 2 amps., 18s. 6d. 6v., Car model, 2 amps., 25s.; 12v., 30s. Steel cases, metal rectifiers; just plug-in, fit spades, switch-on! Full details, Brighton Radio Service, 34, Middle Street, Brighton.

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MULTI-PURPOSE TUNING UNIT—See page 119.

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3D. EVERY WEDNESDAY

Edited by F. J. CAMM

A GEORGE NEWNES Publication

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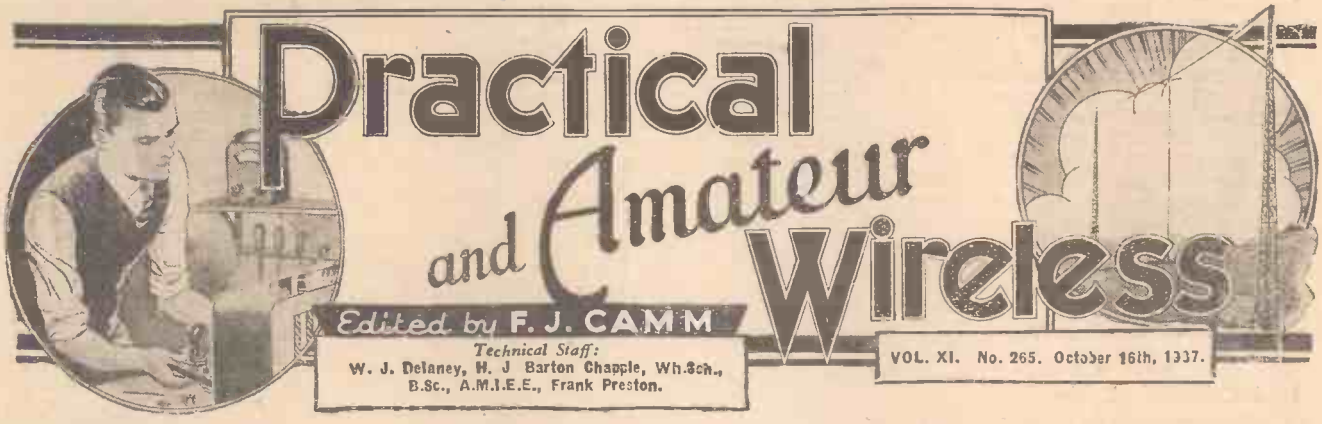
Screening Fads & Fallacies—

See Page 121.



ROUND *the* WORLD *of* WIRELESS

Short-wave Vagaries

A NUMBER of letters have been received concerning the use of short-wave apparatus. Complaints are made that there is nothing worth hearing or that reception is too erratic to warrant the use of short-wave receivers. As a justification for their plaint they instance the recent Five Hours Back programme which the B.B.C. had to cut short on account of the fact that reception conditions were so bad that the programme could not be held well enough to enable it to be re-broadcast. It is quite true that such conditions do obtain from time to time, but it is in the erratic behaviour of the short-wave radiations that hundreds of listeners obtain enjoyment. There is a certain satisfaction to be gained by overcoming an obstacle, and the mere setting of a knob on a receiver to pick up a given station soon becomes such a simple process that pleasure is lost, although a good programme may be obtained. When you sit at a short-wave receiver, you can never be absolutely certain just what you are going to hear. It is quite true that some stations may be tuned in without fail night after night, but there are hundreds of other stations which will only be heard on occasions, and it is in the unexpected results which are sometimes obtained that much of the enjoyment of short-wave searching is found. There are, of course, definite programmes which will on the majority of nights take the place of the normal medium-wave broadcasts, but the unexpected long-distance stations which will be found on the dial from time to time will add a measure of enjoyment which must be experienced to be believed.

Royal Command Variety

THE B.B.C. announces that the whole of this year's Royal Command Performance (the first to be given in the presence of Their Majesties King George VI and Queen Elizabeth) will be broadcast from the London Palladium in the National programme on November 15th. This will be the outstanding event of this year's variety programmes, and the broadcast has been made possible by arrangement with the Variety Artists' Benevolent Association, with whom negotiations have just been concluded. Full details are not yet available, but the programme will be on the air from 8.15 p.m. to 10.45 p.m., with a short interval for the news bulletin.

Schumann Violin Concerto

IT is announced that owing to the postponement until next month of the first world performance of the Schumann Violin Concerto in Germany, it has been found necessary to postpone the first performance of the concerto in England. (An announcement regarding this broadcast appeared in last week's issue.) The concerto will now be played by Jelly d'Aranyi at the B.B.C. Symphony Concert on February 16th, 1938, instead of on October 20th next. As a result of this alteration, the programme advertised for February 16th will be performed and broadcast on October 20th, and the programme announced for the latter date will be transferred to February 16th, 1938.

On Other Pages

Domestic Statistics

AN analysis was recently made by a well-known publishing house in America concerning the manner in which their readers spent their evenings. Listening to the radio and reading proved the greatest attractions, and the following is the result of their analysis :—

	Women Per cent	*Men Per cent*
Listened to radio	45	35
Had cocktails	5	12
Worked overtime	5	5
Dined out	12	15
Read newspapers	26	30
Read magazine or books	35	42
Played bridge	1	6
Talked	20	16
Went to the movies	8	10
Walked	12	10
Entertained guest	10	2

American-style Radio

ARRANGEMENTS are now practically complete for the production in this country of two of the better-known American receivers. These are of the multi-valve custom-built type, using 16 or more valves, and designed to provide tuning from about 5 metres up to 2,000 metres. These receivers are supplied direct to the public, and it is claimed that they are practically hand-made, with an "exhibition" type chromium-plated chassis. In both cases a 5-year guarantee is to be given, and in one case a spare set of valves is to be included in the price. Further details will be revealed when they become available.

Brass Band Concert

THE North, and a Manchester brass band, will provide the opening concert for the National programme on October 17th. The band is that of Baxendale's works, and the conductor will be Harry Mortimer, who is particularly well known as a trumpet player. Reginald Charles (bass), who is a native of Manchester, will be the soloist of this concert.

The "North Stars"

THIS popular Aberdeen concert party will be on the air again on October 18th. They will be presenting, under the direction of Violet Davidson, another programme of reminiscences of the old Beach Pavilion, Aberdeen, the celebrated home of concert parties in the north-east, where Harry Gordon, who now runs the present Beach Pavilion, began his career as an entertainer. Violet Davidson was one of the brightest stars of the Old Beach Pavilion. Her niece, Alice Stephenson, is Harry Gordon's accompanist at the new Pavilion, and was heard in a solo programme recently.

ROUND the WORLD of WIRELESS (Continued)

INTERESTING and TOPICAL NEWS and NOTES

Mr. Stanford Robinson

WE are informed that Mr. Stanford Robinson, who for the past year has been making an intensive study of both British and Continental operatic conditions, has now been appointed director and conductor of a new section of the Music Department of the B.B.C., to be known as Music Productions. Mr. Gordon McConnel has been appointed producer to this unit, which will be concerned, under Sir Adrian Boult, with programmes from operettas to opera, including relays and outside broadcasts in this field from home and abroad. Most of the studio output will be handled by the Theatre Orchestra.

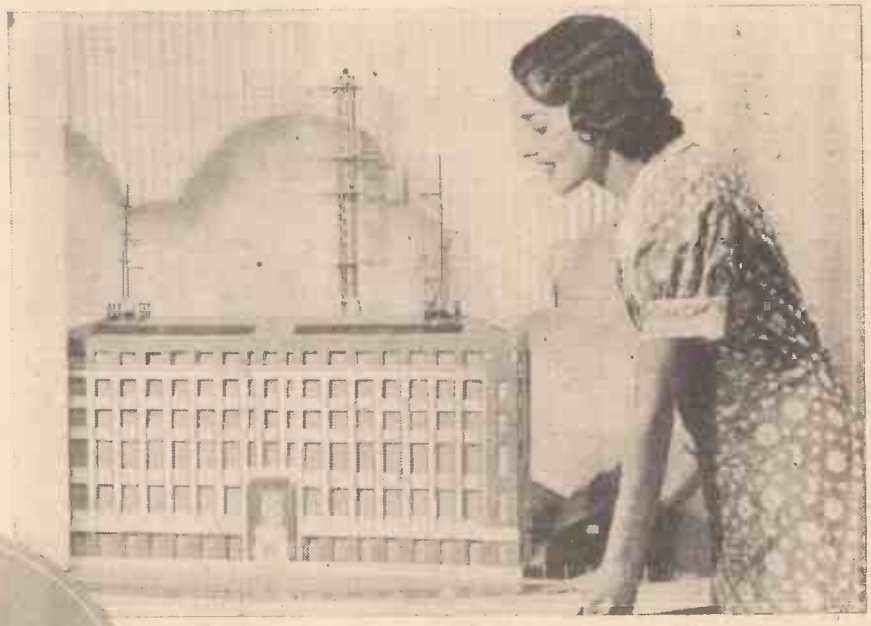
Hallé Concerts Again

MUSIC lovers will be interested to know that the Hallé concerts at the Free Trade Hall, Manchester, come into the broadcast programmes once more on October 21st, when Northern listeners will hear the famous orchestra under the baton of Sir Thomas Beecham. The first part of that evening's concert, the section which is to be broadcast, contains Haydn's Symphony No. 104, known as "The London"; and Mozart's Symphony No. 39 in E Flat, one of the three symphonies Mozart produced in less than two months of the summer of 1788.

A charming listener with her new Cossor model 837 all-wave radiogram, which is listed at 24 guineas.

"Big Timber"

MOORE RAYMOND, author of several radio plays and broadcaster in the "House Next Door" series, has written "Big Timber," a story of the Canadian pine forests, especially for Jim Collier, "the Singing Lumberjack," who will tell the story of a log from the forest to the port. Michael North has written the music to Moore Raymond's three lyrics. The play, produced by Martyn C. Webster, will be broadcast in the Midland Regional programme on October 23rd.



An interesting model of the "His Master's Voice" research laboratories at Hayes, where all the research work on the high-definition system of television used by the B.B.C. is carried out.

Dance Cabaret from Bournemouth

THE artists in Dance Cabaret from the Royal Bath Hotel Ballroom, Bournemouth, on October 20th, will include: Walsh and Barker (the sophisticated stylists of song and satire); Greta Keller (popular cabaret star); Carlos Ames (the wizard of the harp); and dancing to Harry Roy's Lyricals, directed by Maurice Kasket, with John Harris and Mona Brandon.

"Four-in-Hand"

THIS novel broadcast to be given in the Western programme on October 19th, is described as an original entertainment in double harness—that is to say there will be two double vocal acts, accompanied by a double piano act. There are, however, only four artists—the Carroll Sisters, and Compton Evans and Ray Monelle—and each is an accomplished singer, as well as an actor. The words are by Dorothy Worsley and the music by Mai Jones.

Schubert's Music

THE third of the programmes which Victor Hely-Hutchinson is presenting to give an illustrated biography of Schubert is entitled "Schubert among his Friends." George Parker (bass-baritone) and Marjorie Westbury will be the vocalists in the programme on October 17th. Leslie Heward and Victor Hely-Hutchinson will play two pianoforte duets; Ernest Element and Margaret Ablethorpe, two movements from the Sonatina in D; and the Alfred Cave Quartet, the Quartet-satz in C minor.

SOLVE THIS!

PROBLEM No. 265.

Reed's receiver refused to function unless a wire was connected across the 25 mfd. electrolytic condenser connected in the cathode circuit of the I.F. valve. What was the fault? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 265 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, October 18th, 1937.

Solution to Problem No. 264.

The L.T. winding was rated at 4 volts, 3 amps., but was used to feed five 4-volt 1-amp valves.

The following three readers successfully solved Problem No. 263, and books are accordingly being forwarded to them: T. Wilson, 44, Sanyhile Ave., Ladies Mile, Patcham, Nr. Brighton; L. Sharrock, c/o 59, Henry St., Rotherham, Yorks; E. Shiels, Corbiehill Rd., Davidsons Mains, Edinburgh, 4.

A Multi-purpose Tuning Unit

Details of a Simple Three-range Unit that can be Used as a Wave-trap, a Wavemeter, or, in Conjunction With Other Components, as a Crystal Receiver, Adapter or Modulated Oscillator. By FRANK PRESTON.

A COMPLETE tuning assembly covering short, medium and long waves is extremely valuable to the experimenter, for it can be used for a multiplicity of purposes. One of the most obvious uses is as a wave-trap, another is as a wavemeter (if calibrated); it can also be used in conjunction with a crystal detector and a pair of 'phones as a complete receiver, or you can connect a valve to it, to form a receiver or adapter. There are many other uses which will occur to the reader.

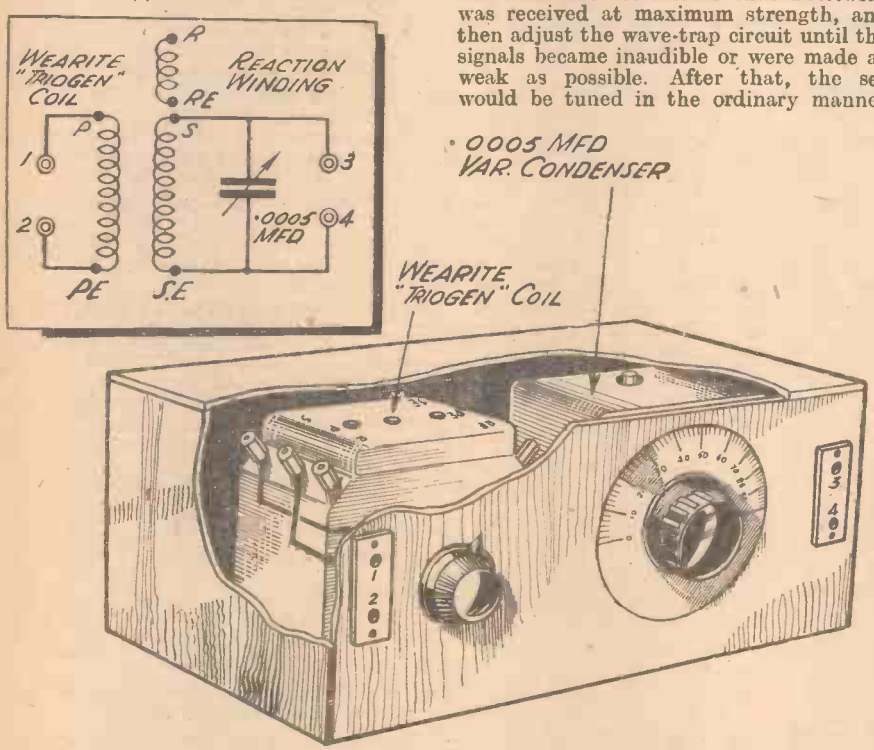


Fig. 1.—Theoretical and practical arrangements of the three-range tuning circuit. A Wearite "Triogen" coil is shown, but wave-change-switch connections are omitted for simplicity.

The tuning unit itself can consist of one of the many three-range tuners now on the market, and a variable condenser. These components can be mounted in a small box fitted with four terminals or plug sockets, as shown in Fig. 1. Use a screened coil fitted with a built-in switch and, for preference, have a condenser that is either screened or fitted with large end plates. A large, neatly-calibrated dial should be used for the condenser, one such as the 4½-in. Wearite or the Eddystone Precision slow-motion dial being ideal. These are rather expensive, and if a cheaper arrangement is desired, the Eddystone knob and cursor, costing 2s., can be used satisfactorily although the degree of accuracy for calibration purposes will not be as great.

Series Wave-trap

The simplest use of this tuning system is as a wave-trap, when it is connected as shown in Fig. 2, where only two terminal connections are used. This is a series wave-trap, and unwanted signals can be prevented from reaching the receiver by bringing the tuning circuit into resonance with them. As long as the coil is of a selective type, unwanted transmissions can be eliminated without reducing the strength of signals on nearby wavelengths to any very appreciable extent. Thus, suppose that Radio-Paris could not be received free from Droitwich, you would first tune the receiver so that Droitwich was received at maximum strength, and then adjust the wave-trap circuit until the signals became inaudible or were made as weak as possible. After that, the set would be tuned in the ordinary manner until the desired transmissions were received.

The same procedure applies to other wavelength ranges, although the trap is not generally particularly satisfactory on the short-wave band.

Simple Crystal Set

Now suppose that a temporary crystal receiver were required, it would be necessary only to connect the aerial and earth leads to terminals 1 and 2, respectively, and to connect a crystal detector-phone combination, as shown in Fig. 3 to terminals 3 and 4. When using terminal sockets, it would be a simple matter to mount a "permanent" type of crystal detector, along with a pair of 'phone terminals and the .001-mfd. by-pass condenser on a strip of ebonite provided with two split pins, which would fit into the sockets numbered 3 and 4 on the tuning unit.

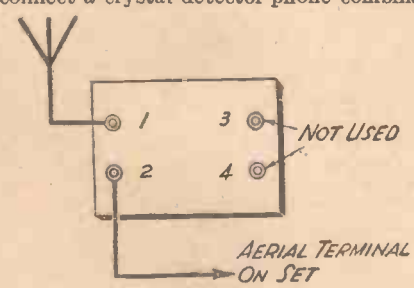


Fig. 2.—How the tuning unit can be used as a series wave-trap, by connecting it between the aerial down-lead and the aerial terminal on the set.

The tuner could also be used if it were desired to check a suspected coil in an existing set. In that case, aerial and earth leads would be joined to terminals 1 and 2, whilst terminals 3 and 4 would be connected to the grid circuit of the first valve in the set, after disconnecting the original coil and one side of the variable condenser, as shown in Fig. 4. In most cases it would be best to take another lead from terminal 2 on the unit to the earth terminal of the set.

As An Adapter

A short-wave adapter could easily and quickly be rigged up by using the tuner in conjunction with a few components mounted on a small baseboard and connected as shown in Fig. 5. In that case the reaction winding of the three-range tuner, which has not previously been mentioned, would have to be employed, and if desired, the two leads from this could be brought out to an extra pair of terminals or sockets. The same arrangement would be useful when checking the pre-detector portion of a receiver, for it could be put out of action, allowing the adapter to feed straight into the L.F. amplifier. When using this arrangement, the adapter could be used, not only for short waves, but for tuning over all three bands.

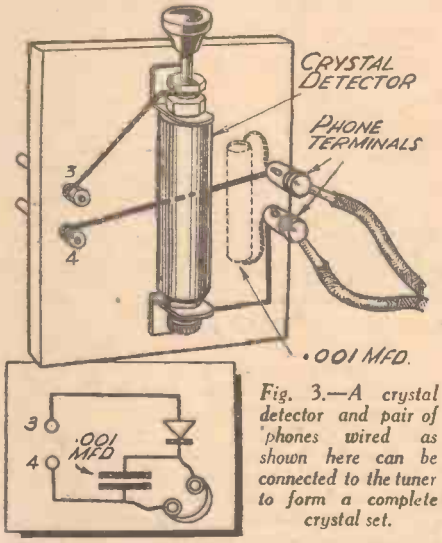


Fig. 3.—A crystal detector and pair of 'phones wired as shown here can be connected to the tuner to form a complete crystal set.

Wavemeter Calibration

There are various methods of employing the unit as a wavemeter, but in every case it would be necessary first to calibrate the tuner. This can be done easily enough if a three-range receiver is available on which a number of stations have been logged. The simplest method of calibration is to connect the unit as shown in Fig. 2. Then tune in a few recognised stations of known wavelength on each band on the receiver, and tune the "wave-trap" until signal strength reaches a minimum. It will be found that signal strength gradually

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falls off as the tuning unit is brought into resonance, and then rises again as the tuning point is passed. Take the mid-point on the wavemeter tuning scale, and make a note of this against the wavelength of the transmission. Either a table or a graph can be drawn up in this way, so that in future the wavemeter can be quickly and accurately adjusted to any desired wavelength.

Then, when testing an unknown receiver, or identifying a station received on it, it is necessary only to tune in the station and then to adjust the wavemeter until signal strength is reduced to the greatest possible extent. By taking the reading of the wavemeter condenser, the wavelength can be determined from the graph, and the station thus identified.

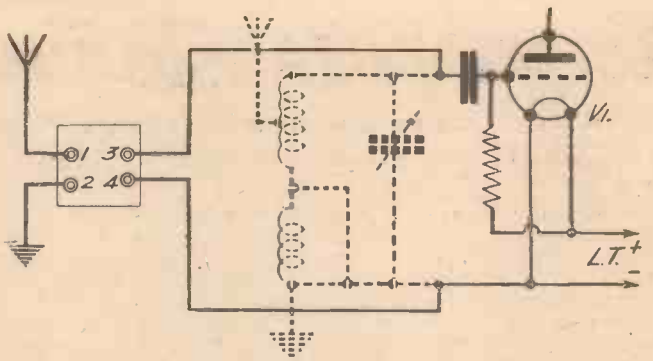

Fig 4.—How a tuner in an existing set can be checked by connecting the tuning unit in its place.

Modulated Oscillator

A more pretentious form of wavemeter is the modulated oscillator, and a simple and effective type of this can be made by using the circuit shown in Fig. 6. It will be seen that a screen-grid valve is employed, in conjunction with a tapped 3-henry choke, such as the Varley D.P. 18. All of the components should be mounted in an aluminium box, or in a wooden box lined with tinfoil, and terminals 3 and 4 joined to the corresponding terminals of the tuner. The H.T. supply might consist of a midget H.T. battery of about 30 volts, or of a couple of 15-volt G.B. batteries in series, whilst a small 2-volt accumulator can be used for L. T.; the batteries, also, should be placed inside the screening box, which should be earth connected.

The complete outfit, valve unit and tuner—will generate a steady note, corresponding with the signal from a transmitter. This note can be varied in pitch by using different tappings on the choke, and the intensity of the "signal" can be adjusted by means of the 20,000-ohm potentiometer.

To use this type of wavemeter, terminals 1 and 2 should be joined to the aerial and earth terminals on the receiver, and sometimes it is better to connect a .0001-mfd. fixed condenser in series with one of these leads, to avoid damping the receiver aerial tuning circuit. For calibration, a number of signals of known wavelength should be tuned in on the receiver, as before. As each is received the tuning unit of the modulated oscillator should be set until the note which it produces "drowns" the signal, or reaches maximum strength. As with the simpler type of wavemeter, a chart should be made as the wavemeter is calibrated. The process may, of course, be reversed in order to find the wavelength of a signal.

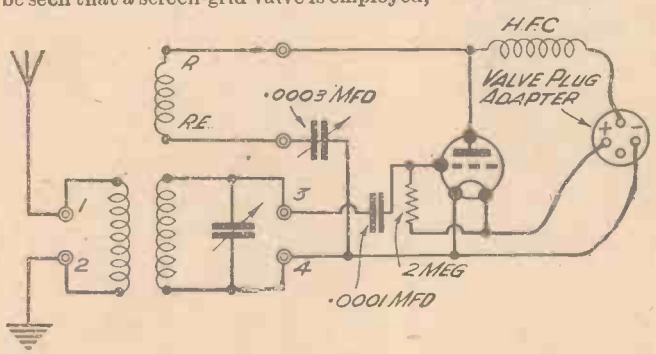

Fig. 5.—A three-range adapter circuit, incorporating the tuning unit described.

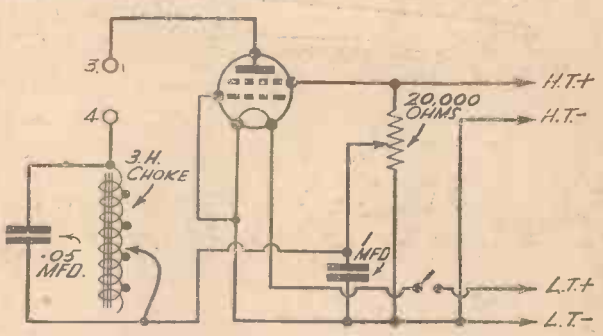

Fig. 6.—A modulated dynatron oscillator, which can be used with the tuner for wavelength checking, or for adjusting the trimmers in a set having ganged tuning condensers.

Important Broadcasts of the Week

NATIONAL (261.1 m. and 1,500 m.)
Wednesday, October 13th.—National Lecture.
Thursday, October 14th.—Organ recital from the studios, Maida Vale.
Friday, October 15th.—Mrs. Grundy Comes to Tea, a play.
Saturday, October 16th.—Palace of Varieties programme.

REGIONAL (342.1 m.)
Wednesday, October 13th.—Dance music.
Thursday, October 14th.—Arlette, a musical comedy programme.
Friday, October 15th.—I Remember, orchestral and choral programme.
Saturday. October 16th.—Mrs. Grundy Comes to Tea, a play.

MIDLAND (296.2 m.)
Wednesday, October 13th.—At the Sign of the Dancing Bear, gramophone records presented in the form of a cabaret entertainment.
Thursday, October 14th.—Instrumental recital.
Friday, October 15th.—I Remember, orchestral and choral programme.
Saturday, October 16th.—A Symphony Concert from the Town Hall, Birmingham.

NORTHERN (449.1 m.)
Wednesday, October 13th—Brass band programme.
Thursday, October 14th.—A Chest of Viols: reading of poems dedicated to the makers of beautiful violins, with musical illustrations.
Friday, October 15th.—Variety from the Victoria Theatre, Burnley, and the Theatre Royal, Stockport.
Saturday, October 16th.—Running commentary on the International Bridge Tournament: Great Britain v. Ireland, from the Imperial Hotel, Blackpool.

WEST OF ENGLAND (285.7 m.)
Wednesday, October 13th.—An account of the history and some of the scenes at Tavistock Goose Fair.
Thursday, October 14th.—Pianists' Half-Hour, a discussion.
Friday, October 15th.—Western Salon: Vocalists from Dartmouth College.
Saturday, October 16th.—Gaffer and Gavotte, the twenty-first of the series of West Country programmes of simple humour and sophisticated dance.

WELSH (373.1 m.)
Wednesday, October 13th.—Art or Propaganda in Literature?—a discussion.
Thursday, October 14th.—Newtown Night: a tour of Community House, Newtown.
Friday, October 15th.—Cross Section, from the Tredegar Miners' Institute, Tredegar.
Saturday, October 16th.—Symud Ty, a Welsh farce by Marjorie Wynn-Williams.

SCOTTISH (391.1 m.)
Wednesday, October 13th.—The Old Heroes, a talk.
Thursday, October 14th.—Orchestral programme.
Friday, October 15th.—Recital of Scottish Folksongs.
Saturday, October 16th.—Scottish Dance Music.

NORTHERN IRELAND (307.1 m.)
Wednesday, October 13th.—Hymn recital from St. Anne's Cathedral, Belfast.
Thursday, October 14th.—A Ballad concert.
Friday, October 15th.—Orchestral concert.
Saturday, October 16th.—All Kinds of Music, a programme of unusual music played on unusual instruments.

Screening Fads and Fallacies

The Introduction of Screening into a Receiver will Not Always Result in an Improvement, and Some Fallacies and Hints on the Best Method of Screening are Given in this Article : : : By W. J. DELANEY

A GLANCE into a modern powerful receiver will show that practically every component is enclosed in its own metal screen and this remark extends even to the individual valves. Many amateurs, especially those who are building a modern multi-valver, think that this method of construction is essential to obtain good results, and accordingly introduce as much screening as possible. The results may be satisfactory or they may not, and tests which have been carried out with certain home-made sets, as well as with certain commercial sets which have not been giving good results, have shown that screening can be the source of a considerable amount of trouble. Firstly, the reason underlying the introduction of screening is to eliminate interaction between components and separate circuits of a receiver. Unfortunately, it is possible to introduce screening in such a way that instead of reducing or eliminating such interaction, it will actually increase it and therefore might easily introduce greater trouble than would exist had the screening not been employed. Before we can go into the subject fully, it is necessary to remember that the screening which is fitted must all be at earth potential, or, in other words, connected to earth, and it is [in this respect that the majority of screening difficulties arise.

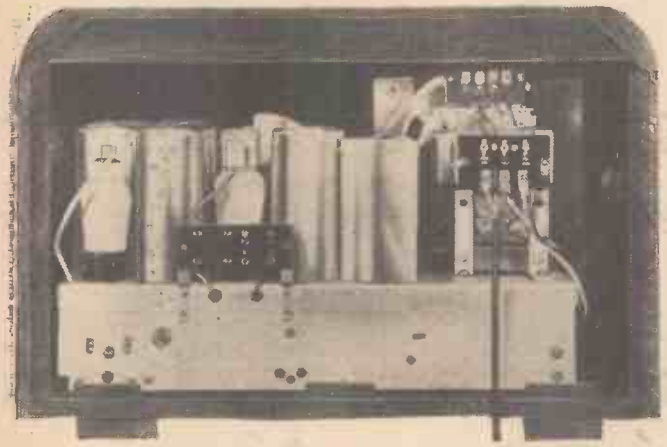

Fig. 1.—A typical modern receiver, showing the elaborate screening which is employed.

Ineffective Earthing

In the modern receiver a metal chassis is employed, and the various screens are bolted to the chassis. The latter is, in turn, joined by a lead to the earth terminal, or this is mounted direct on the chassis without insulation. Theoretically, therefore, the screens are all earthed. There are, however, several methods in which this arrangement will fail. The commercial receiver will be built with a steel chassis in the majority of cases, and therefore the following remarks will not apply very rigidly. The home-constructor, on the other hand, will make his chassis from heavy gauge aluminium owing to the easier working which is introduced, but owing to the softness of the metal there are various points which must be carefully attended to. Take first of all the construction of separating screens such as might be used in a short-waver to isolate H.F. stages. These will probably be made up after the manner shown in Fig. 2, and an edge about ⅜in. wide will probably be bent over on the screens for bolting to the chassis. What often happens when this idea is introduced is that the turned-over edge is bent with the aid of a hammer and a piece of hard wood and a close examination will probably reveal that instead of being straight, it is distorted throughout its length and so when bolted to a flat chassis the effect will be something as shown in Fig. 3. This is an actual case which was once investigated and apart from the fact that the screen, when first bolted into position, only touched over a total length of about 1 inch, the fact that air had access to the junction resulted in oxidisation which eventually rendered the screen almost effectively insulated from the chassis. It is not intended to suggest that it can be insulated, but the fact that it is only in contact in small parts will result in the same effect as a high-resistance joint and if this high resistance is common to two circuits it can in certain cases produce instability, as has been shown before.

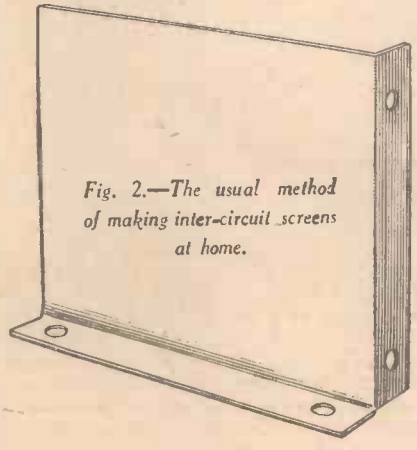

Fig. 2.—The usual method of making inter-circuit screens at home.

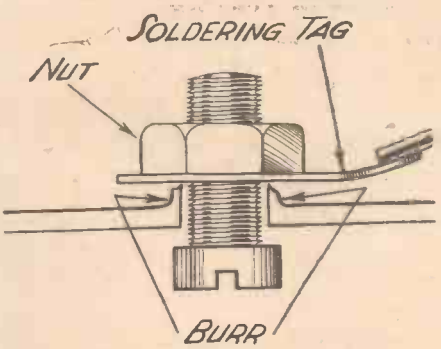

Fig. 4.—Leave the burr caused by the drill to assist in making good contact.

Clean Contacts

This point will also apply when a commercially-produced component such as a screened coil, I.F. transformer, gang condenser or similar component is mounted on the chassis. The mounting surfaces of all of these components will be true but may not be clean when obtained by the constructor. Therefore, before bolting to a chassis the two should be placed into approximate contact and a careful examination made to ascertain that the chassis at that point is quite flat and that the surfaces will meet all over. Then, before bolting into position, the contact surfaces should be scraped with a sharp pen-knife or cleaned with some chemical cleanser. In this way all risks or doubts are removed and then if the finished receiver fails to work as it should, any doubts regarding the screening will be avoided and attention can be paid to the other parts of the circuit or design.

A point worth noting in the method of attaching earth leads to a home-made metal chassis is that the burr left by drilling can often be turned to valuable use instead of being cleaned off. For instance, when drilling an aluminium panel or chassis, the drill will leave quite a substantial burr if sufficient pressure is employed. In the ordinary way this would be removed by a countersink drill or with a file. If, however, the general layout is considered before holes are drilled and the drilling is then accomplished in such a manner that the burr is left on the side where contact has to be made, the sharp edges will cut into the surface which is bolted to it and the metal will then spread, resulting in a joint almost as good as a soldered one. This idea is especially worth taking note of in the case of the attachment of soldering tags of copper.

Chemical Interaction

A point which has probably not received very much attention is the effect which can be introduced into screening when dissimilar metals are bolted together. Chemical experts will tell you that if a copper disc is bolted to an aluminium one, a chemica

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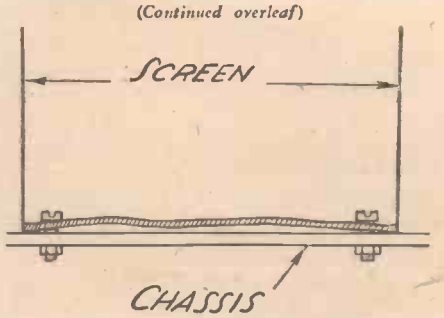


Fig. 3.—How a badly-made screen may cause trouble due to poor workmanship.

SCREENING FADS AND FALLACIES

(Continued from previous page)

reaction will take place which may have an adverse effect on the metals as well as on the circuit into which this junction is included. Probably some of the more enthusiastic readers of this paper will like to try the actual effect of such junctions and will make measurements at high-frequency to prove whether or not this is the case. No actual fault has so far been brought to my attention in this connection, although it would appear that there is a probability that such a thing can exist and may have escaped notice in the past.

Unusual Arrangements

The foregoing remarks cover the main requirements and points of normal screening, but it may often be found that even when these points are attended to results are not as they should be. This may be found to be due to the fact that certain screens or earthed metal surfaces are common to two circuits and although quite effectively joined and earthed the fact that the screen is permitted to cut into two different inductive fields may act as a link and produce instability or loss of efficiency. It may appear, on the face of it, that such a thing is not possible, but actual tests in some cases have revealed that this is so, and when the screen has been so modified that the common link is removed, results have been improved. One such instance concerned a powerful short-wave set in which the H.F. and detector stages were each separated by a single sheet of metal bolted to the chassis. Results were definitely inferior although all working voltages and connections were found to be as they should. Various modifications were made without effect and it was finally decided that the screen was causing the trouble. A separate earth lead was attached to it, but still it failed to work properly. Eventually the trouble was overcome by fitting a second screen ½in. from the existing one, and the H.F. gain increased and the instability was removed.

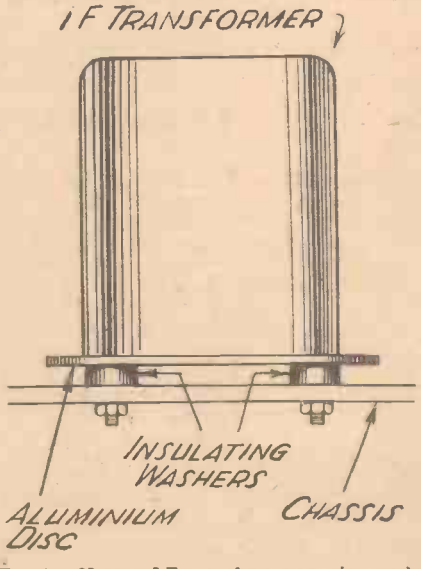


Fig. 5.—How an I.F. transformer may have to be separately screened.

In another case a most peculiar effect was found to exist. The set was an ordinary broadcast receiver with two H.F. stages, and although medium-wave results were quite good, on the long waves selectivity was poor and sensitivity was much below what was expected of the set. The builder carried out many modifications without overcoming the trouble, but eventually found that it was completely cured by mounting the second H.F. coil on a strip of thin bakelite and running a separate earth wire from the coil screen to the earth terminal. An almost similar case was also found to exist in a short-wave superhet where a form of I.F. instability prevented maximum results from being obtained. This was overcome by isolating the screens for the I.F. transformers. These, in many cases, are mounted in square or round-section cans having projecting lugs at the bottom for bolting to the chassis. At this point they are open and the metal chassis is relied upon to close the screens. In the case referred to the cans made perfect contact with the chassis, but the trouble was only cured when the screens were closed by a small disc of aluminium cut slightly larger than the screens, slipped over the bolts and locked into position with another nut. The transformers were then mounted on the chassis in such a manner that an air-space of about ½in. was left below the screens, small bakelite rings being slipped over the projecting bolts before they were passed through the chassis.

BRITISH LONG-DISTANCE LISTENERS CLUB

A.E.L.

Long-distance results seem to have fallen off lately, and no applications have been received during the past two weeks for the All-Empire Listener's certificate. Remember that this is given when you have received verifications from five separate continents, and the five verification cards must be sent with applications for the A.E.L. There is no restriction as to the type of apparatus, and no charge is made. We cannot, however, undertake to forward reports of reception to unidentified stations, or give addresses of stations, and we suggest that a careful watch is kept for the call-sign when stations are heard. In this connection listen carefully for peculiar ways of pronouncing certain letters and numbers. For instance, the Americans and many Canadians refer to the letter "Z" as Zee, and this is often mistaken for "C" or "P." Endeavour to get the call-sign at least twice in order to make a check on your reception, and if the address is given out you will be more certain of obtaining the correct call-sign.

A Good Log

Member 3479, of North London, sends us the following log which he has listed as the best calls heard during August and September. Those stations with an asterisk after them have verified reception by a Q S L card.

K6DAZ (Honolulu, Hawaii), VE1SG, FA3HC (North Africa), CO7VP, CO2HY, CO7HF, W8DIA, CO7QP, SV1CA, VO2Z (Newfoundland), W9UAZ, W9ELL, VE1JA, W10XDA, HH5PA, W9BPK, VS1AJ, J8CF, ZS6AJ(A)?. Best B.C. stations include: TILS*, COBC, COGF*, IUD, HP5L*, CRCX, W 8 X A L *, VP3MR*, PRF5, COAQ, HIN*, VK2ME*, OAX4J, XEWW, KIO (Honolulu, Hawaii), YDC*, KZRM, CR6AA, CR7BH.

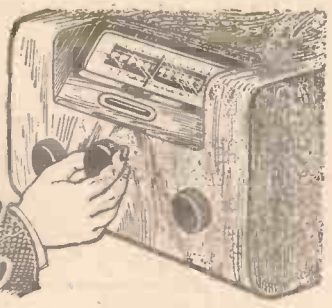
Commercial Stations

There are many commercial stations on the so-called 10-metre band. GIP, Dollis Hill, operates on 27,270 kc/s.; DGF, Nauen, on 27,800 kc/s.; LLC, Jeloy, on 26,350 kc/s.; and DJV, Zeesen, on 26,450 kc/s., are but a few of the European stations heard.

From across the Atlantic WVB, Fort Sam, at San Antonio, Texas, on 26,280 kc/s., and NSS, Washington, D.C., are perhaps the best known. The National Broadcasting Company's "pick-up" stations, which are used to relay baseball games, programmes from outside halls, etc., employ the call W10, followed by a number of letters, such as W10XAH. They operate on short as well as ultra-short wavelengths, and often make particularly entertaining listening.

Miss Sheila Douglas-Pennant is the first Television commère and has just taken over her new duties at the Alexandra Palace. She is here seen facing the television camera for the first time in her new rôle.

On Your Wavelength



By Thermion

What's Wrong with Television?

I ASK this pertinent question because I am convinced that the science is being deliberately delayed by vested interests and muddling on the part of the authorities. Do not let us lose sight of the fact that certain radio interests are opposed to television in the same way that the silent-film magnates were opposed to the talkies and the theatres were opposed to broadcasting. We must admit, and you are going to take my word for it, that television instruments have long since passed the experimental stage, and that they are in a more advanced commercial position than were the horrible receivers sponsored by now famous companies for which they asked fabulous sums in the early days of 2LO. Television to-day is well-nigh perfect. What, therefore, is holding it back? We must remember that various owners of television patents are haggling with one another as to who owns what, and which. But the Television Committee specifically laid it down that in disputes of this nature a Court of Arbitration should be set up to settle the squabble. The squabbling, however, still goes on, and I am yet to learn that any Court of Arbitration has been called upon to settle any disputes. Why? Why has the B.B.C. done so little to encourage television? Why does it still put out such miserable and miserly programmes? They do not seem to have the vision to understand what should be televised, and what should not. Some of the programmes are a sheer waste of programme time. The programme time devoted to television is inadequate. Now there are many hundreds of thousands of pounds invested in television, and the B.B.C. owes it to those who have invested their money to do something to develop it. In my opinion the greatest mistake that has ever been made has been on the part of the television patent owners who have permitted the Postmaster-General and the B.B.C. to exercise a stranglehold on an industry which should have been developed by private commercial enterprise. You see here the effect of bureaucratic control. Had private enterprise been left to develop television it would have been a serious competitor to the B.B.C. The B.B.C., therefore, is put in charge of it, and is able to see that it exercises a stranglehold on television. What is the use of a Government Committee being set up to advise on television and issuing its advice, if the advice is not taken and the B.B.C. goes its own sweet iron-fisted way? I say that television is being deliberately held back by someone, and there is no encouragement at present either for firms to make television receivers, nor for listeners and potential lookers to buy them. A Government department never developed anything worth while. It has no incentive to do so. If it makes a loss there are no shareholders to bother; if it makes a profit the Government is pleased. It does not do anything until forced to do so by public opinion, and the public opinion has to be very strongly expressed, and in great volume, before the Government department moves. That is exactly the position with the B.B.C. It is iconoclastic, bombastic, and in many ways inept. Its personnel are not the sort of people I would pick to carry out those particular jobs. I say that television should be handed back to commercial interests with the power to transmit their own television programmes. You would soon note the rapid growth of television. It is an extra burden to the B.B.C. and the B.B.C. does not want extra burdens. It would like to carry on its present cut-and-dried programme system till the crack of doom, knowing that there is no competition to take its customers away. The very many excellent young gentlemen who, I regret to note, do not rejoice in the equally excellent old English names of Smith, Brown or Robinson, will continue to guffaw at the microphone, and continue to drone and drawing-room their announcements in their naice refained style. Many of them have reason to thank the B.B.C. for lifting them from a well-deserved obscurity to an undeserved notoriety. Therefore, my advice to those with a television interest is to organise, and to transmit their own television programmes under protest. The Government, as well as its despotic servant the B.B.C., might then be disposed to do something about it. Bureaucratic, plutocratic, and autocratic control of science cannot be tolerated. The Government should exist to encourage and not to control a science about which it knows less than nothing, and about which it cares less. It regards it as a nuisance. It cannot see profits in it; it is a wholly scandalous state of affairs which has existed for three years, and the time has come when it must now cease. The B.B.C. have demonstrated that it is quite unfitted to handle the new science which it is obvious is outside the ken of its experience, and which it regards as inimical to its interests. It regards television as a competitor instead of as an ally. It has the power but not the incentive. Such a state of affairs is bad for the public, and I hope that in view of these strong words, the interests concerned will be moved to act. They may rely upon my active support.

The Club Season

WHEN the clocks were put back the Club Season begins. It is the season of dinners, and soirées, and conversaziones, and suppers, and speeches, and lectures, and dances. In fact, it is the season of radio. I am glad to notice that the club movement is more virile than ever before, and that over 250 clubs exist throughout the country largely owing to the encouragement which this journal alone of the technical press has given

to it. I hope that by this time next year the number of clubs will be doubled, and I hope the club secretaries will not need my periodic prod in the ribs to remind them that we regularly publish club reports. I find that most clubs which start and fall by the wayside do so because of lack of organising ability on the part of the officials. Do not make the annual subscription too low, for you will attract the wrong type of member. A guinea a year is the very minimum if you are to have any sort of active programme. Do not forget the social side, for the ladies like to be present sometimes; and expel without compunction the narks who like to cause trouble and the passive resisters who turn up once in a blue moon and then moan. Insist upon the subscription being paid in advance, and tolerate no nonsense from the small cliques which tend to form in every club.

Shulla Natives Marvel at Radio

DARK-SKINNED Shulla natives, neighbours to the Ethiopians in Africa, cannot understand the mysteries of radio reception, according to a letter which has come to the attention of radio officials at Perivale. When they are told the voices they hear come from persons who are "three months' travel away," they gasp and stare blankly and unbelievingly into the speaker.

A Philco radio recently was shipped to a missionary at Doleib Hill, in the Sudan.

"I'm sure I've lost all my reputation as a man of truth," says the recipient of the wireless set. "These Shulla people are a friendly, congenial and warm-hearted crowd, but they just can't believe the radio miracle.

"You would enjoy the sight of a dozen or so almost naked men, with their hair made up in wood ashes and mud, and some of their black faces painted in grotesque fashion, squatted on the floor around the cabinet.

"They pile their clubs and spears outside the house; we take up the carpet, and they watch and listen, with mouths wide open, laughing at the funny noises that come out of the 'box of the foreigner.'

"They nearly all believe the box itself makes the music and words. Only our native teachers can in any way begin to comprehend what it is all about."

"Songs You Might Never Have Heard"

LISTENERS will soon have the opportunity of taking part in another big "song hunt." The B.B.C. informs me that they have decided to reintroduce another of last winter's popular features: "Songs You Might Never Have Heard," and listeners will be invited to vote for the song which they liked best. The first programme of the new series was broadcast on October 6.

The person who originated the programme which he is again devising and arranging, tells me that he has collected from the shelves of music publishers about two hundred all-British songs which, though published prior to 1937, have not been performed.

A representative panel of listeners is meeting at Broadcasting House to choose from the whole collection forty-five songs which, in their opinion, are worthy of inclusion in the broadcasts. About nine new songs will be heard during each of five programmes; the sixth programme will comprise the songs that will have "topped the poll" earlier in the series.

It is likely, this year, that only entirely new numbers will be heard in the "body" of each programme and that choruses of the three songs most popular in the preceding broadcast will be repeated only in the medley which ends each broadcast.

Though this arrangement would make it still possible for one song to retain its popularity throughout the series more time will be available for new numbers.

Bryan Michie, B.B.C. Variety producer, is again the compère, and the B.B.C. Variety Orchestra will accompany the singers, who will be Eve Becke, Bertha Willmott, Morgan Davies, Gerry FitzGerald, the Tin Pan Alley Trio and a section of the B.B.C. Male Chorus.

More than 50,000 votes were received during the last series of "Songs You Might Never Have Heard."

Valve Replacement

A READER wrote to us a few days ago asking whether it was likely that he would damage his receiver by using an MVS/Pen valve in place of an AC/Pen in the output stage of his receiver. The AC/Pen had developed a fault and as he had an MVS/Pen on hand he had used this, connecting the top cap in place of the side terminal of the AC/Pen. This reader is obviously of the "try anything once" type—he had even contemplated plugging a PX4 into the AC/Pen socket, but thought that this would reduce the sensitivity and therefore he had picked on the MVS/Pen. Before he received our reply it is probable that he had damaged the valve and other components in the set. By connecting the screen lead to the cap and the speaker to the normal anode pin, excessive voltage was being applied to the valve screen. Apart from this, and of greater importance, was the fact that the consumption of the MVS/Pen is approximately 7 mA, compared with the 40 mA of the AC/Pen. This low consumption would cause the anode voltages to rise, thereby damaging the other valves and possibly the smoothing and bypass condensers.

Home Recording

ANY receiver that has a reasonably high undistorted output may be used for home recording. Record blanks are now easily available, and all that is necessary is to connect a microphone across the input circuit of the L.F. amplifier and a pick-up in place of the speaker. Direct current must not, however, be allowed to pass through the "pick-up" winding and, therefore, an output transformer or a choke-condenser output circuit arrangement must be used. The normal pick-up sockets of the receiver may be used for the microphone leads, or if these are not fitted the leads may be joined to detector or L.F. valve grid and a suitable G.B.— voltage.

Improving Treble Response

CUTTING the treble response so as to make the tone more mellow is easily done by connecting a condenser of suitable capacity across the speaker terminals or between the anode of the ouput valve and its cathode or filament—this is the type of tone control normally fitted to commercial receivers. It is often found, however (especially in radiograms), that an increase of treble is desirable. The easiest way to provide this without making any internal alterations is to connect a small P.M. speaker via low capacity condensers to the set speaker leads.

Screen-Grid Valves

THE first screen-grid valves to be marketed in this country, with a standard four-pin base, made their appearance in 1926. The filament screen-grid and anode were led out to the four points, and the control grid was brought out to the top cap. Shortly afterwards it became customary to lead the anode out to the top cap. Now about half the screen-grid valves on the market have the control grid brought out to the top again, with an increasing tendency towards this practice. Nobody can offer a satisfactory explanation for these astonishing acrobatics, it is just one of those things which happen in this country, and which could not happen anywhere else in the world.

Practical Television

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TELEVISION FROM FILMLAND

ANOTHER step in the history of television was completed recently when the B.B.C. mobile television unit was successfully installed at the Pinewood Studios at Iver, in Bucks. Situated about eighteen miles from the Alexandra Palace, there were phenomenal difficulties to be overcome in an attempt to convey to viewers some of the work carried out in film-land. A special radio transmitting aerial had to be erected to radiate the signals picked up by the portable Emitron camera, and these, in turn, had to be received at the Alexandra Palace and re-broadcast. The scheme was fully successful and a series of broadcasts took place over a period of five days commencing on the last day of last month. We attended the studios and saw the preliminary tests and trials, and on the opening day had the unique experience of seeing Mr. Leslie Mitchell and Miss Elizabeth Cowell—television announcer and hostess—welcomed to Pinewood by the Studio Director, Capt. Richard Norton, and then in one of the rooms of the palatial Pinewood Club a continuance of the broadcast was seen on the screen of one of the Marconiphone television receivers which have been installed there.

During this opening broadcast Mr. Maurice Chevalier intruded into the picture with his characteristic gestures and was introduced to viewers through the camera. A tour was then made of the carpenters' shops and studios during which many well-known film stars were, for the first time, brought into the homes of those who own television apparatus. Amongst these may be mentioned Jessie Matthews, Jack Whiting, Sonnie Hale, Roland Young, Margaret Lockwood, and many others, and many listeners were able to see and hear the work of the film studio staff in directing and taking films. Actual scenes from the new Gaumont musical, "Sailing Along," Paramount's "Lancashire Luck," the new Jack Buchanan musical film, "Break the News," were broadcast in a series of ten broadcasts covering the period of five days, and those actors and others who were not actually engaged in the broadcasts were able to see the results on a number of Marconiphone receivers distributed throughout the Club.

A group on the set of "Sailing Along" at Pinewood Studios during a break in the televising and shooting. Left to right (from television camera) can be seen Barry Mackay, Jessie Matthews, Jack Whiting, Roland Young, Elizabeth Cowell (B.B.C. television hostess) and Sonnie Hale.

Difficulties Overcome

A review of this series of broadcasts reveals a number of interesting points. Firstly, it was the longest radio link which has yet been used by the outside broadcast department of the television section of the B.B.C. The aerial system used was elaborate, but Mr. Gerald Cock told us that as yet it has not been found practicable to use a directional beam for this purpose in view of the high quality of the signal which is needed. A semi-directional effect is obtained, and the aerial was erected on the roof of one of the studios. It resembled a partially dismantled advertisement hoarding! Many hundreds of yards of cable had to be employed for connection between the mobile van and the camera, which was mounted on the trolley seen in one of the accompanying pictures. Apart from the sources of voltage supply to the camera, there are also needed the output feeders and the supplies from the microphone which is carried on a boom handled by a separate operator. During the opening ceremony, the television announcer and hostess, accompanied by Capt. Norton, walked the entire length of one of the streets in the studio grounds, and the trolley had to be wheeled backwards, whilst keeping these three people in the screen the whole time. A gang of workmen held the cable and walked backwards with the trolley, reeling in the cable to prevent it from being brought into the picture, and the transmission was flawless from a technical point of view.

On the reception side the Marconiphone apparatus also worked without a fault. A standard Marconiphone television aerial system had been erected on the roof of the Club premises, and this fed the various receivers.

June Knight (with hat), Vivian Duncan and Maurice Chevalier, looked in to part of the transmission on the Marconiphone Mastergram which is installed in the Pinewood Club.

Televiews

Weather Charts

AT the beginning of the television service from Alexandra Palace about a year ago, weather charts formed part of the daily programme. This was remarked upon in the annual report of the Director of the Meteorological Office published recently. Of late, however, little attention has been given to this type of television broadcast by the B.B.C., and the only weather report now seen is the lettered forecast of the next day's weather at the beginning of the programme. The experiments which have been conducted show quite clearly the importance of this weather service, and the public realise that it is of value. There is little doubt, therefore, that once the extension of programme hours permit, and when television becomes one of the amenities of the majority of the inhabitants of this country instead of the privilege of the comparative few, then the whole problem of televised weather charts will have to be reviewed. The appeal must be made of a popular and interesting character, for the average viewer will not tolerate an academical dissertation on isobars, etc. Commercial organisations whose activities are governed so largely by a knowledge beforehand of weather prospects will be quick to appreciate such a viewing service, and there is real scope for work of this nature.

A Useful Service

ONE of the larger national morning newspapers has recently been rendering a very useful service to television by organising an Exhibition of Receivers at towns in the Home Counties which are inside the Alexandra Palace service area. So far, displays have been featured at Woking, Harrow, and Redhill, and in every case hundreds have been turned away owing to the limited capacities of the halls chosen for this purpose. Eight manufacturing firms have participated in the scheme, which had the full approval of the R.M.A. These were Baird, Cossor, G.E.C., Murphy, Marconi, Halcyon, Pye, and Ultra. In all, eleven receivers were shown, for three firms—Ultra, Pye, and Baird—showed two models of their range. Fed from an aerial, amplifier and distribution system arranged on somewhat similar lines to that of Radiolympia, the sets flanked the walls of the hall, while seating and standing accommodation was provided for a viewing audience of about 600. By working the exhibits in this way the public were given an opportunity of making direct comparisons between individual sets when operating under identical conditions with the same programme. A short lecture preceded each transmission to describe briefly and simply the principles involved, and there is no doubt that any scheme of this nature will do much to help television, and bring home to the public the scope of the present service, together with a realisation of the results to be expected in the district chosen. The B.B.C. might be prevailed upon to develop an exhibition of this nature, for there is no doubt that the public will have to be educated to television before a full appreciation of the service can be brought about, together with the increased receiver sales which will inevitably materialise.

C.R. Tubes

THE cathode-ray tubes used for reconstituting the television pictures two or three years ago were only capable of providing a picture which was not very brilliant when judged by present-day standards. Transmissions using 25 pictures per second showed hardly a trace of flicker at this degree of brightness, but it was realised that many improvements would have to be effected before cathode-ray tubes would be wholly suitable in television sets. A large proportion of these have now taken place but it seems that each step forward throws into relief one or more defects which previously were not visible. Better screen graining to give full scope to increased picture definition is one important improvement. More adequate picture size and black and white colours are two other factors which have engaged the attention of the electronic engineers, and now this year with some of the manufacturers we have really brilliant pictures which can be viewed without any form of room darkening. This last-named development, however, has shown up another important tube characteristic which has yet to be solved completely. This is the alteration of spot size on the screen during modulation changes. Theoretically, the size of the scanning spot must not alter in area and only its degree of brightness or the measure of its fluorescence should change in exact conformation to the modulation intensity of the incoming television signal.

Due to a variety of circumstances associated with electrode assembly, scanning and focusing, together with the electrostatic and electromagnetic fields involved, this theoretical factor does not function in practice. The change in spot area is, as a rule, more noticeable in tubes operated electrostatically when compared with their electromagnetic counterparts. There is no doubt that the engineers engaged on this work will succeed in their efforts, and it is only the high standard of achievement in receiver design that makes this problem of such paramount importance. To take just one simple aspect, if the size of the focused spot on the screen when unmodulated is adjusted so that the scanning field is built up from lines whose edges just touch, then during picture reconstitution, which, of course, embraces modulation, the lines will show traces of underlap and overlap over the viewing area. To the critical engineer this is disconcerting, and tends to destroy partially the good quality of an otherwise satisfactory picture.

SEEING STARS IN THE KITCHEN

The chefs and waitresses at Pinewood studios had a "His Master's Voice" television receiver installed on which they saw the stars as they appeared on the television screen.

NORTH LONDON EXHIBITION TO BE TELEVISED

An unusually fine opportunity for the general public to see how television shots are actually made will present itself when the twelfth annual North London Exhibition is opened at the Alexandra Palace on Wednesday, October 13th, at 2 p.m.

The opening ceremony will be televised in the exhibition halls and, it is contemplated, will form an extensive item in the B.B.C. television programme broadcast at 3 p.m.

Ronald Frankau, the Band of the 1st Batt. the Queen's Own Cameron Highlanders, with their celebrated pipers and dancers, Don Rico and his Gipsy Girls' Orchestra, Jan Zalski, the popular tenor, and the 10 Gordon Ray Girls in a fashion display and cabaret show will be some of the highlights in the opening broadcast.

A Long Link

ATTENTION was drawn in these paragraphs recently to the completion of the coaxial cable to Munich so that it can be used for visual telephonic communications at moderate fees. Not content with this, the German Post Office engineers have carried out a very interesting experiment. The lines were looped to give a continuous cable from Berlin to Munich through Leipzig and Nürnberg, and back again to Berlin. The total length involved was approximately 1,100 miles.

The Amateur Set Designer

The Importance of the Detector Stage, with Especial Reference to S.G. and Pentode Valves, is Dealt With in this Sixth Article of this Series

WHERE sensitivity is an all-important factor the grid detector should be used.

Fig. 26 shows a triode arranged for grid detection. A grid detector works at or near to zero bias and the operating point is at the bottom of the grid current characteristic, but on the straight section of the anode current characteristic. The latter fact shows that the valve will be in a better condition to give amplification from grid to anode than if it were biased back for anode-bend detection.

To take advantage of the rectification of the grid current it is essential, for full sensitivity, to have a load resistance and this is represented by the grid leak, R. The grid condenser, C, becomes necessary because without it the tuned input circuit (Fig. 26) would short-circuit R. With tuned-anode coupling from the preceding valve, C would also be required to insulate the grid from the high D.C. positive potential of the anode.

The grid detector will accept only a limited signal input and if this is exceeded bad distortion will result. Under no-signal conditions the grid is at or near to zero potential, but signal oscillations will establish a rectified grid current in R and the grid potential will then be driven negative. With an unmodulated carrier the grid potential would settle to a certain mean negative value, dependent upon the carrier amplitude. Under modulation conditions the grid potential will rise and fall above and below this mean negative value. It should be apparent that a drop of grid potential (i.e., a greater negative voltage) will depress the anode current towards values appropriate to the lower bend of the anode current characteristic. If the bend of the characteristic is trespassed upon anode-bend detection effects will be produced. This will cause bad distortion and will limit the output and explains the manner in which input overloading takes place with the grid detector.

Component Values

Matters can be improved greatly by increasing the anode voltage. "Pushing the bend further away" is an expressive but rather non-technical way of describing the effect of the anode voltage increase, and it is certainly worth while to give the grid detector all the anode voltage that is possible. A triode of fairly low impedance with plenty of H.T. can be made to be quite good as regards signal acceptance, although the question of consumption may be an awkward one. There is no doubt, however, that if the designer feels that the matter of signal input overloading is going to be a real problem then he must be working on wrong lines, for if the input is going to be so strong as to suggest a problem the grid detector is not the one to use. This is just where the diode can save the situation.

The resistance of the grid leak is not a value to be regarded as critical. In average cases 2 megohms with a battery valve and 1 megohm with a mains valve are used.

For the grid condenser there are conflicting requirements. We want the reactance of the condenser to be low at the radio frequencies; the lower the better as far as the matter of input to the valve is concerned. On the other hand, grid blocking effects will cause trouble if a large capacity is used. There is another reason which makes a large capacity unsuitable: during reception there are L.F. voltages developed across the grid leak and it is desirable that

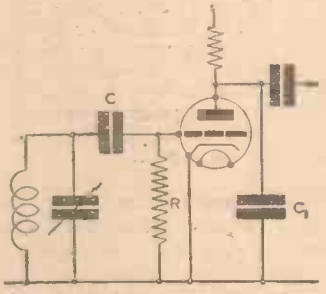


Fig. 26.—The standard grid rectifier circuit.

as far as possible the effective grid circuit load impedance shall keep at R ohms (the leak resistance). At frequencies near the top of the audio-frequency range there is the danger that the reactance of the grid condenser may be down sufficiently to drop the effective load impedance enough to lead to frequency distortion. On the whole, therefore, there is much reason to keep the grid condenser capacity low. For the receiver that has to cater for the M.W.

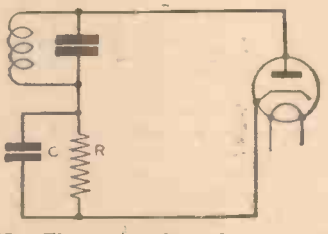


Fig. 27.—This circuit shows the main principles of the mains-operated diode rectifier.

and L.W. bands a value of .0001 mfd. is the most commonly used.

With the battery-operated grid detector the grid leak is generally returned to L.T. positive, although in some cases L.T. negative may prove to be the better point. This question is one that can very easily be settled by practical test. There is the alternative of running the grid leak to a potentiometer across the filament and this may be useful if conditions are at all critical.

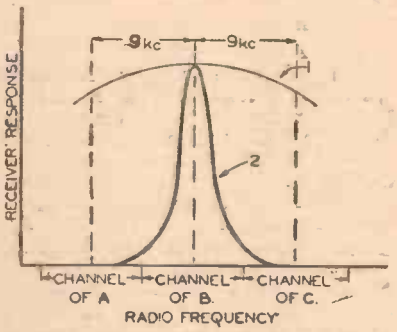


Fig. 28.—Diagram depicting the effects of quality and selectivity.

Inter-electrode Feed-back

The anode-to-grid inter-electrode capacity of a valve is responsible for feed-back between the anode and grid circuits, and this effect is naturally more pronounced at radio than at audio frequencies. The voltage fed back to the grid will have different phase relations to the original grid potential variations according to the nature of the anode load impedance.

If the anode load is effectively acting as a capacity the feed-back voltage will be in antiphase and will have a damping effect.

As far as the radio-frequencies are concerned, the anode load of a detector is bound to be capacitative, and the H.F. component of anode voltage will therefore cause input damping. This effect can be very serious with a triode detector.

The trouble can be minimised by employing an H.F. by-pass condenser between anode and cathode (or filament). (See C_1 of Fig. 26.) The larger the capacity of this condenser, and hence the lower the capacity reactance, the more effective will it be for minimising feed-back, but other considerations make it necessary to restrict its capacity value. It is important that the condenser should not have so much capacity that it causes frequency distortion on the L.F. side of the receiver to become pronounced. A capacity of .0002 mfd. is a value very commonly used with reacting detectors, including H.F. pentode detectors.

Screen Grid and H.F. Pentode Detectors

The screening grids of these valves reduce the anode-to-grid capacity to a very low value, and in view of the bad effect of inter-electrode feed-back with a detector there is much to be said for using a screen grid or an H.F. pentode.

The H.F. pentode can accept a larger input signal voltage than the S.G. valve, so that the former will be found in more frequent use than the latter.

For the best possible compromise between requirements of sensitivity, low input damping and large signal acceptance, the H.F. pentode should be given serious consideration by the designer. If a larger signal acceptance is wanted but the H.F. amplification before the detector is not sufficient to warrant the use of a diode, then a medium impedance triode should be used with plenty of H.T. (The term "power grid detection" came into being in connection with this case.)

The Diode Detector

The diode detector is definitely to be regarded as the best of all detectors if the H.F. signal input is adequate. It does not suffer from input overloading and, properly used, is remarkably free from distortion.

(Continued overleaf)

THE AMATEUR SET DESIGNER

(*Continued from previous page*)

A diode is not an amplifying detector and reaction cannot be used with it, so it will be obvious that the diode should be used only when there is considerable amplification taking place in front of the detector. The amateur may find it useful to note that if a survey of a large number of receivers is made to ascertain just where designers leave the grid detector and change over to the diode, it will be found that the smallest receivers normally using diodes have two valves in front of the detector. As an example—a diode preceded by an I.F. stage and a frequency changer features in a great many superhets of popular type.

In Fig. 27 is sketched the essential circuit of a mains-operated diode detector. R is the load resistance and C is the H.F. by-pass condenser. With an unmodulated carrier the rectified diode current will build up a D.C. voltage across the load resistance and the value of this voltage will be very little short of the peak value of the H.F. input voltage. Under modulation conditions the voltage across the load resistance will fluctuate at audio frequency.

The output voltage must, therefore, be picked up from the load resistance. The coupling condenser to the next stage could be taken from the end of the load resistance nearest to the tuned input circuit (Fig. 27). If an L.F. volume control is to be incorporated into the design, R could be made a potentiometer. Alternatively, the grid resistance of the next stage could be of potentiometer form.

If a double-diode valve is to be used as detector, but is not to be used for A.V.C., then the two diodes should be connected together.

We shall meet the diode again in connection with A.V.C., and in view of the use of double-diode valves for signal detection and A.V.C. we will defer a closer consideration of diode circuit details until we go into the matter of A.V.C.

The Path Divides

Up to this point we have been working back from the output stage without much in the way of side issues being allowed to affect the sequence. We have reached the position now, however, when various different considerations will have greater or lesser importance according to the actual type of receiver that is under contemplation by the designer.

This appears to be a suitable juncture in this series of articles to go into the general matter of receiver types, and the main problems that must necessarily influence the designer's plans. We will then return to detailed technical considerations and due allowance will be made for the various possible lines along which the designer may be working.

Receivers may be classed broadly as being either of special purpose or of general purpose types. Two examples of special purpose receivers are: (*a*) a receiver designed for local broadcast reception only, with high-fidelity reproduction; (*b*) a receiver intended for long-distance morse reception.

The general purpose broadcast receiver can be defined as a receiver designed for all-round performance including both local and distant reception, with a quality of reproduction that is acceptable but is definitely not to be regarded as true high fidelity. The majority of broadcast receivers in use at the present time come under this general purpose heading and there is, of course, very great variety to be found among them. One receiver may be designed to give a certain minimum of performance with the cost of construction cut down to the limit; the arrangements of another may have been worked out on "less gain per valve but more valves" idea; one may have sensitivity as a particular feature; another may be characterised by high volume on local transmissions, and so on.

Major Problems of Design

There are certain problems of radio design that look as though they will always be with us. One of them is the sensitivity *versus* stability problem. It is natural that a designer will sometimes feel that he wants

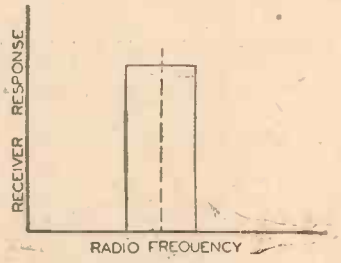


Fig. 29.—The ideal tuning "curve."

to get the limit of gain from each valve stage that he intends to use, but if he attempts to force up the amplification of any one valve too much, trouble will be experienced due to the receiver becoming unstable. Thorough screening, adequate decoupling and careful lay-out of parts will make the position as favourable as it can be, but the designer must be prepared to meet instability troubles if he becomes too ambitious over stage gain.

Sensitivity *versus* Noise

By adding valves the sensitivity of a receiver can be pushed up and up, but it is quite impossible to do this without reaching a limit. The limit is imposed by noise. In a congested area an early limit may be reached due to noises produced by external electrical interference. The final limit is brought about by noises produced in the receiver itself, i.e., valve and circuit noises

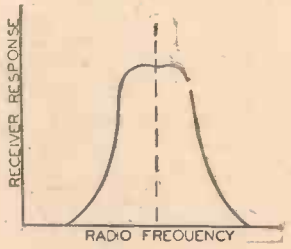


Fig. 30.—How the band-pass tuner approaches the ideal shown in Fig. 29.

Selectivity *versus* Fidelity

This is a nasty problem, and one upon which it will pay us to dwell. The need for selectivity for the purpose of preventing reception interference between different transmissions is an obvious requirement, and this requirement becomes more severe the greater the reception range of the receiver. Unfortunately, a high degree of selectivity adversely affects the audio-frequency response characteristic of the receiver, considering the receiver as a whole.

It must never be forgotten that the radiation from a broadcast transmitter must be regarded as occupying a band of frequencies ranging from the carrier frequency minus the greatest modulation frequency up to the carrier frequency, plus the greatest modulation frequency. For anything like quality in reception it will therefore be necessary for the receiver to be more or less flat in response over a band of radio frequencies centred on the carrier frequency of the wanted station.

Let us consider the case of a transmission utilising a carrier frequency which is separated by 9 k/c per second from the stations on the adjacent "channels."

In Fig. 28 three 9 k/c channels are marked off along the frequency axis and we will say that these are appropriate to three stations, A, B and C, respectively. Suppose the receiver is tuned to receive the transmission of station B. This means that the radio-frequency response curve of the receiver will be centred on the carrier frequency of B. If the receiver is of a very unselective type, the response curve will be of the character shown by curve 1.

At first sight it may appear that reception of station B will be impossible without very bad interference from both A and C, but we must not jump to conclusions. If the field strength of B's signal is very much greater than that of either A or C, and if the sensitivity of the receiver is sufficient to receive B, but is too low to give audible response to A or C, then the flat H.F. response will not lead to interference. As far as good reproduction is concerned the low selectivity will be all to the good.

If the receiver is of the sensitive, long range type such low selectivity will lead to hopeless results; so let us consider the other extreme. Curve 2 of Fig. 28 represents an extremely sharp peaked selectivity characteristic, and freedom from adjacent channel interference would certainly be a pronounced feature of the receiver. The quality of reproduction would, however, be worse than awful, as should be apparent when it is remembered that station B is transmitting its broadcast material with the aid of a band of frequencies, while the receiver response drops right away, with negligible "spread" around the carrier frequency.

A compromise between the two extremes of curves 1 and 2 would evidently improve matters. This implies a degree of selectivity that gives a limited "top spread"—just sufficient to make the quality of reproduction acceptable. Incidentally, the idea of making the L.F. section of the receiver have a rising frequency response characteristic to give compensation for high note cutting on the H.F. side is a useful one.

Over-all Selectivity

Over-all receiver selectivity as represented by a single peaked response curve can give quite satisfactory results up to a point, but actually we can go one better, and in many cases the designer will find it necessary to do so. Let us consider, for a moment, what ideal we should aim at, even if the ideal is impossible in practice. Fig. 29 gives a "curve" which represents the ideal. The response keeps constant over a band of frequencies and then cuts right off to zero. Outside the band of acceptance the receiver gives absolutely no response at all. This ideal is unattainable in practice, but by judicious use of coupled circuits designed and adjusted for band-pass tuning it is possible to get a response curve of the kind shown in Fig 30. It will be observed that the curve has what is very nearly a flat top and that, although the cut-off is not straight down to zero, the curve nevertheless has a very sharp fall away. Here we have the best possible compromise between "spread" for quality of reproduction, and sharp cut-off for freedom from interference.

(*To be continued*)

A PAGE OF PRACTICAL HINTS

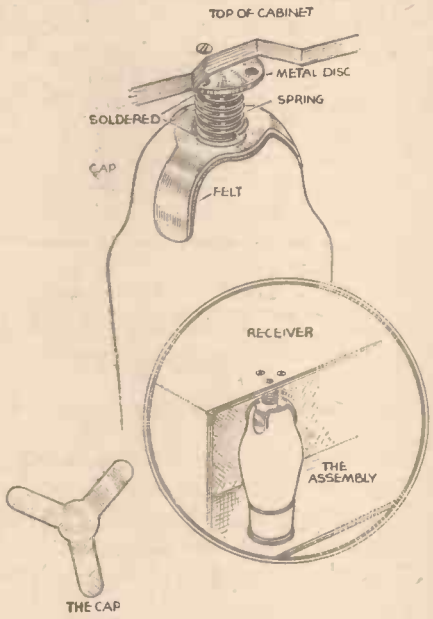
SUBMIT YOUR IDEA

READERS WRINKLES

THE HALF-GUINEA PAGE

Safety Valveholders

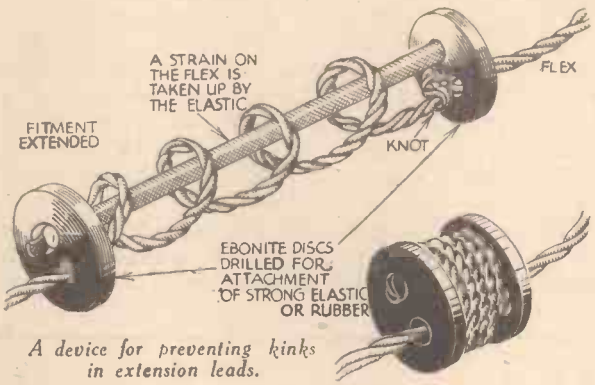
I RECENTLY constructed a small receiver for my cycle and found that the vibration was inclined to loosen the valves in the holders. After some experiment I hit upon the idea depicted in the accompanying illustration. Small cross-pieces were cut from some stiff metal sheet, together with pieces of felt of a similar size and shape. The three arms of the clip were then bent to conform to the top of the glass bulb on the valves in the receiver, and the felt was attached to the clip by means of a good adhesive. To the other side of the clip a small spiral spring was soldered and the other end of the spring (which is of the compression type) was attached to a small disc of metal screwed to the inside of the cabinet. It will thus be seen that the cabinet must be just slightly larger than the overall height of the valve, when the latter will be kept firmly pressed into the holder, due to the action of the spring on the clip. The valves may easily be inserted and removed and perfect safety is assured. —R. PATE (Liverpool, 4).



Method of making anti-vibration valveholders.

THAT DODGE OF YOURS!

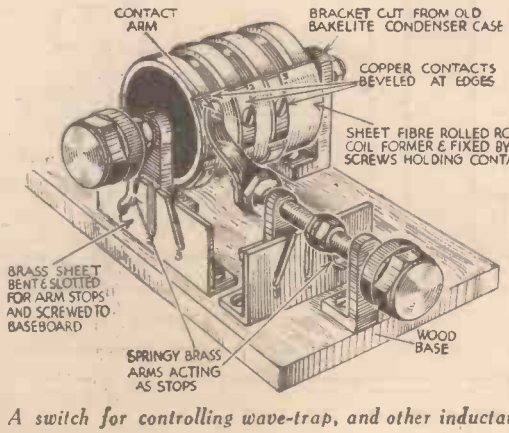
Every Reader of "PRACTICAL AND AMATEUR WIRELESS" must have originated some little dodge which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted, and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account 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.



A device for preventing kinks in extension leads.

A Wave-trap Switch

THE principle of switching which I have adapted in the construction of a wavetrap, and which is clearly shown in the attached sketch, may be advantageously employed in other coil constructions in a receiver, such as tone compensating inductances, H.F. tapped chokes, etc. By virtue of the system of the locating slots, a sound and fool-proof contacting will result. In this model, however, I arranged it so that the left knob, which protrudes through the side of the cabinet, should control the overall inductances of the coil, the "neutral" end of which, by the way, goes to the centre spindle, affording contact to the components through the medium of the location strip on the left of the sketch. The other control constitutes individual inductance tappings, the values of which are determined during the winding of the whole. —PERCY WILLMOTT (Esher).



A switch for controlling wave-trap, and other inductances.

Non-kink Extension Leads

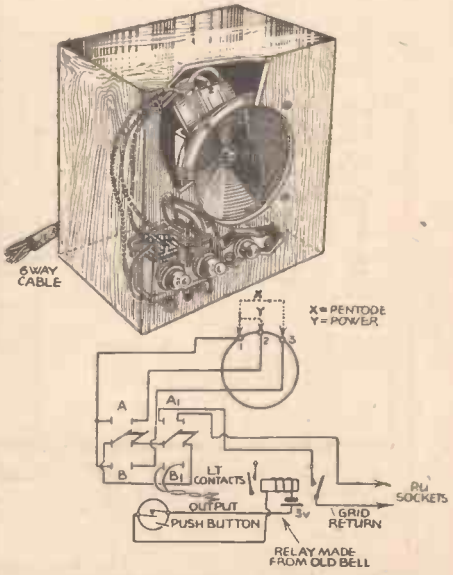
THIS fitment, for insertion in extension speaker leads, or in any lead where it is necessary to carry a length of flex, saves many a broken lead, and its accompanying annoyance. Two discs of ebonite are fastened together by a length of strong rubber. The lead, coiled as shown in the sketch, is passed through a hole drilled in each disc, a knot preventing the flex from being pulled through.—PETER GORE (Earlsfield).

A Microphone-speaker Unit

I AM using the "speaker-microphone" principle for the dual purpose of normal reception and a system of radiophone conversation between the dining-room and the kitchen of my house. The speaker is of the midget type, having three terminals, for power and pentode connection, but owing to the speech being very much better on the pentode side, I have incorporated in the circuit extra switching, so that for broadcast reception I switch over to the "B" position on the D.P.D.T. switch No. 1, and position "B1" on the D.P.D.T. switch No. 2, and for the microphone the respective positions A and A1 are used.

I have also included a relay control for switching on the receiver, and completing the P.U. connections, as shown, the grid return being effected by one pair of relay contacts, whilst the other pair switch on the L.T.; thus the possibility of hum—which would otherwise result on the broadcast side, should the grid return be left connected—is obviated. A speaker of the cone type is fitted in the kitchen for reception of speech or broadcast reproduction.

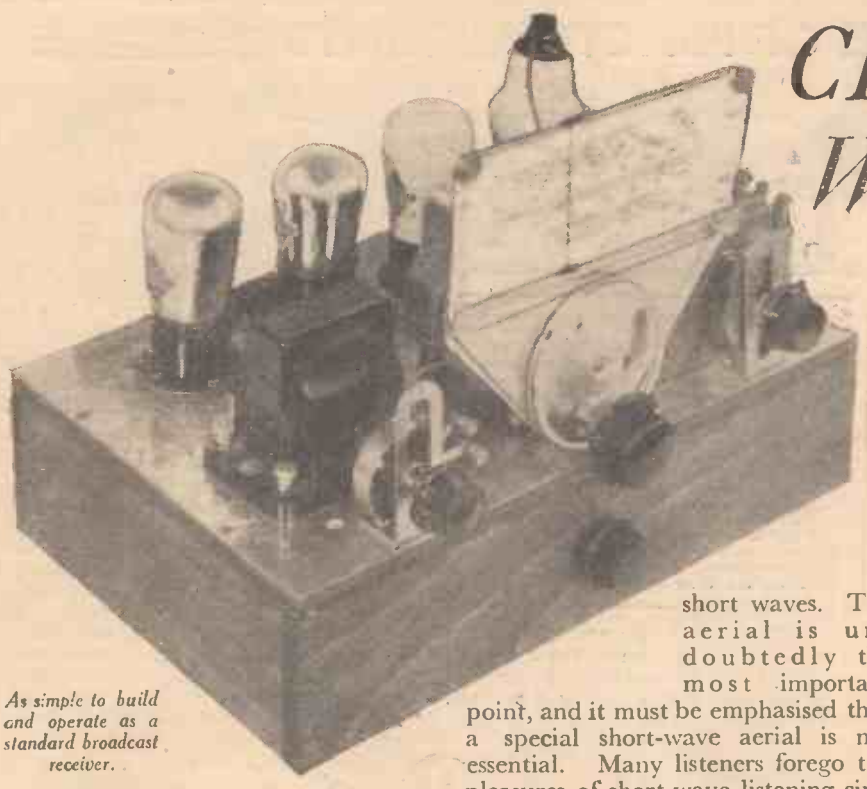
The relay, by the way, restores by re-pushing the same button, as the pawl and ratchet principle is employed.—N. E. WESTERHOUSE (Loughton, Essex).



A microphone-speaker unit for radiophone conversation.

CRUISING TH
With F. J. CAM

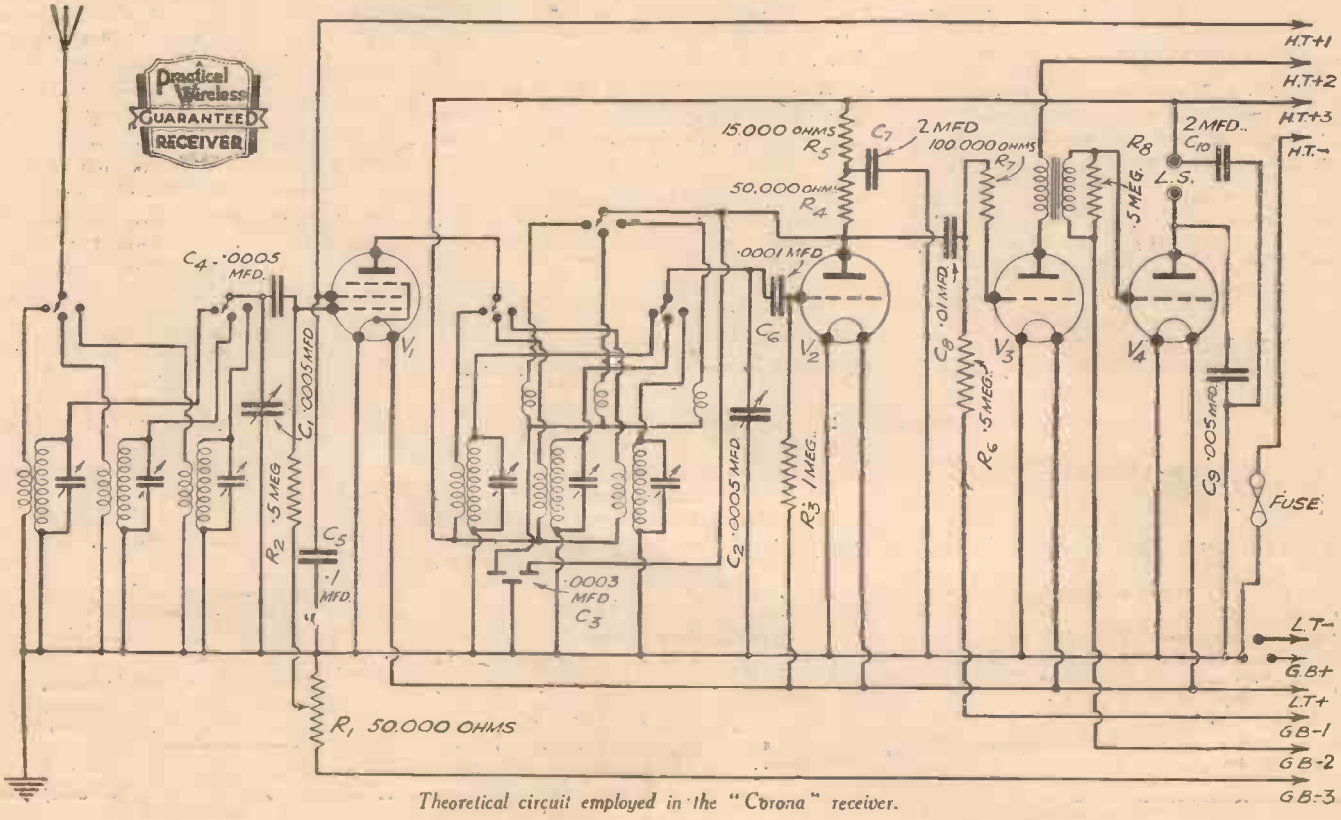
Further Notes on this Moder
Reference to Suitable Aerial S
on the Short



As simple to build and operate as a standard broadcast receiver.

ALTHOUGH we have now published all the more important data regarding the preliminary setting-up and operation of this new battery receiver, it is now necessary to go into one or two of the more important features of its operation for the benefit of those who have not before made use of the short waves. The aerial is undoubtedly the most important point, and it must be emphasised that a special short-wave aerial is not essential. Many listeners forego the pleasures of short-wave listening simply because they imagine that they have to erect a di-pole or some other elaborate short-wave aerial system. Whilst an aerial of this type will improve results on the short waves, a standard horizontal aerial such as is now used by the majority of listeners for ordinary broadcast reception will be productive of quite good results. It must not, of course, be too long. A maximum of about 40ft. will be found quite satisfactory, and will give all that is desired on the ordinary broadcast bands. In many cases a listener may be using a long wire, say 70ft. or more in length, and by reducing this he will find that not only will results on the short waves be improved, but in many cases the ordinary broadcast bands will be sharper and many selectivity difficulties will be overcome. The receiver does not tune down sufficiently low to give trouble from motor-car

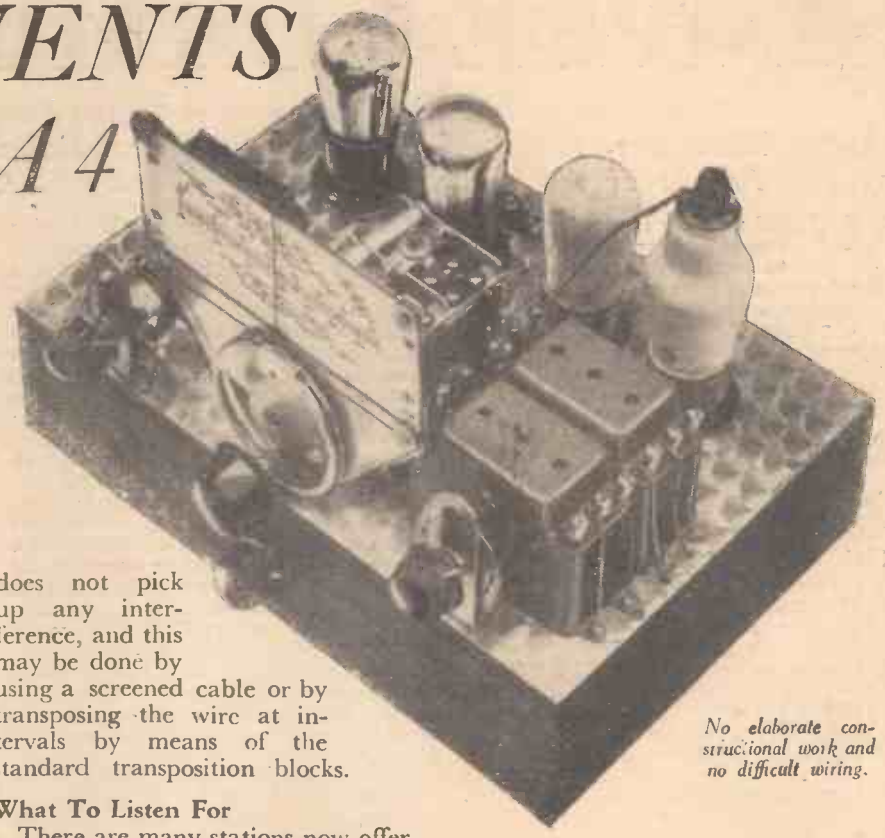
A FULL-SIZE BLUEPRINT FOR WIRING THIS REC IS PW79 AND TH



Theoretical circuit employed in the "Corona" receiver.

'E CONTINENTS
M'S CORONA 4

Receiver, with Particular ystems and What to Expect Wavebands



No elaborate constructional work and no difficult wiring.

T MAY BE OBTAINED EIVER. THE NUMBER IE PRICE IS 1/-

interference, although it may be found that when tuned to the lowest wavelength, some increase in man-made static may be experienced.

Anti-interference Aerials

This may, or may not, result in the necessity for the use of an anti-interference aerial. Many electric signs give interference on the short wavebands, and, therefore, if the short waveband appears very noisy you should look round for some such apparatus in the vicinity of the aerial. The remedy, of course, will be to erect the aerial as far away as possible from the apparatus and in this connection do not consider the length of the lead-in wire which will be required. Consider first the position of the aerial to avoid the interference, and then, if the lead-in will be of undue length an impedance-matching transformer may be fitted at each end to avoid the loss which would otherwise be obtained. Obviously, the lead-in will itself have to be arranged so that it does not pick up any interference, and this may be done by using a screened cable or by transposing the wire at intervals by means of the standard transposition blocks.

What To Listen For

There are many stations now offering good programmes, with English announcements, on the short waves, and probably the first station you will hear will be Tokio. This will tune in almost at the bottom of the dial, the exact position depending upon the setting of the trimmers and the effects of stray capacities introduced by wiring. Announcements are made in English periodically, and no doubts will arise concerning the identity of the station. Similarly, there are two or three German transmissions to be heard on the short waveband, and these also will be heard to give announcements in English from time to time. With regard to the Americans, the G.E.C. station at Schenectady (W2XAD) should be obtained at the bottom of the dial and can be identified, apart from its announcements, by the bell interval signal sounding the musical notes G,E,C. The exact wavelength is 19.57 metres, and this will enable you to identify several other stations about this point. At the other end of the dial you should easily pick up Caracas, Venezuela, on 47.06 metres, or the Moscow station on 45.38 metres. Times of transmission vary, but the signal strength of these two stations is generally exceptionally good, and they, therefore, form marking points for some of the weaker stations which are often to be heard about these points.

LIST OF COMPONENTS

Two all-wave coils, type Triogen, with 2-gang spindle (Wearite), 20s. 6d.
One 2-gang condenser, bar type .0005 mfd. (C1, C2) (Polar), 12s. 0d.
One S.M. drive, V.P. horizontal, with station names (Polar), 6s. 6d.
One differential reaction condenser .0003 mfd. (C3) (B.T.S.), 2s. 6d.
One potentiometer, 50,000 ohms, with 3-pt. switch (R1) (B.T.S.), 4s. 6d.
One L.F. transformer, type AF8 (Ferranti), 11s. 6d.
Seven fixed condensers: Two 2 mfd. (C7, C10) (type 65); One .0001 mfd. (C6); One .0005 mfd. (C4); One .005 mfd. (C9); One .01 mfd. (C8); One .1 mfd. (C5) (tubular) (T.C.C.), 10s. 8d.
Seven fixed resistances: One 1 meg. (R3); Three .5 meg. (R2, R6, R8); One 100,000 ohms (R7); One 50,000 ohms (R4); One 15,000 ohms (R5) Type F½ (Dubilier), 3s. 6d.
Four valve-holders, 4-pin chassis mounting type (Clix), 2s. 8d.
Two socket strips, A.E. and L.S. (Belling and Lee), 1s. 6d.
Two component brackets (Peto-Scott), 8d.
One Plymax chassis, 12in. by 8in. by 3in. (ready drilled for valveholder) (Peto-Scott), 5s. 9d.
Eight plugs: H.T.—, H.T.1, H.T.2, H.T.3, G.B.+, G.B.—1, G.B.—2, G.B.—3 (Belling and Lee), midget type, 1s. 4d.
Two spades, L.T.—, L.T.+ (Belling and Lee), 4d.
One fuse and holder, 100 mA (Microfuse), 1s. 6d.
Four valves: 210VPT (met.), 210DET (met.); 210DET (plain), 220P (Cossor).
One speaker, Stentorian Junior (W.B.).
One H.T. battery, 120v.; One G.B. battery, 9v.; One accumulator, 2v. (Exide).

SIMPLE FORMULAE—3

The Applications of Simple Formulae to the Problems of Inductance, Reactance, and Oscillatory Circuits, are Explained in this Third Article of the Series - - - - By L. ORMOND SPARKS

WHEN problems concerning calculations involving inductance have to be tackled, one is often perplexed by the number of different formulæ apparently available. In the early days, when "basket," "honeycomb," and other types of plug-in coils were in vogue, the necessary calculations were, admittedly, more complicated, but, as present-day coils are invariably wound in the form of single layer solenoids, matters are not quite so difficult.

However, there are still many versions of the essential formula published, so examples of those in most common use are given here.

Unit of Inductance

The unit of inductance is the henry, but as that value is never approached when considering tuning coils or H.F. chokes, it has been divided into smaller units which are known as "microhenrys," 1,000,000 of which are equivalent to 1 henry, and millihenrys of which 1,000 go to 1 henry.

It is necessary, of course, to always note which units are used in any calculation.

After comparing many formulæ, I would suggest that the following is the most satisfactory arrangement, as all the values are easily obtainable.

$$L \text{ (for single layer solenoid winding)} = \frac{0.2 \times A^2 \times N^2}{3 \times A + 9 \times B}$$

Note.—$3 \times A$ would be written, normally, as 3A.

where L is the inductance in *microhenrys*.
A is the mean diameter of the coil in *inches*.
B is the length of the *winding* in *inches*.
N is the number of turns.

Example :—

What is the inductance of a coil having 54 turns of 30 D.S.C. wire on a former of 2in. diameter?

From a wire table we find there are 67 turns to 1 inch of the wire in question. Therefore, 54 turns will measure $\frac{54}{67}$ which equals (approx.) 0.8in. Therefore, we can write

$$L = \frac{0.2 \times 2^2 \times 54^2}{3 \times 2 + 9 \times .8} = \frac{0.2 \times 4 \times 2916}{6 + 7.2}$$

$$= \frac{2334.8}{13.2} = 175 \text{ microhenrys, which is a suitable value for a medium-wave coil.}$$

It is often required to determine the number of turns for a coil of specified inductance, the other factors, such as size of wire and former, being known. To do this, the formula $N = \sqrt{\frac{3 \times A + 9 \times B \times L}{0.2 \times A^2}}$ can be used, therefore, we will apply this to the above example, thus checking our previous calculation.

$$N = \sqrt{\frac{3 \times 2 + 9 \times .8 \times 175}{.2 \times 2^2}} = \frac{6 + 7.2 \times 175}{.8}$$

$$= \sqrt{\frac{2310}{.8}} = \sqrt{2900} \text{ to the nearest whole number}$$

$= 54$ Turns. Ans.

Reactance

As in the case of capacity—as explained in the last article—inductance offers a certain opposition, or sets a limit to the amount of current an alternating voltage will cause to flow through a coil. At this stage, it would not be out of place to refresh one's memory of the effect produced when a current flows through a coil.

As soon as a current is allowed to flow through a coil—inductance—a magnetic field is created around the coil and the two items are closely related in the following manner. If the current is increased, the strength of the field is likewise increased; if the direction of current flow is reversed the direction of the field is reversed, and, what is even more important, it should be noted that if a magnetic field cuts or passes through a coil, an E.M.F. (electro-motive force, i.e. voltage) is *induced* in the coil.

Now the induced voltage always wants to flow in the *opposite* direction to that producing it, therefore, it is not very difficult to see that when an alternating current is flowing through an inductance it produces quite an appreciable back E.M.F. which tends to resist any change in the current flowing, and thus limits the amount. It must be appreciated that, with an alternating current, the magnetic field around the coil is being built up to maximum in one direction, then, with the next change in current flow, it collapses and is rapidly built up to maximum in the opposite direction, and so on.

Importance of Frequency

From this brief description, it will be obvious that the frequency of the alternating current will play an important part in determining the amount of opposition offered by any given inductance, and it is quite true to say *inductive reactance* is proportional to the frequency, and to the value of the inductance.

Inductive reactance, expressed $X_L = 6.28 fL$

where "f" is the frequency in cycles-per-second
L is the inductance in henrys

Example :—

What will be the reactance of an L.F. choke having an inductance of 25 henrys on a 50-cycle supply.

Ans. $X_L = 6.28 \times 50 \times 25 = 7850$ ohms.

Bearing in mind last week's article on the reactance of a condenser, supposing the above choke was being used in a filter output circuit, and the designer was particularly keen on the low notes being reproduced; on working out the reactance of a 2 mfd. condenser at 50 cycles, we find that it is only 1,600 approx.; therefore, the condenser will offer a very easy path to the speech currents compared with the choke.

Series and Parallel Inductances

When inductances are connected in series or parallel, they obey the same laws as resistances, provided that they are so placed that no magnetic reaction can take place between the windings.

If the values of inductance are inserted instead of resistance, the same formulæ can be applied, for example :—

$L \text{ (total)} = L1 + L2 + L3 + \text{ etc.}$, when they are connected in series, and :—

$$L \text{ (total)} = \frac{L1 \times L2}{L1 + L2} \text{ for } \textit{two} \text{ inductances}$$

in parallel or $\frac{1}{\frac{1}{L1} + \frac{1}{L2} + \frac{1}{L3} + \frac{1}{L4}}$ if there are more than two.

Example :—

What will be the total inductance of two chokes connected in series, when one is 25 henrys and the other 15 henrys at a given d.c. current?

Ans. $L = 15 + 25 = 40$ henrys.

Example :—

Supposing the same two chokes are connected in parallel, what will the total inductance be then?

Ans. $L = \frac{15 \times 25}{15 + 25} = \frac{375}{40} = 9.37$ henrys.

Oscillatory Circuits.

One often comes across the need for calculating the wavelength of a tuned circuit; therefore, in such circumstances the formula $\lambda = 1{,}885 \sqrt{LC}$ can be applied, where λ is the wavelength in metres, L is the inductance in microhenrys, and C the capacity in microfarads.

Example :—

To what wavelength will the following combination tune: Inductance 175 microhenrys, Capacity .0005 mfds?

$\lambda = 1{,}885 \sqrt{175 \times .0005} = 1{,}885 \sqrt{.085}$

$= 1{,}885 \times .29$ (approx.) $= 546.65$ metres.

When designing filters, one has to consider the frequency at which a circuit will be in a state of resonance, so it is quite usual to apply the formula :—

$$f = \frac{1{,}000{,}000}{6.28 \sqrt{LC}}$$ where L and C are the same as before, and f is the frequency.

Taking the figures or values from the previous example, we will determine the frequency at which the circuit will resonate.

$$f = \frac{1{,}000{,}000}{6.28 \sqrt{175 \times .0005}} = \frac{1{,}000{,}000}{6.28 \times .29}$$

$$= \frac{1{,}000{,}000}{1.82} = 549{,}450, \text{ or } 549.4 \text{ kilocycles,}$$

Now wavelength—in metres—is also equal to $\frac{300{,}000 \text{ (velocity)}}{f \text{ (in kc/s.)}}$ therefore, we can determine the wavelength at which the circuit will resonate by substituting the figure obtained from the last example. Wavelength $= \frac{300{,}000}{549.4} = 546$ metres.

ITEMS OF INTEREST

Can a Diode Oscillate?

TO the question "can a diode oscillate?" 99 people out of 100 would answer "No," but providing a diode is filled with suitable low pressure gas, such as mercury-vapour, or neon, it can under certain conditions possess a negative resistance slope, and can therefore be made to oscillate. The background noise sometimes experienced with mercury-vapour rectifiers has been traced to self-oscillation, while certain two-electrode neon tubes have been made to oscillate due to inherent causes.

A Twin Loudspeaker Hint

THE custom of using twin loudspeakers is growing increasingly popular. The speakers may either be of similar type to give better diffusion or more volume, or they may consist of examples of widely varying dimensions in order to give better frequency resistance. In either case it is absolutely necessary that they should be acoustically in phase if the best results are to be obtained. That is to say, that on a particular note both diaphragms should move in the same direction. A most simple way of phasing two speakers is to apply a battery to the common lead feeding both speakers, and see that this applied voltage causes both diaphragms to move in the same direction. If the speakers have no individual transformers, and are therefore of the low-impedance type, a 1½-volt cell is usually sufficient, while on the ordinary high impedance type, 100 volts or more is often necessary to produce a discernible movement of the core. To avoid damaging the speaker, it should be remembered that the voltage applied can safely be increased until the speaker gives a good healthy "plop" at the moment of contact, comparable in volume to that given by the speaker under normal conditions.

A WLW Artist Listens-in

LIKE the proverbial postman who takes a walk on his day off, Sidney Slon, a WLW broadcast artist, and Mrs. Slon embarked aboard a freighter at Montreal early this summer to tour England and France. The prime object—to get away from radio for a while.

They toured England and France—drove more than 3,000 miles in a small 8 h.p. car they purchased in London.

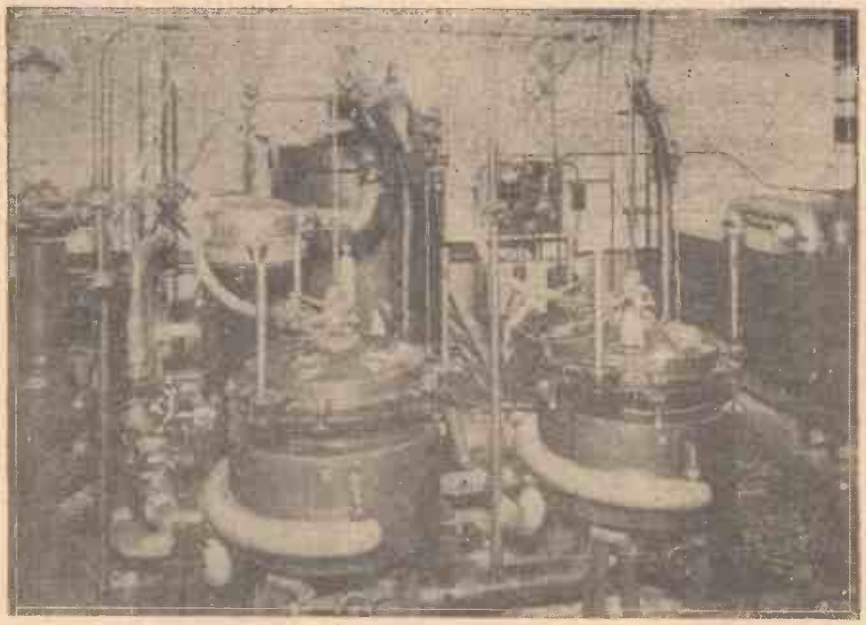
"We had a radio set in the car," said Slon, who returned recently to the Nation's Station at Cincinnati, Ohio. "We enjoyed British programmes, but had heard none from home until one night I was tuning around the dial and heard James Leonard announce 'Vocal Varieties.'"

From then on Mr. and Mrs. Slon tuned in "Vocal Varieties" at 12,15 a.m. (British time) each Wednesday and Friday. The programme, broadcast by the Nation's Station, is heard at 6.15 p.m., E.S.T., Tuesdays and Thursdays, over WLW and the NBC-Red network.

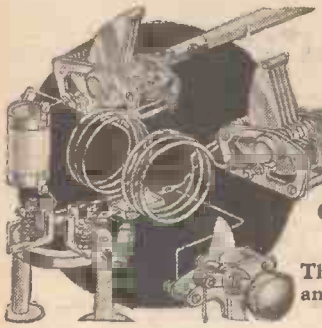
"Reception was good most of the time," said Slon.

Impregnating Condensers

A GREAT deal has been written from time to time in PRACTICAL AND AMATEUR WIRELESS on the manufacture of various wireless components, valves, coils, and so on, but little is heard about condenser construction. A modern condenser, although in itself simple, is treated in a most elaborate manner to fit it for a long and useful life. Many of our readers will no doubt remember the days when paper condensers had a definite life, and after three or four years without trouble in this direction, one could almost sit and wait for a condenser to break down. The enemy of a condenser is, of course, moisture. Moisture in the sense of pure water would do little harm, but it has usually either a small acid or alkaline content, or alternatively manages to pick it up out of the condenser material itself. Water in this condition is a conductor of electricity, and as the paper separating the foil is often only about 1/1000th of an inch thick, it is easy to see how the presence of a conducting moisture can cause trouble, as the passage of current through the paper generates heat, which in turn will break up the electrical properties of the paper and ultimately lead to a breakdown. The ordinary 2-mfd. condenser simply made of foil and paper, and left to absorb all the moisture from the air unhindered, could run a high-tension battery down in a few days. After the condenser is wound, or built up in layers, as the case may be, it is necessary that it should first have every trace of moisture removed, and secondly treated in some manner to prevent the re-entry of moisture from the atmosphere. The moisture in the newly made condenser is removed by baking it in a specially constructed "oven," the hot air in which has been filtered to remove moisture. This treating process may occupy anything between 24 and 48 hours, after which the tank is hermetically closed, and the air is pumped out by means of a vacuum pump. This pumping is continued for a very considerable time, and then molten wax is allowed to flow in and completely cover the condensers. The wax, incidentally, is of a special kind, and has been treated so that any free water which may be present is entirely removed. The temperature of the "oven" is so adjusted that the wax is kept in a molten state until some considerable time after bubbles have ceased to rise. The temperature is then decreased until the wax has reached a plastic state which will prevent it flowing out of the individual condensers when they are removed from the "oven." The condenser of the tubular type usually has its ends filled with some bituminous substance, or, alternatively, it is placed in a tin or bakelite container, and filled up with wax or pitch. Modern condensers made in this manner are capable of outliving almost every other component with which they are associated.



A corner of the Cossor condenser shop showing the impregnating plant.



Short Wave Section

CONVERTER CIRCUITS FOR THE ULTRA-SHORT WAVES.

The Construction and Operation of an Efficient Unit and Various Types of Circuits are Discussed in this Article.

THERE must be a great many short-wave experimenters who have not so far sampled the possibilities of ultra-short-wave reception. The average short-wave receiver is not generally of a design that will operate well (if at all) below 10 metres. This is particularly true of the H.F. Dct. and L.F. type of set, which can give a good account of itself on the short waves, and is usually home built for reception only on the higher frequencies.

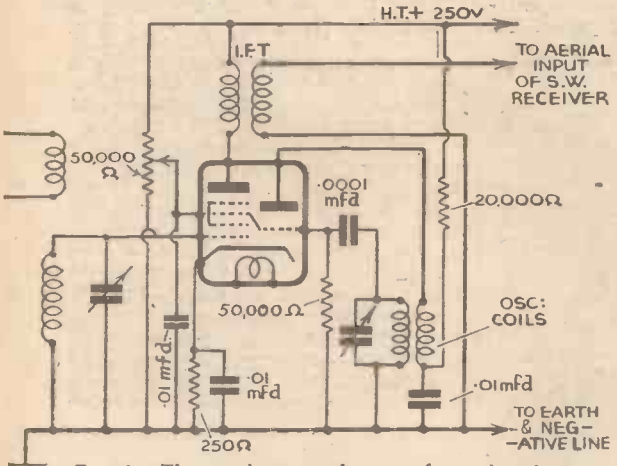


Fig. 1.—Theoretical circuit diagram of an ultra-short-wave converter using a triode-hexode.

The simplest way of obtaining efficient reception below 10 metres is to use a separate converter for the ultra-short waves, and make use of an existing short-wave receiver for amplification purposes. The reason for specifying a short-wave receiver, and not a broadcast set, will be seen in a moment.

To obtain good reception on the ultra-high frequencies three conditions have to be complied with. First, the tuning must not be excessively sharp; secondly, a stable oscillator circuit must be used and, most important of all, the intermediate amplification frequency must be high. It will now be seen why a short-wave receiver can be made the most use of with an ultra-short-wave converter. The short-wave set may be tuned to about 50 metres, and used as an I.F. second detecter and output amplifier, or in other words, a superheterodyne receiver specially for the ultra-short waves. The same arrangement is often used, of course, for normal short-wave reception where an adapter is tacked on to a broadcast set.

An Efficient Converter Circuit

It must be pointed out that it is absolutely necessary for the short-wave set to have at least one stage of high-frequency amplification. There are many frequency converter circuits that can be used for ultra-short-wave reception, though to obtain all the conditions that have already been outlined, it is necessary to use a multi-purpose type of valve. To many home constructors this may seem an unnecessary complication, but if a glance is taken at Fig. 1, it will be seen that quite a simple circuit is used.

The valve is a triode-hexode, the triode portion being used in a conventional oscillator circuit making use of the magnetic coupling between the plate and grid coils for feed-back purposes. The grid circuit of the oscillator only is tuned, and the hexode part of the valve is used both for signal detection, and oscillator injection, which takes place automatically, due to the connection inside the valve. The circuit capacities for tuning purposes should be carefully noted. The capacity of the grid tuning condenser of the oscillator is comparatively high, being .00015 microfarads; this is to obtain good stability, a very necessary feature on the ultra-high frequencies, as already pointed out. The signal tuning condenser should have a maximum capacity of 20 micro-microfarads, which will give a good band-spread, and at the same time make the tuning as easy as it is for 40 metres.

The two oscillator coils have three turns each with an outside diameter of three quarters of an inch, and are closely coupled. If desired, the two coils can be wound on a small former, as it is not necessary to have a very low loss arrangement here. As the signal tuning condenser has such a small capacity, it is necessary that its associated coil should be interchangeable to cover the whole of the ultra-short waveband. Here, a four turn coil will cover the 5-metre amateur band, and a six-turn coil will cover both the television frequencies. All coils may be wound with 16 gauge tinned copper wire.

I.F. Transformer Windings

One part of this converter circuit calls for special comment, and that is the I.F. transformer in the anode of the triode-hexode. It will be understood that as the intermediate frequency is to be high (depending on the wavelength to which the short-wave receiver is tuned) that a special transformer will have to be made up for the purpose. This is not a very difficult matter, and if reference is made to Fig. 2, it will be seen that a very suitable transformer can be made by interwinding 36 turns of No. 30 D.S.C. wire on a small former two and a half inches long, and having a diameter of one inch. The method of interwinding is very simple. The two lengths of wire are taken, and both wound round the former at the same time. So that it can be said the primary turns are wound inside the secondary, or *vice versa* as the case may be.

There are several reasons for winding the I.F. transformer in this way. First of all, a tight coupling is achieved which can be used with advantage here; also, the capacity due to the windings is lowered, and this applies to both primary and secondary. This all tends to flatten out the frequency response, and make the tuning less critical, a point that will be very much appreciated by anyone who has carried out any reception work at all on the ultra-short waves.

A potentiometer is used to obtain the screening voltage, as a variable adjustment is sometimes necessary, particularly if a weak signal is being tuned in, or if different valves are being tried out.

Little need be said about the practical construction of an ultra-short-wave converter, except perhaps to mention again the oft-repeated statement to keep all the wiring as short as possible. In connecting up the converter to a short-wave receiver it should be seen that the earth, and incidentally, the negative line, is kept both short and direct. Many troubles on the short, as well as the ultra-short, waves can often be traced to a long and straggling earth and negative line.

Those who have already carried out experiments with ultra-short-wave converters will no doubt be aware that there are several different combinations of circuits available. For instance, it is possible to use a separate oscillator valve, and inject the oscillations into the suppressor grid of an H.F. pentode. Though where two valves are used, conditions for efficient operation are apt to be far more critical than in the circuit described above.

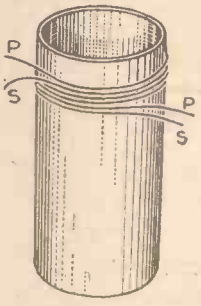


Fig. 2.—Showing the method of interwinding primary and secondary of the I.F. transformer.

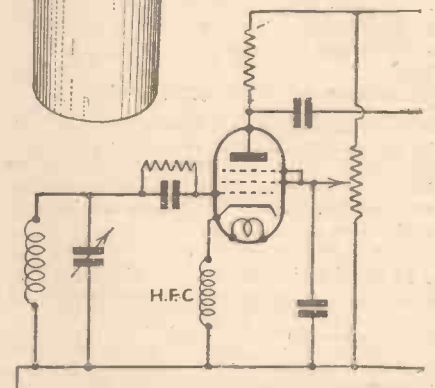


Fig. 3.—The autodyne circuit of a commercial receiver for the ultra-short waveband.

The Autodyne Circuit

The simplest of all converter circuits is, no doubt, the autodyne. This type of circuit suffers from many disadvantages, of which the most important of all is its insensitivity to weak signals. However, it is interesting to note that a well-known firm, Epoch Reproducers, Ltd., have developed a special autodyne circuit for use in their commercial ultra-short-wave receiver. This takes the form of an H.F. pentode, in which oscillations are produced by means of an ultra-short-wave choke in the cathode of the valve, the strength of

(Continued overleaf)

SHORT-WAVE SECTION

(Continued from previous page)

the oscillations being controlled by the screen potentiometer. It may be remembered that a similar circuit has been used in broadcast superhets, where a tuned circuit is inserted in the cathode of a screen-grid valve. In the present case the tuned circuit is replaced by the H.F. choke, which is aperiodic over the frequencies to which the receiver will be tuned (Fig. 3.).

Those who may be sufficiently interested to experiment and build an ultra-short-wave converter may well ask, "What is there to receive on these comparatively new frequencies?" The answer is that there is certainly not such a varied reception as on the normal short waves, but the potentialities are far greater. There are the two television channels, sound and vision, also there is considerable amateur activity on the 5-metre waveband. Distant reception is becoming far more frequent, and with progress in both transmission as well as reception technique, world-wide communication on the ultra-high frequencies may well be possible without the disadvantages possessed by the lower frequencies. Added to this is the quality of reproduction which can be obtained, and for this purpose the B.B.C. may soon be operating a transmitter in the region of 7 metres, putting out their broadcast programme solely for high-quality reception.

Leaves from a Short-wave Log

XEUZ Asks for Reports

XEUZ, Mexico City (Mexico), now on 49.04 m. (6.118 mc/s), has been heard broadcasting from G.M.T. 23.00 until 05.00. From G.M.T. 04.00 until 04.30, a news bulletin followed by a talk in English is regularly given every morning. The studio is anxious to receive reception reports from European listeners. Address: Radioemisora XEUZ, Mexico City (D.F.), Mexico.

Transmissions from the North Pole

UPOL, the Arctic station installed by the Soviet Polar Expedition, operates regularly on 21.28 m. (14.095 mc/s). Under the call sign REAM, it is willing to work with amateur experimental transmitters throughout the world on the 20 m. and 40 m. bands daily between G.M.T. 19.00-21.00.

Short-Wave Station for Dublin

The Irish Free State is considering the installation of a powerful short-wave transmitter to relay the Dublin radio programmes for the benefit of its nationals resident in North America. It is proposed to erect the station in the immediate vicinity of Athlone.

Another Chilean on the Ether

A new short-wave broadcaster located at Valdivia, situated at some 450 miles south of Santiago (Chile), is said to be testing on 24.98 m. (12.01 mc/s) between G.M.T. 00.30-03.00. The call sign as announced is CB1109.

Holland to have a S.-W. Transmitter

So far the Dutch short-wave radio programmes have been broadcast by privately-owned stations. The Netherlands Government is constructing a high-power transmitter at Jaarsveld in the neighbourhood of the city of Utrecht. It is hoped to launch this station on the ether in the beginning of 1938.

Martinique Broadcasts Heard in Europe

French listeners report the reception of a transmission from Fort-de-France (Martinique) on 30.98 m. (9.685 mc/s), between G.M.T. 23.30-00.30. The station was previously stated to be operating on 31.73 m. (9.454 mc/s).

Daylight Transmissions from Japan

For the benefit of listeners in Australia, and the Pacific Islands, special broadcasts are made daily by JZK, Tokio (Japan), on 19.79 m. (15.16 mc/s) from G.M.T. 13.00-14.00.

Another Broadcast from Buenos Aires

LSY, Monte Grande (Buenos Aires), on 16.56 m. (18.115 mc/s) 10 kW., is now being used for a regular transmission entitled *The Voice of the Argentine Republic*. News and a musical programme may be heard nightly at G.M.T. 21.00.

Schenectady's Autumn Schedule

W2XAD and W2XAF, in the N.B.C. network, on 19.56 m. (15.33 mc/s) and 31.48 m. (9.53 mc/s) respectively, are now working on most days of the week from G.M.T. 16.00-05.00. From 16.00-23.00, W2XAD transmits a programme for Europe, and this is also relayed simultaneously from G.M.T. 21.00 onwards by W2XAF. From G.M.T. 23.00-02.00 on the higher frequency a broadcast is beamed on South America for the benefit of the Latin States, and the programme is extended until G.M.T. 05.00, but only through W2XAF on the longer channel. On Fridays and Saturdays, W2XAF is brought into action at an earlier hour than on other weekdays, namely, at G.M.T. 18.00, and at 17.00 respectively.

Chief Officer Cartwright, of the Coventry City Fire Brigade, after three years of research work has had installed a portable wireless station, operating on a wavelength of 5.17 metres with an output of 1½ watts. It can be used on any of the engines. The permanent station at the fire headquarters operates on a frequency of 56 megacycles. The call-sign is G8YH. Results have been so satisfactory that the idea is to be adopted with sets of permanent construction. Tests have shown that fire officers can be in constant touch with headquarters while out on a fire. The illustration shows a fireman operator receiving instructions from headquarters.

Proposed Short-Wave Station in Utah

It is reported that the Mormon Church at Salt Lake City (Utah), U.S.A., has been authorised to erect a 50-kilowatt short-wave transmitter to work on 13.98 m. (21.46 mc/s) and 19.68 m. (15.243 mc/s).

XEXA on New Channel

A transmitter operated by the Ministry of Education (Mexico City) previously reported on 48.94 m. (6.13 mc/s) is now working on 48.62 m. (6.17 mc/s), and relays the radio programmes of XEXM in the Mexican capital. Schedule: Daily, except Sundays, G.M.T. 09.00-04.00; 13.00-15.00; and 20.00-22.00.

Bangkok Tries Out a New Wavelength

HS8PJ, Saladeng, Bangkok (Siam), which had been experimenting on 32.09 m. (9.35 mc/s), is now trying out a new channel, namely, 31.58 m. (9.5 mc/s) between G.M.T. 12.30-15.00, and occasionally from G.M.T. 06.00-07.30. Interval signal: 3 notes (ascending scale). When recently the announcer closed down the programme he was heard to give the call in English, and terminated with the words: *Good Health, Good Luck and a very Good Night from Siam.*

PHILCO RADIO-BOOKCASE

ONE of the most novel, inexpensive radio cabinets ever placed before the public has been introduced by Philco Radio. Known as Model C.527 Concert Grand with bookcase, the set contains provision for storing books, magazines and radio programme material which is to be kept convenient to the owner's hand.

In addition to the receiver cabinet and its bookshelves, separate matched units are available for increasing its book-storage capacity. The bookcases are examples of high class cabinet work, and the shelves line up accurately with the shelves in the radio cabinet, so that the ensemble looks like one piece of furniture.

The radio unit is 15in. wide by 32½in. high by 10½in. deep. Each bookcase unit is 15in. wide by 22½in. high by 10½in. deep, and these units can be used for any type of radio receiver table model if desired. Both units are made of beautifully hand-polished dark walnut with an attractive natural grain. The radio, with its inclusive bookshelves, sells for £10 9s. 6d., and separate bookcase units are 2 gns. each.

The new Bookcase Radio with 2 units added. The individual parts are obtainable separately.

BOOK RECEIVED

Talks For Discussion Groups

THREE interesting series of talks: "Design in Everyday Things," by Anthony Bertram; "Clear Thinking," by R. W. Jepson; and "Men Talking," arranged in such a way as to provide material for discussion by groups listening to them together, began last week, when Anthony Bertram broadcast his first talk in the series "Design in Everyday Things," on Monday, October 4th, in the National programme. He will continue each Monday until December 20th.

The talks under the title "Clear Thinking" will be broadcast by R. W. Jepson, Headmaster of the Mercers' School, Holborn. They will be given in the National programme each Tuesday from October 5th, and are a sort of counter-blast to slogans, catch-phrases and ready-made opinions.

The series "Men Talking" is an extension of an experiment which the B.B.C. recently tried out with unrehearsed conversations in the afternoon programmes. Two or three speakers will sit talking in a studio and, as soon as the argument has had time to warm up, the microphone will be made live and listeners will be able to eavesdrop. Twenty minutes later the broadcasters, still talking, will be faded out. Family life will be the general theme of their conversations, which, of course, will be quite impromptu. John Gloag, who was heard as "John" in the recent afternoon "Men Talking" series, will be in the studio for all the discussions and sometimes he will have experts with him, and on other occasions ordinary men and women. The talks will be given each Thursday from October 7th to December 16th inclusive.

A pamphlet outlining these three series of talks for Discussion Groups is available (post free), while, in connection with the series "Design in Everyday Things," a special explanatory pamphlet with an introductory essay by Anthony Bertram, and many illustrations is published at eightpence (post free). Both pamphlets are obtainable from the British Broadcasting Corporation, Publishing Department, 35, High Street, Marylebone, London, W.1, or on personal application at Broadcasting House, Portland Place, London, W.1. The booklets may also be obtained from all B.B.C. Regional offices.

NEW FERRANTI CAR RADIO

ALTHOUGH in America about 17% of her thirty-three million cars are fitted with radio, in this country various technical difficulties, together with high prices, have prevented much progress being made.

However, the signs would now seem to be pointing to a marked increase of public interest in car radio, and it is significant to find that the latest and lowest priced set on the market comes from an English manufacturer with a distinguished name in domestic radio and electrical industries—Ferranti Ltd.

The receiver is unusual in that it consists of two units, the makers pointing out that this enables it to be neatly fitted without loss of leg-room in small cars and, furthermore, allows provision of a full-size moving-coil speaker, a point which very materially assists quality of reproduction.

The six-valve superhet circuit is sensitive and powerful, giving an output of 2½/3½ watts, and incorporates full automatic volume control.

No Plug Suppressors

Although the background is as silent as a good domestic radio, no plug suppressors are required. The consumption of the receiver amounts to 12 volts 3 amps, or as much as one headlamp.

Long and medium wavelengths appear on the illuminated dial, and the principal station names are clear and readable. The dial and control knobs are fitted to the steering column, or to the dash, as desired, one knob operating tuning control and, by a push-pull action, the wave-range switch, and a second knob provides continuously variable tone control. An ignition-type key switches the receiver on or off, and also controls the volume.

The speaker is a 7in. permanent magnet moving-coil unit.

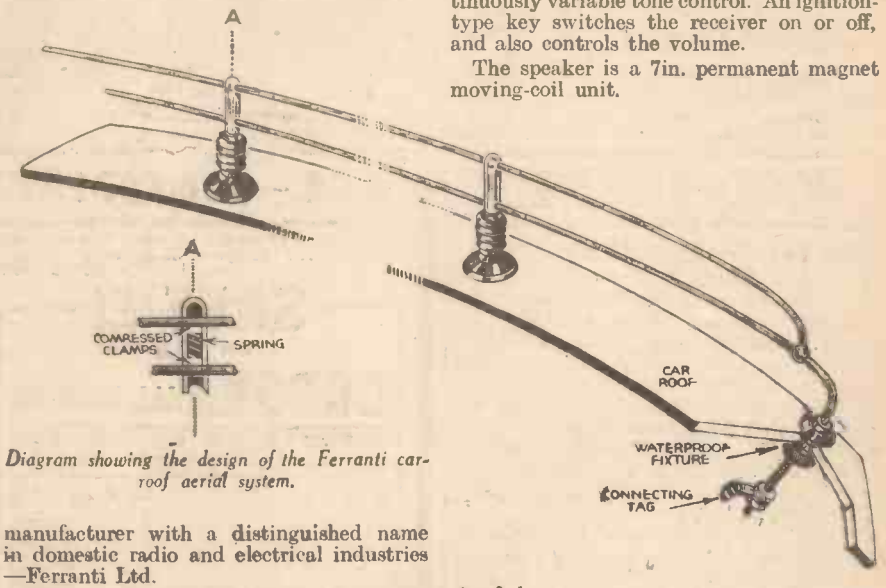


Diagram showing the design of the Ferranti car-roof aerial system.

Aerials

Two types of aerial are available, a roof aerial, pleasantly streamlined, and an under-chassis aerial. The roof aerial, shown in the accompanying illustration, gives rather better signal strengths than the latter, and can be fitted to a sunshine roof. Another advantage of the roof type of aerial is that it reduces interference from the engine as it is situated farther away from it than the underchassis type of aerial.

The price of the receiver is 13½ guineas, the roof aerial and under-chassis aerial costing 21s. and 12s. 6d., respectively.

A.V.C. Refinement

ONE of the most unpleasant features of a powerful superhet is side-band shriek, which makes tuning so unpleasant that it seriously detracts from the enjoyment of station searching. The cause of side-band shriek is very simple. Any A.V.C. system has a certain amount of *time* delay, so that as the dial is swung towards the station, the edge of the station side-bands are met with the set at its maximum sensitivity, and until the A.V.C. has had time to work, the shrieking side-bands are reproduced at great volume. It is, fortunately, very simple to eliminate or minimise this trouble in the following manner:

The I.F. valve is coupled to the second detector by means of an I.F. transformer, which must necessarily make use of two diodes, one a signal diode which is taken to the high potential end of the I.F. transformer secondary, while the A.V.C. diode is usually connected to the signal diode by means of a small condenser. If, however, this small condenser is removed, and the A.V.C. diode is joined through the condenser to the anode of the I.F. amplifier, a considerable improvement will result. The manner in which this alternative connection effects an improvement is as follows:—

The primary of the I.F. transformer will have a response curve that is comparatively flat when compared with that of the secondary, consequently, as the tuning dial is rotated towards the station, the A.V.C. diode has the signal voltage applied to it an appreciable time before the signal diode, long enough, in fact, for the A.V.C. to become effective or partially effective, providing that the time delay of the A.V.C. system is not too great. Excessive time delay is due to the A.V.C. decoupling condenser being too large for the decoupled resistance. These two components can be varied without upsetting the stability of the receiver, as long as the resistance is increased to compensate for the decreased capacity.

IMPRESSIONS ON THE WAX

Brunswick

A NEWCOMER to Brunswick this month is Josephine Tumminia, a young San Francisco opera singer, who has recorded "The Wren" and "Blue Danube Waltz" on *Brunswick* 0317. The feature of the two well-known items presented on this record is that they are sung with special swing accompaniment, arranged by Fred Livingstone and played by Jimmy Dorsey and his Orchestra. Two famous film stars, Alice Faye and Gene Raymond, appear on *Brunswick* 02156 singing "I've got my Love to Keep me Warm" and "Twinkle, Twinkle, Little Star." You will like the recording made by the Mills Bros. with Louis Armstrong on *Brunswick* 02461. They have featured two old favourites, "The Old Folks at Home" and "In the Shade of the Old Apple Tree."

Decca

THERE are three new Ambrose records this month. Two of them, *Decca F* 6472 and *F* 6473, present four tunes from the new Jessie Matthews film, "Gangway." They are "Moon or no Moon" and "Lord and Lady Whoozies," and "When you Gotta Sing" coupled with "Gangway." "Power House" and "The Toy Trumpet," recorded on *Decca F* 6468, are very interesting tunes by that outstanding composer, Raymond Scott.

This month that popular favourite The Street Singer has recorded two of his songs from his latest film, "The Street Singer," on *Decca F* 6475. They are "Halfway to Heaven" and "Street Serenade." Also on *Decca F* 6465, he sings two popular tunes of the moment—"It Looks Like Rain in Cherry Blossom Lane" and "Where Are You?"

"Let's Call the Whole Thing Off" and "They Can't Take That Away" are two musical duets between Greta Keller and Brian Lawrence. The two tunes were written by the late George Gershwin for that bright musical film "Shall We Dance?"

If you like organ music you should hear "Hit Parade" No. 2, played by Donald Thorne, who is a first-rate cinema organist. He introduces six popular tunes of the moment on this record, which is *Decca F* 6477.

In the Decca "X" series there is now presented the first recorded performance of Schubert's "Wanderer Fantasia," originally written for piano solo, and very much elaborated for piano and orchestra by Liszt. A truly brilliant performance is submitted by Clifford Curson and the Queen's Hall Orchestra, conducted by Sir Henry Wood, on *Decca X* 185 to 187.

Rex

SANDY POWELL and Company have made another humorous sketch this month on *Rex* 9123. "Sandy Wins the Football Pool" is the title, and I am sure you will enjoy a good laugh.

Bob Mallin sings two new hill-billy songs—"My Little Buckaroo" and "With my Little Horse and Wagon"—on *Rex* 9061, and Carson Robinson and his Pioneers also oblige with "Rambling Cowboy" and "Happy go Lucky" on *Rex* 9127.

Jay Wilbur and his Band have a "Shall We Dance?" selection on *Rex* 9125. He introduces "They Can't Take That Away From Me," "I've Got Beginner's Luck." "They All Laughed," "Let's Call the Whole Thing Off," "Shall We Dance," and "Slap That Bass." Vocal refrains are sung by Sam Costa.

Two new records by Brian Lawrence and his Landsdowne Orchestra are "One in a Million" coupled with "I'm Gonna Kiss Myself Good bye," on *Rex* 9119, and "You're Looking for Romance" and "Sunset in Vienna" on *Rex* 9120. He has also made a vocal recording, accompanied by Fred Hartley and his Quintet, of "It Looks Like Rain in Cherry Blossom Lane" and "Carelessly" on *Rex* 9118.

Decca-Polydor

ONE or two of Liszt's Hungarian Rhapsodies have become extremely popular, and the famous European pianist, Alexander Borowsky, is to record all the Liszt Rhapsodies on Decca-Polydor records. His first rhapsody, which has just been released, is "Hungarian Rhapsody" No. 1, on *Decca-Polydor DE* 7073/4.

RADIO CLUBS AND 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.

British Short Wave League

ON Saturday, October 16th, at 22.30 G.M.T., a special programme dedicated to the British Short Wave League is to be broadcast from the League of Nations short-wave stations HBL (31.27 metres) and HBP (38.47 metres), at Geneva. Special verification cards will be issued to all listeners sending fully detailed reports on this programme, together with 1½d. to help pay postage and production costs (or 3d. for the two verification cards if reports are sent on both stations). All reports should be sent to: J. R. Garrett Pegge, 2ADG, BSWL230, The Meades, Chesham, Bucks.

Maidstone Amateur Radio Society

THE recently formed Maidstone Amateur Radio Society is now making great progress. The membership has trebled itself since the forming of the society, being now fifteen, and includes two members from the neighbouring city of Rochester.

The society has been very fortunate in securing the loan of the large new clubroom behind No. 244, Upper Fant Road, Maidstone, upon which members have been busily engaged in thoroughly cleaning it out prior to the fitting, by members, of entirely new floorboarding at the club's expense. This work has now been completed, and meetings are held every Tuesday evening at 7.45 p.m.

A new committee of four has been elected, and is as follows: Chairman, Mr. James Dodd; Vice-chairman, Mr. Denis W. Carr (G8UC); Hon. Treasurer, Mr. Roy Brooker (2BFW); Hon. Secretary, Mr. P. Michael S. Hedgeland.

A small library is being formed, from which members may borrow various text books, and also the complete set of issues of PRACTICAL AND AMATEUR WIRELESS.

Details of the society were published in the issue of PRACTICAL AND AMATEUR WIRELESS, dated August 21st, 1937, and very many more members are required. We therefore invite any in the Maidstone area who are interested in radio from any aspect to come along to our meetings, or, if they require any further details first, to get in touch with the Hon. Sec., M.A.R.S., Michael Hedgeland, 8, Hayle Road, Maidstone.

Lincoln Short-wave Club

THE above club commenced activities recently and Mr. Rilett, an old transmitter, was elected president, and Mr. Babbs, hon. secretary. The president opened with an interesting lecture on Short-wave Communication, and traced its history from the early experiments of Hertz, Marconi, etc., down to the regular point-to-point S.W. telephonic communications of to-day. An attractive syllabus of lectures, etc., has been drawn up and arrangements for Morse practice have been put in hand. —G. F. Shepherd, Sec., 287, Wragly Road, Lincoln.

Edgware Short-wave Society

A SHORT-WAVE society has now been formed under the above title, and meetings are held every Wednesday, at 8 p.m., and Sundays, at 11 a.m., at the address given below. Readers residing in Edgware and district who are interested in short-wave work or transmitting are invited to get in touch with the Hon. Sec., G.Vale, 40, Raeburn Road, Edgware.

Liverpool S.W. Radio and Transmitting Club

A VERY successful meeting of this club was held on Monday, September 6th. Meetings are held every Monday night, and the subscriptions are 2s. 6d. per year and 6d. per attendance. All interested in the club are requested to write to the Hon. Secretary, C. E. Cunliffe, 368, Stanley Road, Bootle, Lancs.

Newbury and District S.W. Club

THIS club has now been running for a year, and recently we celebrated its first birthday at our "shack." We had a very fine demonstration on a Class B amplifier by one of our members, and obtained some good results. We were lucky to have the S.W. stations rolling in all round the dial on that evening. Another of our members gave us a good half hour's entertainment, and we finished the evening with a toast to the future of our club. We have been increasing our membership lately and are now thinking of enlarging our "shack."—L. Harden, Hon. Sec., 11, Highfield Avenue, Newbury, Berks.

The Croydon Radio Society

THE society's list of fixtures to the end of next month is as follows:—

October 19th: Gramophone Pick-up Night. Comparison of members' models, and experiments on sound reproduction from records will be effected.

October 26th: The hon. secretary, Mr. L. F. Marshall, talks on "Making Electrical Measurements," illustrated by his own practical experiences.

November 2nd: Lecture on Sound Reproduction by the chairman, Mr. W. J. Bird.

November 9th: Mr. G. S. Taylor, of the Whiteley Electrical Co., Ltd. (W.B.), on "Some Stepping Stones in Speaker Progress." An onlooker's account of his technical department's experiments, with practical examples.

November 16th: Loudspeaker Night. To ensure a comprehensive collection, all members are urged to bring theirs no matter how ancient or modern. Each instrument's frequency range will be examined on the society's own oscillator.

November 30th: "Avo Instruments and Radio Servicing." Lecture given by the Automatic Coil Winder and Electrical Equipment Co., Ltd.

Exeter and District Wireless Society

THE usual weekly meeting of the above society was held on Monday, October 4th, and the subject for discussion was the construction of an amplifier for the society's own use. This is being built by members, and the parts used will be subscribed for by them.

After much discussion they had to decide that an amplifier giving an undistorted output of 10 to 15 watts was necessary, and this is being obtained by 2 MHL 4's and a final stage of 2 PX 25's in push-pull.

This piece of apparatus will be ready for test by the middle of November, and a set of frequency test records is being obtained.

At the meeting to be held on Monday next there will be a lecture and demonstration given by Mr. Cholot of Messrs. Lissen, Limited, and this particular meeting is open to members of the public. A lecture on short-wave materials and work is the subject. As usual, all meetings are held at No. 3 Dix's Field, and further particulars can be obtained from the secretary, Mr. Ching, 9, Sivell Place, Heavitree, Exeter.

Bradford Short-wave Club

AT the annual general meeting of this club, held at the club headquarters at Bradford Moor Council Schools on Friday, October 1st, the following officials were elected for the season 1937-8.

Hon. Sec., Mr. S. Fischer (2BMO); Hon. Treas., Mr. V. W. Sowen (2BYC); Committee: Mr. E. M. Varley, Mr. G. Walker (2AWR), Mr. E. J. Simonard (2CQY). Mr. Simonard was elected chairman of the committee.

Now is the time for new members to join the club, and as encouragement for them, it might be mentioned that the subscription has been slightly reduced.—S. Fischer (hon. sec.), "Edenbank," 10, Highfield Avenue, Idle, Bradford, Yorks.

The Slough and District Short-wave Club

AT the meeting held on September 28th, Mr. L. Dean, G8QP, took the chair in the absence of the chairman. A new member, Mr. Jones, was proposed and accepted, and the meeting continued with the comparison of scores in the listening contest. Mr. N. Davies was well ahead of everyone else with a fine log on 28 mc/s.

Discussion then followed on a club transmitter and receiver, and the construction of the latter was undertaken by Messrs. White and Gilbert.

The club is now well established and is running smoothly, but new members are still needed. Those interested should apply to the Hon. Sec., J. H. White, 20, Chalvey Road East, Slough, Bucks.

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.

K. M. (Nelson). We have no details of a low-definition television service now being carried on.

L. D. (E.2). The back number costs 4d., by post.

W. G. D. (Balham). The fact that the volume control gives rise to oscillating as in the reaction condenser indicates H.F. instability. This can be due to wrong H.T. or G.B. voltages, interaction between leads in the H.F. and detector stages, or faulty wiring. Attention to these points may result in your tracing the trouble.

J. R. C. L. (Rugby). It is theoretically possible to use the converter, but there may be some peculiarity in the circuit of your receiver which will prevent good results. Write to the makers and obtain their opinion before making or buying the unit.

S. M. (Edgehill). You cannot use the mains for lighting the filaments. You would have to replace the present valves and this might result in difficulty due to the higher efficiency of the mains type of valve. You could make a simple eliminator to supply H.T. and a simple trickle charger would enable the accumulator to be kept in good condition. This is your best solution.

F. H. (Penarth). The circuit is quite in order and there can be dozens of reasons for failure to obtain satisfaction. Valve types may be critical; voltages may require adjustment to obtain maximum results from modern valves, and your layout may not be satisfactory.

M. R. (Ballyshannon). We regret that we cannot supply a blueprint of a public address amplifier of the type mentioned. We do not know of any firm who would be prepared to supply such a print.

B. H. R. (Leath). We cannot supply a blueprint to enable you to use the parts mentioned. The blueprint for the Cossor Melody Maker which we can supply is only intended for the conversion of the receiver to employ Lucerne coils.

S. F. E. (Bootle). The only receiver in which we employed the set of coils mentioned was the Mains Express Three. This was a mains version of the Long-Range Express, and you could no doubt incorporate the coils in the latter, although the blueprint shows coils which are now obsolete. The battery blueprint number is P.W. 2.

J. L. N. (Hertford). So far as we can gather, the unit should be quite suitable for your requirements. You do not state whether you have mains facilities, but we assume that you have not—hence the advisability of using the unit in question.

T. N. (Llandrindod Wells). We cannot advise definitely as there may be several reasons for the failure to work properly. The secondary may be used for the purpose outlined. You must have A.C. for the lighting, but can convert the D.C. into A.C. by several different methods.

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).

An Interesting Broadcast

SIR,—A very interesting broadcast was picked up here on Sunday, September 19th, at 20.00, when WQT, 'phone station, was heard checking a big hook-up with G.A.F., Rugby, GBTT, *Queen Mary*, and TYEI, Paris. The transmission was as follows. Car 14 calling H.Q., reporting fire, etc., then to Cleveland Airport, 'planes landing by radio, GBTT, talk by Captain and first radio operator on D.F., on to Paris Airport, and then Croydon; also airports in Germany, Italy, Holland, and Switzerland—R6, QSA5, no QRM. Receiver used was an o-v-1 pen. bandspread. I should be glad to hear from anybody interested, using the same type of set, so as to compare results. —D. CARPENTER (10, Swallowfield Road, Charlton).

A Short-wave Portable

SIR,—As you are asking in your journal for suggestions for a short-wave portable, you may be interested in the following description of my transportable. It is a straight 3-valve det. choke coupled first L.F., transformer coupled second L.F., and choke filter output to Blue Spot balanced-armature speaker. To get over the difficulty of wave-change I put the coil holder outside the cabinet on the left-hand side, so that I can still use my four-pin plug-in coils (home made). I have seen designs with the coil on the front panel, but I think this would be a drawback when tuning on account of hand-capacity effects. The batteries are on a shelf near the top of the cabinet. I have found results on all the S.W. sets I have made better without an earth. I have connected a medium-wave H.F. choke in series with the S.W. one, and with a roughly-wound coil can get the B.B.C. stations from approximately 260 metres to 450 metres, helped, of course, by the .0001 mfd. preset aerial condenser. The tuning condenser is of .00016 mfd. capacity. A variable potentiometer on the detector gridleak is controlled from the panel.

Results on the above set are quite good, WXAD, W3XAL and Tokio all come in at excellent L.S. strength on favourable evenings, together, of course, with the usual "locals." Your interesting paper started me two years ago on the short-wave track, and I am still keen.—T. J. PARRY (Wallasey).

"Wireless Coils, Chokes and Transformers"

SIR,—Having recently purchased your latest publication, "Wireless Coils, Chokes, Transformers, and How to Make Them," I should like to express my appreciation of a book that has covered such a difficult and unusual subject in a most thorough, yet simple and effective manner. Without being over-technical, the data is clearly conveyed to the reader by both script and illustration.

As a constructive wireless enthusiast, I consider the outlay (2s. 6d.) to be extremely well spent, especially when one realises that British publications dealing with the subject are very few.—WM. HARRISON (Aintree).

A Good Log from Doncaster: Correspondents Wanted

SIR,—As a newcomer to the short waves, my log may prove of interest to other beginners. Since September 12th I have heard on 20 metres: EA9AH, CN8AM, CN8AA, F8QD, I1MG, I1KF, LA5M, SM5OH, SP1HH, VO1T, VO1P, VE1JA, VE1LR, VE1GB, VE2HG, VE3BK, VE3ED, CO2AY, CO2RA, CO6OM, TI2SB, TI2KC, LU5CZ, HI4F, and many W1, 2, 3, 4, 8, 9 amateurs.

Using a "valve-base" coil for 10 metres I have also heard the following stations on two evenings: W1—HVF, AUJ, COO, JRZ; W2—FWK, ADY, HGU, EBT; W3—AKE, FBY, DIZ, FBA, FBW, FVO; W6CKR; W8—BTO, MID; W9—PTC, FAA, and BMX.

Most of the 10-metre amateurs were heard between 6.0 p.m. and 7.0 p.m., and the 20-metre stations between 10.0 p.m., and 11.0 p.m. My receiver is a o-v-pen. The

(Continued overleaf)

CUT THIS OUT EACH WEEK.

Do you know

—THAT colour coding is adopted for wiring and for components other than resistors.

—THAT an ordinary receiver and extension speaker may be used as an inter-communicating 'phone system.

—THAT H.F. chokes may be obtained with iron cores.

—THAT the type numbers of American valves indicate at a glance the filament voltage, type and number of electrodes.

—THAT many modern S.G. and pentode valves have the grid joined to the top cap whilst others have the anode taken to that point.

—THAT improved results on the long waves are often obtained, if a series aerial condenser is fitted, by short-circuiting this condenser.

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.

LETTERS FROM READERS

(Continued from previous page)

aerial consists of 10ft. of "bell" wire across the room. No earth is used.

I should like to hear from any other S.W. fans interested in receiving or transmitting. —ANTHONY G. HOBSON (99, Woodhouse Road, Doncaster, Yorks).

A 10-metre Log: 5-metre Transmissions from G5BM

SIR,—As the 10-metre band is again showing signs of returning to life, I enclose a log of stations received here on that band.

On September 12th :—

W6LNS, W9VMV, W6AM, W4EDD, W4CYU, W9SYG, W9LO, and W9RRX.

On September 18th :—

W9DJU, W3BZJ, W2JCY, W2JQJ, W8QKI, W3KCY, W9ARG, W9DKU, W2CJW, W9LIG, W3AIR, W2IJU, W4CY, W9RXX, W2JQX, W1HUJ, W2DOZ, W8JFC, W2KCY, W3FKK, ZU6P, W2FVO, W5EJO, W2KAP, W2BYF.

Receiver 0-v-1 (battery), aerial, doublet. H.T. 60 volts.

Much time has been spent on 5-metre reception by myself, 2CGN and 2CTG, using a 2-valve super regen. Stations received : G5MI, G2KB, G6IH, and G5BM, using 'phone and I.C.W. G5BM has done much work on 5-metres, and has recently received two R7 reports from Czechoslovakia. Transmissions on 5 metres are on Sundays from 11.0 a.m. B.S.T. till 1.0 p.m., and listeners reports are welcome. This station uses a self-excited transmitter, the valves being a pair of T20's in push-pull, class B modulated. The aerial is of the matched impedance type, supported by a pole 57ft. high ; the Q.R.A. is Cheltenham. —W. C. BARNES (Swindon).

A Good Log from Middlesbrough

SIR,—I enclose a list of amateur telephony calls I have heard here using a det.-1LF (or 0-v-1) bandspread receiver, at present in experimental form, in conjunction with a variable directional aerial (Model B1). This receiver is similar to that which I described in a recent article in PRACTICAL AND AMATEUR WIRELESS.

From September 8th to September 27th, 20 metre amateur 'phones :—

W1's	W2's	W3's	W4's
W1CRL	W2IUU	W3CIL	W4BYY
W1BLO	W2MP	W3BSH	W4CYU
W1EBO	W2OH	W3AJ	
W1AVM	W2TLH	W3DI	W8's
W1VEI	W2GO	W3DLL	W8INU
W1BW	W2BRR	W3LJ	W8MUN
W1JFG	W2HFS	W3FII	W8ELF
W1JA	W2BXA	W3AZ	W8CNA
W1DME	W2FD	W3CQL	W8MPX
W1FH	W2CFU	W3AXG	
W1HAM	W2AZ	W3PIR	VO1C
	W2FOH	W3ASG	
	W2PO	W3MD	CO2HY
		W3CO	VE1JA

10 Metre 'Phones

W4GB	W5EAQ	W3CHO
W2SGV	W2UK	W1EZW
W1WB	W9AGO	W2EDD
W1WV	W5SAC	W1COO*
W4DRZ	W9FAA	W8HKY †
W9ARA	W8AYY	W1DQK‡

* Between 2.30-5 p.m.
† Period September 28th-September 30th
‡ With W4GB on October 3rd.

—A. W. MANN (Middlesbrough).

QUERIES and ENQUIRIES

International Morse Code

"I wish to know the International Morse Code as used by ships, etc. Do Newnes, Ltd., publish anything in regard to this, or if not where can I obtain it?"—H. M. (Waterford, I.F.S.).

IF you require to know the full code, we regret that we do not publish this. You can find it, however, in the *Handbook for Wireless Telegraph Operators*, which costs 9d. net from His Majesty's Stationery Office, Kingsway, London, W.C.2.

Signal-noise Ratio

"I have been engaged nearly all this year on building a battery superhet. This consists of frequency-changer, I.F. valve, triode detector and 2 L.F. stages. The set, built on an aluminium chassis, has only one fault, which is: when tuned to a station—even locals—the noise to signal ratio is far too high. The set is practically dead silent between stations. Perhaps you will be kind enough to indicate possible reasons for this and the lines of experiment to take to cure the same."—A. W. C. (Musselburgh).

THE trouble is one which is often experienced by users of the superhet and is one reason for the preference which many listeners have for a simple straight circuit. The general noise may be divided into two groups—firstly the background arising from valve hiss and inter-circuit noise, and secondly that consisting of general static or electrical interference picked up on the aerial. The first class of noise can only be cured by using good modern valves and making quite certain that all connections are soundly made. The second class of noise is practically incurable, although there are several steps which may be taken to increase the strength of the signal, which in turn will result in an *apparent* decrease in the noise level. The simplest improvement to your particular circuit is to fit an H.F. stage. Although on the face of it this will increase the high-frequency pick-up and give more noise, it will actually not do so, for the following reason. The noise is "untuned," or in other words occurs at all kinds of frequency. The signal, on the other hand, is of a definite frequency. Consequently, the more tuned circuits you employ the greater will be the selection of the signal and exclusion of static on frequencies close to the signal. As a result you will have a powerful signal (which will have to be controlled by the L.F. volume control) which will eventually enable you to put on the speaker speech or music with only a medium background of noise. Alternatively, you can fit some form of noise suppressing device working on the selective frequency principle, but this is a difficult arrangement to devise to work efficiently without losing quality.

Ferranti Class B Valve

"I have a Ferranti Class B valve. Could you please tell me the filament current and the impedance of the valve? It is the H.P.2."—H. L. (Lancaster).

THE valve has a 2 volt .4 amp. filament, and is designed to operate with an optimum plate to plate load of 8,000 ohms.

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.

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.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

RADIOMART

SHORT-WAVE MANUAL

Packed with short-wave information and circuits of mains and battery receivers, including straight, superhet and 5-metre transmitters, modulators, etc. Information on transmitting licences, aerials, Class B amplifications, neutralizations, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free, 7½d. including catalogue.

1937 Short-wave Catalogue only (3 times enlarged) price 1½d., post free.

44, HOLLOWAY HEAD, BIRMINGHAM 1

CONVERSION UNITS for operating D.C. Receivers from A.C. Mains, improved type, 120 watt output at £2/10/0. Send for our comprehensive list of speakers, resistances and other components. **WARD**, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

THE largest stock of components in England, over 500 lines, new catalogue now ready 1½d.—J. Bearfield, 105, Upper Street, London, N.1.

HEADPHONES.—Brown, Ericsson, G.E.C., B.T.H., Standard Telephones, Nesper, Western Electric, Sterling, etc., 2,000 ohms, 2s. 6d.; 4,000, 5s. Postage 6d. **SPECIAL.** Ericsson, 4,000 ohms, as new, 7s. 6d. Telefunken, lightweight, adjustable, 7s. 6d. **CRYSTAL SETS.** Burne-Jones. Complete, Guaranteed, 5s. 6d. Ditto, double circuit, 8s. Sensitive permanent detectors, 1s. 6d. Crystal Detectors, complete, 1s. Crystals with silver cat's-whisker, 6d. Postage 1½d.—Post Radio, 2, Copenhagen Street, London, N.1.

VAUXHALL. Polar Midget condensers, 2-gang, 6s. 8d.; 3-gang, 8s. 9d.; 4-gang, 13s. 6d. Polar full vision horizontal drives, 5s.

VAUXHALL. Hivac valves, entire range, full discounts. Polar station-named scales for horizontal drives, 1s.

VAUXHALL. T.C.C. electrolytic condensers, 8 mfd. and 4 mfd. 500 volt, 2s. 6d.; 50 mfd. 50 volt, 1s. 6d.

VAUXHALL. Iron-cored coils, 3-gang, on base, with circuit, 17s. J.B. drives with station-named scale, 5s. 6d.

VAUXHALL. Magnavox and Rola P.M. speakers, 7in. cone, 16s. 6d.; 10in. cone, 22s. Energised models, 2,500 field coils, 7in., 12s. 6d.; 10in., 17s. 6d.

VAUXHALL UTILITIES, 163a, Strand, W.C.2, Temple Bar 9338. Send postcard for free list. Post paid, 2s. 6d. and over, or C.O.D.

SOUTHERN RADIO'S Wireless Bargains—all guaranteed and sent post paid.

CELESTION Soundex Permanent Magnet Speakers, 10/-; Telsen speaker units, 2/6; Telsen (1937) iron cored coils, W349, midget size, 3/6; W478 (twin ganged), 9/-; W477 (triple ganged), 14/6; W476 (triple ganged superhet), 14/6; I.F. transformer coils, W482, 4/-; Telsen dual range coils, 2/9, with aerial series condenser incorporated, W76, 3/9; Telsen A.C./D.C. multimeters, 5-range (tests anything radio or electrical), 8/6.

HEADPHONES, 4,000 ohms, 3/-; Ace (P.O.) microphones, ready for use with any receiver, 4/6.

GARRARD Record Changers, A.C. 200-250 volts, changes eight 10-in or 12-inch records, £6; Garrard A.C. motors with pick-up, 42/-.

A FULL Range of Valves for all American Receivers, 6/- each; bargain parcels of radio components, including coils, chokes, condensers, circuits, etc., etc., to the value of 21/-, 5/- per parcel.

SOUTHERN Radio, 323, Euston Rd., London, N.W.1; and 46, Lisle St., W.C.

All mail orders to Southern Radio, 323, Euston Rd., London, N.W.1 (near Warren St. Tube). 'Phone: Euston 3775.

MISCELLANEOUS

MEISSNER Tuning Units, Coil Packs, I.F.S. condensers, chassis, etc.—Radiographic, Ltd., 66, Osborne Street, Glasgow, C.1.

PREMIER SUPPLY STORES

All goods guaranteed perfect; carr. paid over 5/-; under 5/- postage 6d. extra.

All Post Orders to: JUBILEE WORKS, 167, LOWER CLAPTON RD., LONDON, E.5. 'Phone: Amherst 4723.

CALLERS, AS USUAL, TO 165 & 165a FLEET ST., E.C.4 (Next door to Anderton's Hotel), Central 2833. New **Branch: 50, HIGH ST., CLAPHAM, S.W.4 (Macaulay 2381).**

PREMIER "TROLITUL" Short Wave CONDENSERS, Certified superior to Ceramic. All-brass Construction, 40 mmfd., 1/7; 100 mmfd., 1/10; 160 mmfd., 250 mmfd., 2/6; Double Spaced 15 mmfd., 2/9; 40 mmfd., 3/6. S.W. H.F. Chokes, 9d.; screened, 1/6. All-Brass S.W. Condensers with integral slow-motion, .00015 Tuning, 3/9; .00015 Reaction, 3/3.

NEW 1937 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT. 13 to 86 metres without coil changing. Complete Kit and Circuit, 12/6. **VALVE GIVEN FREE!**

DE LUXE MODEL 14 to 150 metres, complete Kit with Chassis, 4 Coils and all parts, 17/6.

SUPERHET CONVERTER KIT, 13/6. De Luxe Model, 18/6. S.W. SUPERHET CONVERTER KIT, for A.C. Mains Receivers, 20/-. A.C. Valve given **FREE! NEW 1937 2-VALVE S.W. KIT,** 13 to 86 Metres without coil changing. Complete Kit and Circuit, 19/6. **VALVES GIVEN FREE!**

DE LUXE MODEL, 14 to 150 Metres, complete Kit and Circuit. 4 Coils and all parts, 25/-. **VALVES GIVEN FREE. 2-VALVE S.W. KIT,** S.G. Det. and Pen., 42/-. **VALVES GIVEN FREE!**

Now Ready. Our New 1938 Enlarged Illustrated Catalogue, Handbook and Valve Manual. Price 6d.

Send 6d. in Stamps for 90 Pages of Radio Interest!

SHORT-WAVE COILS, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of 3 S.W. Coils, 14-150 metres, 4/- set with circuit. Premier 3-band S.W. Coil, 11-25, 19-43, 38-86 metres. Simplifies S.W. receiver construction, suitable any type circuit, 2/6.

COIL FORMERS, 4- or 6-pin low-loss, 1/- each.

Famous **EUROPA MAINS VALVES,** 4 v. A.C. and 20 v. .18 Universal. All standard types, 4/6. I.H. Pentodes and F.W. Rectifiers, 5/6.

BATTERY VALVES, 2 volts, H.F., L.F., 2/3. Power, Super-Power, 2/9. Var-Mu-S.G., 4- or 5-pin Pentodes, H.F. Pens., V-mu-H.F. Pens., 5/-. Class B, 5/-.

AMERICAN VALVES. Genuine American **HYTRON** and **TRIAD,** first-grade Valves, 3 months' guarantee. All types in stock, 5/6 each. 210 and 250, 8/6 each. New Metal-Glass Valves, all types, 6/6 each. Genuine American **DUOTRON** Valves, all types, 3/6 each. Valve holders for all above types, 6d. each. **OCTAL** bases, 9d. each.

3-WATT A.C. AMPLIFIER, 2-stage for mike or pick-up. Complete kit of parts with 3 valves, 40/-. Wired and Tested, £2/15/0.

7-WATT A.C./D.C. AMPLIFIER, 3-stage high-gain, push-pull output. Complete kit of parts with 5 specially matched valves, £4 4s. Completely Wired and Tested, £5/5/0.

COSMOCORD PICK-UPS, with tonearm and volume control, 10/6 each. **PICK-UP HEADS,** only, 4/6 each. **PREMIER MAINS TRANSFORMERS,** wired-end type with screened primaries, tapped 200-250 v. Centre-tapped Filaments. Guaranteed one year. **H.T. 8 & 9 or H.T. 10** with 4 v. 4 a. C.T. and 4 v. 1 a. C.T., 8/6. **250-250 v., 60 m.a.,** 4 v. 1 a., 4 v. 2 a., and 4 v. 4 a. all C.T., 8/6. **350-350 v. 120 m.a.,** 4 v. 1 a., 4 v. 2 a., and 4 v. 4 a., all C.T., 11/-. Any of these transformers with engraved panel and N.P. terminals, 1/6 extra. **500-500 v., 150 m.a.,** 4 v. 2-3 a., 4 v 2-3 a., 4 v. 2-3 a., 4 v. 3-4 a., all C.T., 17/6.

SPECIAL OFFER PHILIPS MAINS TRANSFORMERS, 450-450 v. at 150 m.a., or 500-500 v. 100 m.a., 4 v. 4 a., C.T., 4 v. 4 a. and 4 v. 3 a. Screened Primary. Tapped input 100-250 v., **12/6. AUTO TRANSFORMERS,** step up or down, 60 watts, 7/6; 100 watts, 10/-.

SMOOTHING CHOKES, 25 m.a., 2/9; 40 m.a., 4/-; 60 m.a., 5/6. 150 m.a., 10/6. **Speaker Replacement Chokes,** 2,500 ohms, 60 m.a., 5/6.

SPECIAL OFFER LISSEN TWO-GANG SCREENED ALL-WAVE COILS. 12 to 2,000 metres, complete with switch and wiring diagrams, 6/11 per set.

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ADVERTISEMENT INDEX

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THE Osram W.21 is a 2-volt screened Pentode valve with variable-mu characteristics, particularly suitable for economical and sensitive H.F. or I.F. amplification in Battery sets.

An advantage of the new W.21 valve is the high working screen voltage — of similar value to the working anode voltage thus enabling a common tap in the H.T. Battery to serve for both anode and screen supplies and simplified operation.

A further simplification is afforded by the facility of a 4-pin base and internal suppressor grid connection.

CHARACTERISTICS

Filament voltage	2.0
Filament current	0.1 amp.
Anode voltage	150 max.
Screen voltage	150 max.
Mutual conductance	1.4 ma/volt

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MADE IN ENGLAND

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A NOVEL COIL WINDER—See page 147

Practical and Amateur Wireless

AND PRACTICAL TELEVISION

3D EVERY WEDNESDAY

Edited by F. J. CAMM

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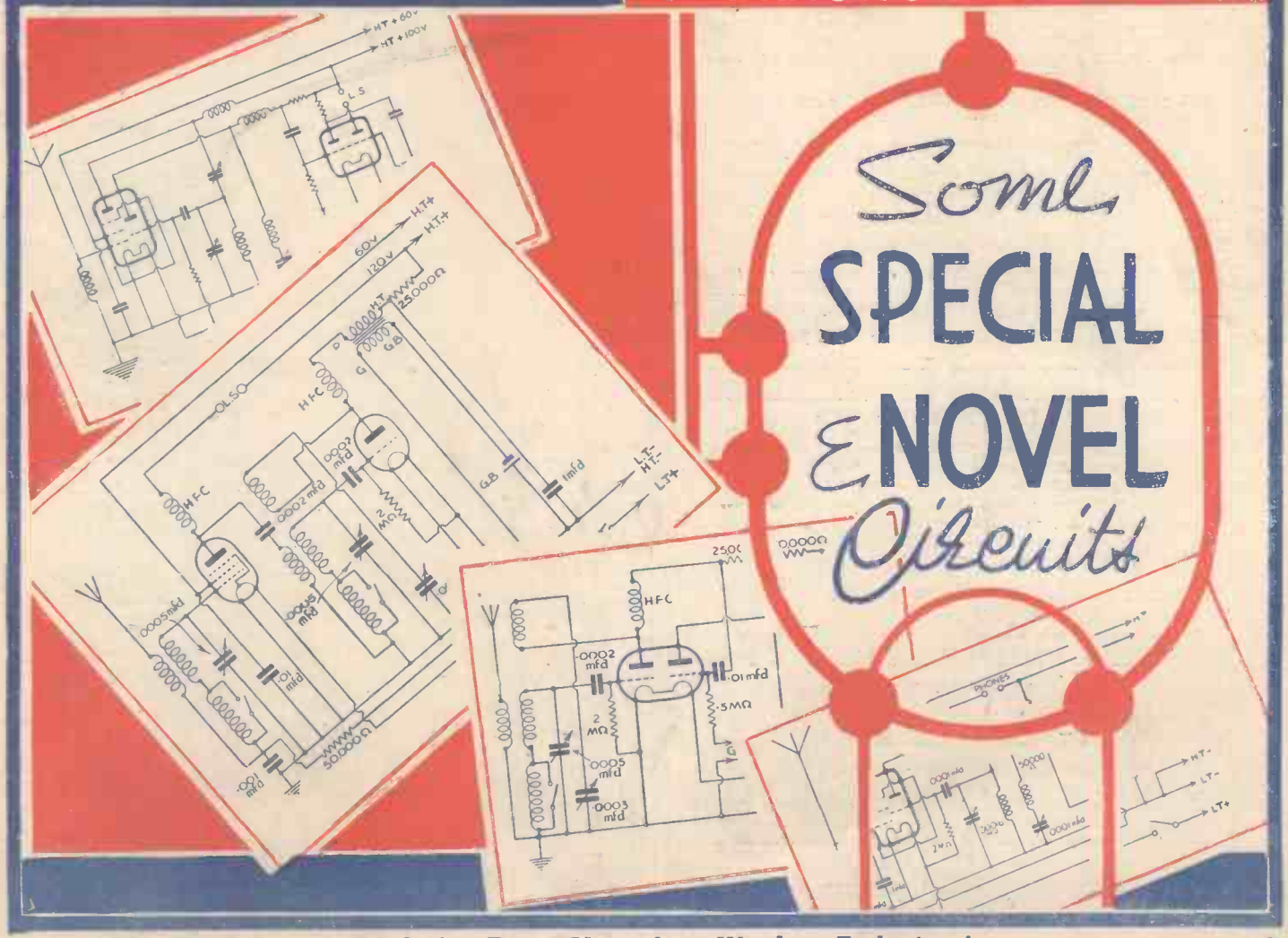


A DE-LUXE SUPERHET—See page 160

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. XI. No. 266. October 23rd, 1937.

ROUND *the* WORLD *of* WIRELESS

"Stunt" Circuits

IT is not so many years ago that the superhet arrangement was classed as a "stunt" circuit, and all other standard arrangements were referred to as "straight" circuits. To-day the superhet is probably the most popular circuit in general use, although, of course, there are many listeners who would not use it on the score of quality. In addition to the standard H.F.-detector-L.F. circuits there are many combinations which find application only in the experimenter's laboratory or for special types of reception. Such combinations as the Flewelling, the Colpitts, the Cowper and the Armstrong are still favoured by the old-time experimenter, and reflex circuits are still in use in many homes. The introduction of the modern multi-electrode valves has, however, introduced a new course of experiment for those who are anxious to try to obtain improved results with the minimum number of valves, and we have already published a tried and tested receiver in which a Class B valve has been employed as a detector and L.F. stage. In this issue we give three or four circuits which may be classed as novel in that the modern valve is employed in an unorthodox manner, and the experimenter will find that these circuits, when properly working will give remarkable results and may prove a basis for some new circuit arrangement which will eventually become the standard for broadcast reception.

Television Flying Squad

THE Outside Broadcast Department of the Television section of the B.B.C. has been given a new title, due to its increasing activities in the broadcasting of topical events. The large vans which are used are daily travelling from one point to another in an endeavour to increase the popularity of television by giving broadcasts of sporting and other events. The distance over which these vans can operate is growing each day and during the past few weeks some remarkable results have been achieved in test relays. It would appear that it is in this particular sphere that the popularity of television will eventually be proved and with increased sales of receivers, the hours of broadcasting will be lengthened and the final success of British television achieved.

Mr. Stanford Robinson

A NEW section of the Music Department of the B.B.C. has been formed, to be known as Music Productions. Mr. Stanford Robinson, who is well known to listeners, has been appointed Director and Conductor of this new section, whilst Mr. Gordon McConnell has been appointed producer. Under Sir Adrian Boult this new department will arrange and produce programmes ranging from operetta to opera and will include relays and outside broadcasts from all parts of the world.

Philips Colour Cartoon

A NOVEL film entitled "Philips Broadcast 1938" will shortly be seen at cinemas throughout the country. The film is in Technicolor with musical background by Ambrose and his orchestra. Instead of the usual flat cartoon drawings, the picture shows animated dolls, over 3,000 of which had to be used in order to obtain the effect of life in both the movement of limbs and the facial expressions. One of the scenes from this film is illustrated on the next page, and every listener should make a point of seeing the film, not only for its publicity value, but on account of the new departure in film technique which will no doubt play a large part in future film work.

On Other Pages

Temperature Effects

MODERN superhets are so critically tuned that temperature may affect leads, trimmers and other components to the detriment of the results. Modern research, therefore, has been undertaken with a view to improving conditions so that the variation in tuning which takes place is very small. An indication of the improvement may be obtained from the following figures given by the H.M.V. research department concerning the gang condensers, fixed condensers and coils used in their apparatus. Two years ago the variation in gang condensers was 250 parts in a million per degree Centigrade. To-day it is only 50 parts in a million. In fixed condensers the figure has changed from 1,500 parts in a million per degree to 50 parts, whilst in coils the change is from 40 parts to 14 parts.

Seventy-five-minute Play

IN the Northern programme on October 28th a play entitled "Fell Top" is to be broadcast, bringing to listeners a hint of one of Durham's many dialects, the Weardale, which is almost unintelligible to the "foreigner." The play has been adapted for the microphone by Patrick Campbell, from Winifred Watson's novel of Weardale, and will take one hour and a quarter to broadcast.

Radio Rodeo

FOR his October edition of "Radio Rodeo" Harold Ramsay will present from the Union Cinema, Kingston, a galaxy of broadcasting stars. Listeners will hear them in the Regional programme on October 20th—Harry Richman, with his American wisecracks and songs; Scott and Whaley, the coloured comedians; Jeanne de Casalis in another "Mrs. Feather" episode; Issy Bonn, an outstanding success in a recent "Music Hall" broadcast; Bennett and Williams; Gaby Vallé; the Eight Step Sisters; and Fred Hudson. Three well-known organists will also take part in the programme; Harold Ramsay, H. Robinson Cleaver, and Phil Park, who has again written the continuity and special lyrics. Production will be by Leon Pollock.

ROUND the WORLD of WIRELESS (Continued)

Museum as Classroom

LAST year school classes to the total number of 774 children paid weekly visits to the South Kensington Natural History Museum, where, under the guidance of the official guide-lecturer, they listened to the weekly Biology broadcast to schools. Tours round various specimens mentioned in the broadcast were made by 554 children.

So pleased are both the museum and the school broadcasting authorities with this experiment for linking up broadcasting, school and museum, that it is to be continued again this year. Professor H. Munro Fox, F.R.S., Professor of Zoology in the University of Birmingham, is in charge of the Biology course, a broadcast of which will be given each Wednesday at 2.30 p.m., and it is hoped that this year an even greater number of youngsters will be taken by their teachers to South Kensington.

Symphony Concerts

THE B.B.C. 1937-1938 season of symphony concerts, to be given in the Queen's Hall, opens this week (October 20th). Sixteen concerts will be given, fifteen on Wednesdays, and one on Saturday, October 30th.

Garland Wilson, the well-known rhythmic pianist of stage, screen and radio fame, who will be heard on the air shortly when he returns to England.

The conductors will be Sir Adrian Boult, Sir Hamilton Harty, Willem Mengelberg, Serge Prokofiev, Malcolm Sargent, Arturo Toscanini, and Sir Henry J. Wood, and the soloists will include Jelly d'Aranyi, Isobel Baillie, Alexander Sved, Mary Jarred, Parry Jones, Harold Williams, Pau Casals, Robert Soetens, May Blyth, Laelia Finneberg, Margaret Balfour, Muriel Brunskill, Walter Widdop, Robert Easton, Jo Vincent, Heddle Nash, Solomon, Dennis Noble, Natan Milstein, Myra Hess, Egon Petri, and Wilhelm Backhaus.

Coal-face Machinery

NORTH REGION'S new series of six talks, "Men and Machines," is likely to attract considerable attention among the industrial communities. The first three subjects are: Cotton weaving, coal-cutting, and clothing. In the second broadcast on October 25th, coal-face machinery will be discussed, and some of the questions to be asked are: "What happens when the latest inventions are introduced into an industry? How are production and employment affected?"

INTERESTING and TOPICAL NEWS and NOTES

Revue Orchestra

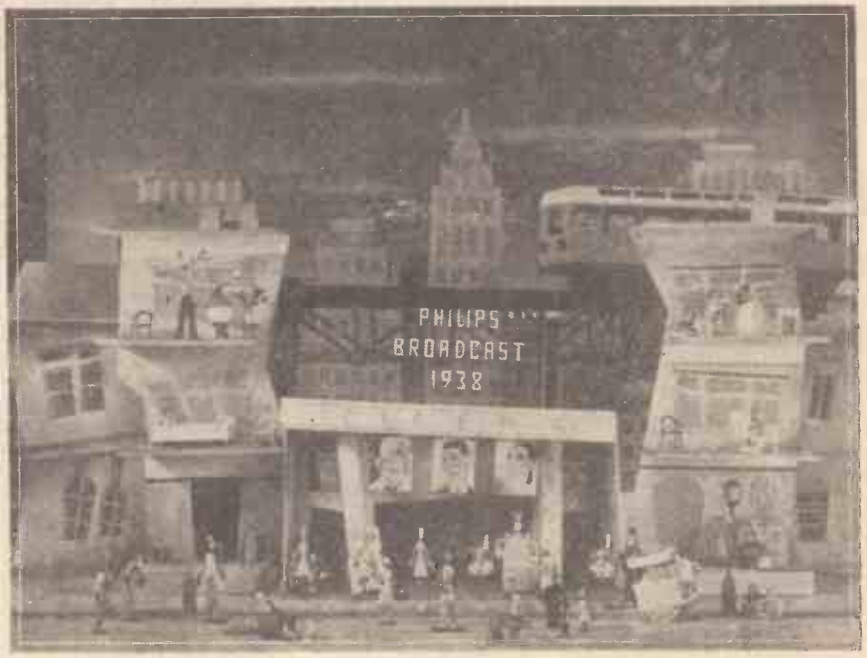
REGINALD BURSTON will conduct the Revue Orchestra on October 29th in a programme of light music, which will be heard by both Midland and Regional listeners. Norris Stanley is the leader of the orchestra, which frequently takes part in radio musical comedy and revues.

Band Concert

THE Radstock Silver Prize Band, conducted by Dan Lloyd, will broadcast in the Western programme on October 25th. The band has been successful in many competitions, and the more recent awards include the "Wessex Championship," 1936-7, and the "Downside Trophy." The solo artist at this concert will be Eileen Vaughan (soprano), who has appeared professionally in many parts of the country in opera, drama, revue, and pantomime.

Midland Parliament

MIDLAND PARLIAMENT opens its session on October 21st with a discussion on "Higher Wages and Shorter Hours?" This will be heard by Regional as well as Midland listeners. In accordance with the wish expressed at the Birmingham Conference on Broadcasting and Industry, the panel of speakers has been extended. Andrew McLaren (M.P. for Burslem, Staffs) is the only one taking part in this discussion who had broadcast before. Ralph Assheton (M.P. for the Rushcliffe Division of Notts) will be in the chair. The Employers' side will be represented by the Graham Cunningham, chairman and managing-director of Triplex, and Wing-Commander J. A. C. Wright (M.P. for the Erdington Division of Birmingham); and the Labour side by Richard Coppack, secretary of the National Federation of Building Trades Operatives, and Mr. McLaren.



One of the scenes (Harlem) from the new Philips film to be seen shortly at all cinemas. The story appears on page 145.

Sea Songs

ON October 30th Edgar Morgan will conduct the B.B.C. Midland Singers in a programme of sea-songs, made up of "The Sailor's Garland," by Alec Rowley, "The Sailor's Journal," by Dibdin, and three songs by Dr. Vaughan Williams.

SOLVE THIS!

PROBLEM No. 266

Norman's A.C./D.C. set ceased to function and when a resistance test was made across the mains input plug infinity was registered. The valve heaters and the heater dropping resistance were then tested and found to be in order. Where was the fault? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 266 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, October 25th, 1937.

Solution to Problem No. 265

The cathode bias resistance of the I.F. valve was open-circuited.

The following three readers successfully solved Problem No. 264 and books are accordingly being forwarded to them:—

J. S. Nicklin, 131, Westminster Street, Crewe; W. James, 12, Greenfield St., Penygraig, Rhondda; D. H. McAllister, 8, Percy Ave., Cullercoats, Northumberland.

A Novel Coil-winder

A Simple Machine for Winding Coils and Transformers, with Indicator for Counting the Turns

By S. MILLIGAN

THE machine shown in the accompanying illustration was built up from odds and ends in order that I could make various coils for experimental purposes. The apparatus has, however,

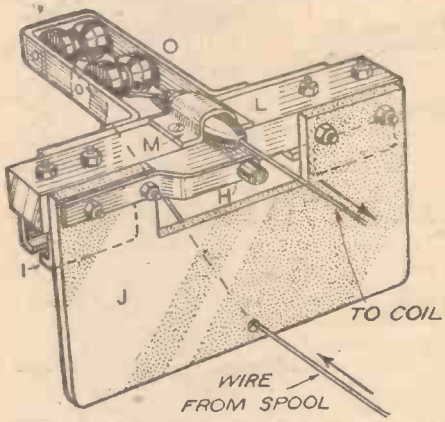


Fig. 3.—This diagram shows how the wire is fed to the coil.

proved so valuable that it has been made into a permanent installation, and I am now able to produce coils just as good as those made commercially. The main drive for the winder is constructed from a grinding machine, obtainable for 6d. from the popular stores. This is clamped, by means of the fitting provided, to the edge of the machine which is built upon a thick wooden base. Over this is laid a sheet of metal, to which the various parts are bolted for rigidity and smooth working. The diagram of the layout shows how the various parts are arranged and also gives the majority of the main details. The separate sketches show also the incidental parts, although these may be modified according to individual requirements. Briefly, in my machine the grinding machine is provided with a large gear which engages a small gear wheel attached to a threaded spindle upon which the coil-former is clamped by means of nuts and large washers. The other end of this spindle is locked to the spindle of an ordinary revolution counter. A bracket at the rear of the machine accommodates a spool of wire, and the end of the wire is passed round an empty spool carried below it. The end of the wire is then carried through a travelling shuttle which is designed to keep a slight tension on the wire and to feed it so that turns lie side by side.

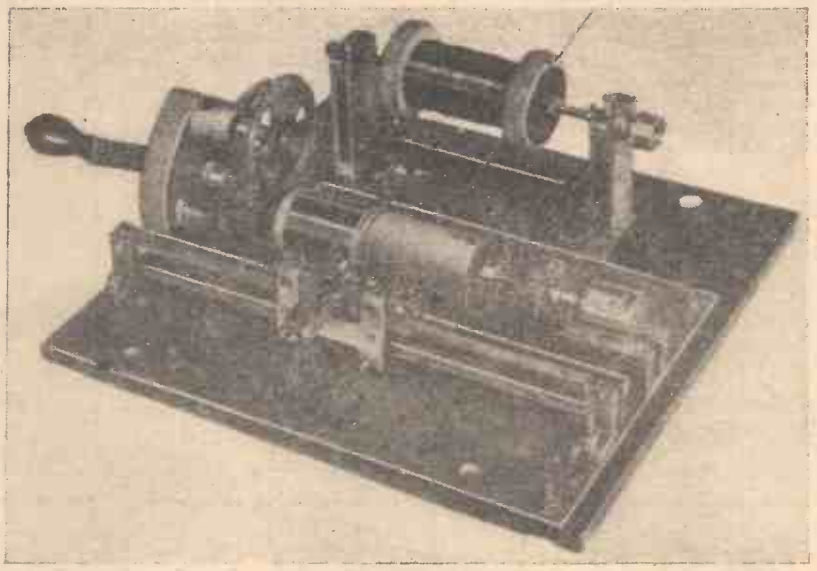


Fig. 1.—A general view of the completed winder.

Detailed Items

The incidental details in my machine are as follows: The spool-carrier is provided at the end with a spring washer held in position by a collar dismantled from an old variable condenser. This enables the spool to be provided with a friction brake to prevent the wire running off in the event of a breakage. The lower guide spool runs quite free. The shuttle device is shown in Figs. 3 and 4. A plate of brass (J) is provided with a pair of metal slips which grip the square section rail supported on the two brackets K (Fig. 2). These brackets are locked to slots in the metal base by means of bolts, and the

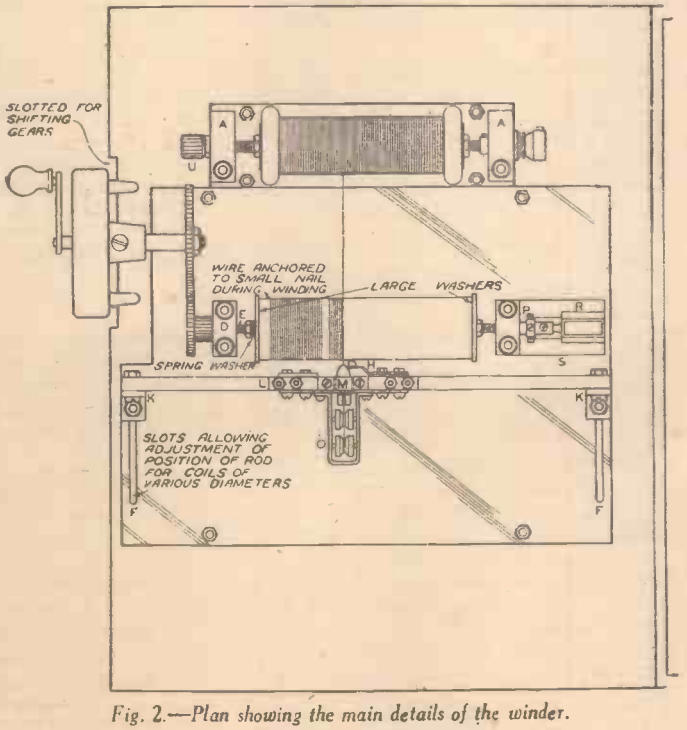


Fig. 2.—Plan showing the main details of the winder.

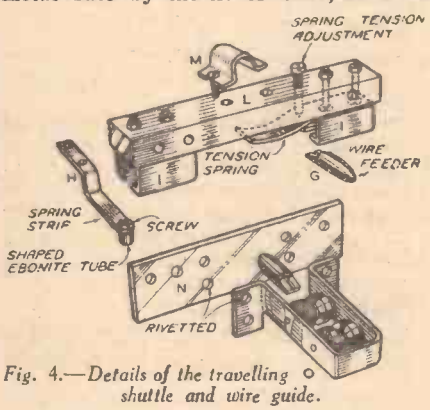


Fig. 4.—Details of the travelling shuttle and wire guide.

slots enable the position of the shuttle to be varied to accommodate coil-formers of varying diameter. A small ebonite button on a spring arm (H) is fitted to the front of the plate and should be adjusted to bear lightly on the front of the coil-former. Two small ebonite reels cut from a piece of ebonite rod (an old extension handle) are then drilled and provided with small spindles, and attached to a "U" bracket, as shown in Fig. 4, whilst on top of the carrier bar a bracket is clamped to hold another piece of the ebonite rod which is brought to a point (after the manner of an ordinary pencil). This illustration also shows how the wire is led through a hole (or a slot) cut in the bottom of the plate J, up to the rear small reel, over this and down under the next reel, then through the small nose piece and so on to the coil-former. It will be found by this means that a moderate tension is placed on the wire—

(Continued on next page)

A NOVEL COIL-WINDER

(Continued from previous page)

sufficient to keep it tight without risk of breaking even the finest gauge—and it will lay on the coil side by side whilst the carrier will feed slowly along. Obviously for the latter requirement the clamping strips I (Fig. 3) must be just sufficient to grip the square runner or guide bar, and a slight trace of vaseline will assist in attaining this desirable feature. With careful adjustment it is possible to lay on 48-gauge enamelled wire perfectly evenly side by side. Care must be taken to align the revolution counter so that no undue pressure is placed at that point, and the various bearings may be split and adjustment further provided at this point.

Winding the Coils

The coil-former should be attached to the spindle (after unlocking the bearings) by means of ordinary lock-nuts and washers—I use the large washers found on electrolytic condensers, although ordinary discs of metal may be cut for the purpose if you so desire. Ordinary small nails (the type generally sold as "tingles") should be pressed into the coil-former and the end of the wire anchored by winding once or twice round the projecting nail. The number shown on the indicator should be noted and the handle then slowly turned until the desired number of turns has been placed on. The ends of the wire may afterwards be anchored by piercing small holes in the former, or by scraping the wire and soldering to the projecting nailends. To enable a coil to be unwound where a mistake has been made or where a coil has been used experimentally and has to be rewound, the end of the spindle carrying the wire bobbin is provided with a further gear wheel, and by loosening the clamps holding the winding it may be slipped along to engage in this wheel and thus the spool may be turned whilst the coil unwinds. This avoids waste of wire and it may thus be used again for a new coil. All threaded rods referred to are standard 2 BA studding.

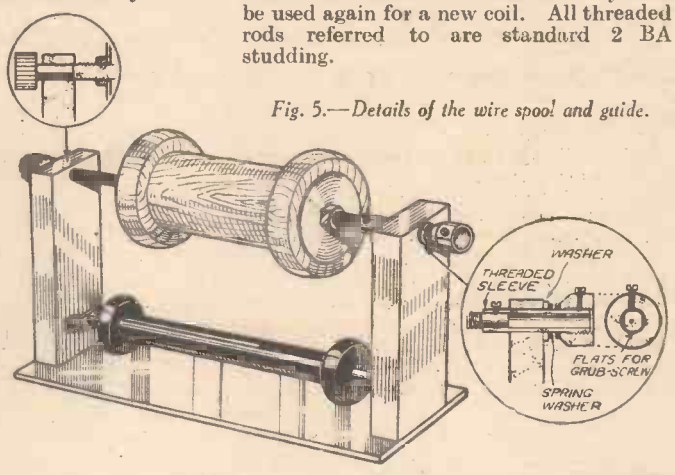


Fig. 5.—Details of the wire spool and guide.

Important Broadcasts of the Week

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

Wednesday, October 20th.—Symphony Concert from the Queen's Hall, London.

Thursday, October 21st.—Eight Bells, variety programme.

Friday, October 22nd.—Stop Dancing, a programme of very light music.

Saturday, October 23rd.—Music-Hall programme.

REGIONAL (342.1*m.*)

Wednesday, October 20th.—Sporting Guns on Test: a microphone tour of the Birmingham Proof House.

Thursday, October 21st.—Variety from the Grand Theatre, Doncaster.

Friday, October 22nd.—Songs of the Ukraine: choral programme.

Saturday, October 23rd.—Cochrane, Wolf of the Sea, a dramatic biography by George Scott Moncrieff.

MIDLAND (296.2*m.*)

Wednesday, October 20th.—Sporting Guns on Test: a microphone tour of the Birmingham Proof House.

Thursday, October 21st.—Midland Parliament: Higher Wages and Shorter Hours, a discussion.

Friday, October 22nd.—How to Get Your Money's Worth: When buying groceries, a discussion.

Saturday, October 23rd.—Handel's Solomon, orchestral and choral programme, from Peterborough Cathedral.

NORTHERN (449.1*m.*)

Wednesday, October 20th.—Variety from the Grand Theatre, Blackburn.

Thursday, October 21st.—The Hallé Society's Concert, from the Free Trade Hall, Manchester.

Friday, October 22nd.—Instrumental recital.

Saturday, October 23rd.—William Rees Concert from the Milton Hall, Manchester.

WEST OF ENGLAND (285.7*m.*)

Wednesday, October 20th.—Dance Cabaret from the Royal Bath Hotel Ballroom, Bournemouth.

Thursday, October 21st.—Bizet's Opera, "Carmen," from the Prince's Theatre, Bristol.

Friday, October 22nd.—Mendip. Wot On't, an impression of its Life, History and Legend.

Saturday, October 23rd.—Why Trials? A defence of trial driving and an eye-witness account of the West of England Open Trial for the Motor Cycle Trophy.

WELSH (373.1*m.*)

Wednesday, October 20th.—Dafydd ap Gwilym, a romantic cantata by Harry Evans, from the Reardon Smith Lecture Theatre, National Museum of Wales, Cardiff.

Thursday, October 21st.—Music by Welsh Composers: orchestral programme.

Friday, October 22nd.—Brecknock's Beacon-lights, a dramatic feature.

Saturday, October 23rd.—By Firelight: orchestral and choral programme.

SCOTTISH (391.1 *m.*)

Wednesday, October 20th.—Variety from the Tivoli Theatre, Aberdeen.

Thursday, October 21st.—Reid Orchestral concert.

Friday, October 22nd.—Scottish Dance music.

Saturday, October 23rd.—Cochrane, Wolf of the Sea, a dramatic biography by George Scott Moncrieff.

NORTHERN IRELAND (307.1 *m.*)

Wednesday, October 20th.—Variety from the Grand Opera House, Belfast.

Thursday, October 21st.—Stop Dancing, a programme of very light music.

Friday, October 22nd.—Belfast Philharmonic Society Concert from the Ulster Hall, Belfast.

Saturday, October 23rd.—Orchestral programme.

P.A. DEFINITIONS

A NUMBER of new terms are now coming into general use in connection with public address work, and the following are some of the lesser-known items:

Acoustic Feed-back: Term applied to the effect produced when the sound from loudspeakers feeds back to the microphones.

Acoustic Watt: The unit of sound energy (based on a reference level of 10^{-16} watt per sq. centimetre).

Angle of Incidence: The angle from the perpendicular at which the sound waves impinge upon a surface.

Beam Power: Term applied in modern valves where the flow of electrons is directed in beam formation to overcome the loss resulting from secondary emission.

Beating: A phenomenon in which two or more period quantities react to produce a resultant having pulsations of amplitude.

Interference Patterns: The effect produced when two or more sound waves arrive simultaneously at a given point.

Mixer: Controls used to combine output from one microphone with other apparatus or another microphone.

Optimum Reverberation: Desirable average for overall frequency range and various sizes and shape of enclosure.

Phasing or Polarising Loudspeakers: Connecting speakers so that they will receive the same instantaneous polarity of signals to enable the diaphragms to vibrate in unison.

Rate of Decay: Time involved in absorption of sound energy.

Reverberation: Persistence of sound energy in an enclosure—due to repeated reflections.

Reverberation Time: The time required for the sound energy to decay to one-millionth of its starting value.

Tweeter: A loudspeaker unit designed to reproduce only the high frequencies (usually above 3,000 cycles per second).

Woofer: A speaker unit designed to reproduce the lower frequencies.

Wow: Effect of change in pitch due to variation of speed in recording or reproducing machine.

Some "Stunt" Circuits to Try

Our Contributors Recommend Readers to Depart from the Orthodox for a Change and to "Invent" Original Circuits. They Assure You that You Will Find it Interesting and Instructive

by The Experimenters

IN the earlier days of wireless the circuit was "the thing," and it was customary, when two enthusiasts met, to inquire: "Have you tried the so-and-so circuit?" Not so to-day. One reason is that circuits have become standardised to a certain extent, and another is that it is not essential to resort to "freak" arrangements to obtain excellent results.

Nevertheless, whenever we begin to feel rather "blasé" concerning this fascinating hobby of ours, we find that a new interest can be created by devising—if only on paper—a few unusual circuit arrangements. Those that get as far as the test bench are often disappointing as far as results go, but we nearly always learn something new from trying out a "stunt" circuit. Peculiarly enough, it is often those circuits that appear so contrary to all theory that prove most satisfactory; and many of those which should behave perfectly well are found to be useless.

Try It

Take our tip: whenever you have the "radio blues" (if that expression is understandable) take a slip of paper and a pencil and "invent" a new circuit. It is generally best to take a practical view of this invention business, but there is no harm in allowing the imagination to run rather wild. After you have produced a circuit that looks as though it should do something, try a temporary "hook-up," as the Yanks put it.

A Class B "Two"

Although most of the fun comes from making up the circuit yourself, we will give you a few suggestions that might prove interesting for a start. A simple two-valve circuit, using only a single class B valve—which is really two valves in one—is shown in Fig. 1. There is nothing very startling about this; in fact, we do not make any claim for its originality. All the same, it works, and works fairly well if you take a little care in choosing the component values. Moreover, the circuit has some practical value, especially if you want to make a midget receiver or a small portable for use with a throw-out aerial. Additionally, it is economical of both H.T. and L.T. when compared with a more usual arrangement of a standard detector valve followed by a small power valve.

In our tests we used an Osram B.21 valve, feeding it from a 100-volt H.T. battery and a small two-volt accumulator. A standard dual-range tuner was employed, and all components were of perfectly ordinary pattern. Values that proved most satisfactory are indicated on the circuit, but we recommend you to try alternatives. The valve used has a filament taking only .2 amp. at 2 volts; it also requires grid bias when used for its nominal purpose. Other .2-amp. Class B valves can be used, for if you employ one of those intended for use without bias, the .5-megohm grid leak should be connected straight to the earth line.

You will see that resistance-capacity coupling is used between the detector and L.F. portions. We also tried using a transformer, but the R.C. appeared to be better. This is probably because there is a certain amount of electrostatic coupling between the two electrode assemblies, so that undesirable feed-back takes place when the voltage step-up is too high. If you wish, you can try all of the modifications that would normally be tried when using a standard two-valve circuit.

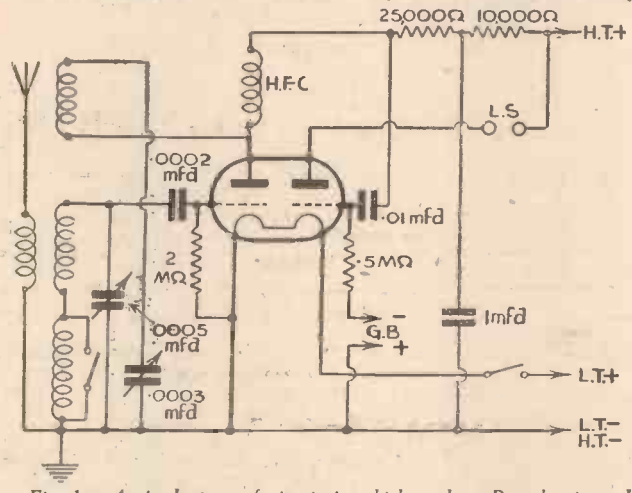


Fig. 1.—A simple type of circuit in which a class B valve is used for detection and L.F. amplification.

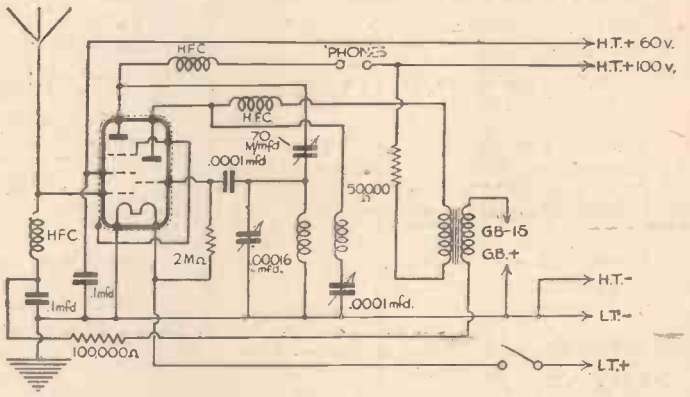


Fig. 3.—An interesting circuit sent in by a reader. A triode-pentode acts as H.F., Det., and L.F.

Reflex

In Fig. 2 we show a circuit for a two-valve reflex receiver. Those of our readers

(*Continued overleaf*)

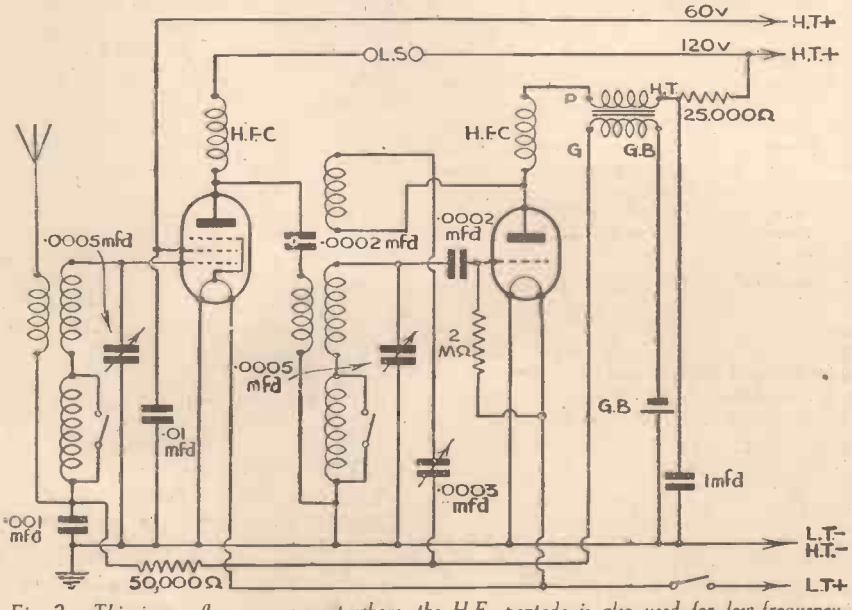


Fig. 2.—This is a reflex arrangement where the H.F. pentode is also used for low-frequency amplification.

SOME "STUNT" CIRCUITS TO TRY

(Continued from previous page)

who have been experimenters for upwards of 12 years will not be unfamiliar with the reflex arrangement, although those who are comparatively new to home construction might not have heard of it before. The idea is that one valve is made to do the work of two—generally to act as both high-frequency and low-frequency amplifier. When valves were far more expensive than they are to-day, it was important to reduce their number to the greatest possible extent, consistent with the degrees of sensitivity and output required. Nowadays, such a saving is not important, and the reflex circuit is more a thing of experimental interest than practical value.

Anyhow, reverting to Fig. 2, you will see that the first valve is an H.F. pentode, the second being an ordinary triode detector. Signals are fed into the detector through a choke-capacity-fed H.F. transformer (tuned-anode or tuned-grid coupling could be used equally well). Instead of connecting 'phones in the anode circuit of the detector, however, there is the primary winding of an L.F. transformer, the secondary of which is connected back to the grid of the H.F. pentode, through the aerial-tuning coil. The loudspeaker is included in the anode-H.T. circuit of the pentode. Thus it can be seen that the pentode valve serves for both H.F. and L.F. amplification. With a little care in the arrangement of the parts and choice of component values, it behaves satisfactorily as long as you do not demand the best possible quality of reproduction.

Decoupling and Biasing

It can be seen that a 50,000 ohm fixed resistance is connected in series with the grid leak from the L.F. transformer to the lower end of the first tuning coil; this acts as an H.F. stopper and grid decoupler. A single 1½ volt cell is indicated for providing grid bias for the first valve, but some H.F. pentodes will take up to 4½ volts. Naturally, the object is to have such a voltage that a reasonable L.F. grid-swing can be handled without the sensitivity of the valve being impaired. If you use a variable-mu pentode, you can have a higher G.B. voltage than if the valve is of the "plain" kind.

The layout of the parts can be almost the same as if you were making a perfectly-ordinary H.F.-Det.-L.F. receiver, for that is what it is, except that the secondary of the L.F. transformer is connected back to the grid circuit of the first valve instead of to the grid of a third one. Just one point; place the 50,000 ohm grid-stopper resistance close to the coil terminal. It is not usually satisfactory to employ a ganged condenser, because the .001 mfd. by-pass condenser between the bottom of the first coil and earth is in series with the first section of it. This particular objection could be overcome by replacing the .001 mfd. condenser with one having a value of .01 mfd., but that would tend to make reproduction rather "woofy," since the condenser is virtually in parallel with the secondary winding of the L.F. transformer. Still, if you prefer to use a two-gang condenser, you can easily experiment with a few different fixed by-pass condensers, noting their effect on reproduction.

A Reader's Suggestion

And now we come to a couple of ingenious circuits that were sent to us a short time ago by reader J. Randle (if we have not made a mistake in reading his signature), of Newquay, Cornwall. He really wrote in reply to our note in a recent issue that very few readers had sent suggestions for a short-wave portable receiver. Apparently, he took pity on us, and wrote a particularly interesting letter. Thank, you, Mr. Randle!

The first of his circuits is shown in Fig. 3. It is really a "three-valve" circuit, using a single Mazda T.P.22 triode pentode. In essentials, the circuit is the same as that we give in Fig. 2, but it is rather more "subtle." As you can see, the pentode portion of the frequency-changer valve is used for H.F. and L.F., while the—so-called—oscillator portion serves as triode detector. Reflexing is used, as in the previous arrangement.

The aerial circuit is untuned, a short-wave H.F. choke providing the necessary impedance, and tuned-grid coupling is used between the two sections of the valve. It must be remembered, of course, that the circuit was originally intended for S.W. use, and the values of components are chosen with that idea in mind.

For use on the broadcast bands, it would be desirable to tune the aerial circuit, and to use .0005 mfd. and .0003 mfd. condensers for tuning and reaction respectively. We are of the opinion that it would be better to use a by-pass condenser of much less than .1 mfd. between the lower end of the H.F. choke in the aerial circuit and earth, because a .1 mfd. component is almost a short-circuit to audio-frequency currents. With regard to this circuit, our correspondent remarks: "Although at first sight this would appear to be an easy way of making a set really portable, in practice it is not quite so simple. The valve requires at least 100 volts on its anode, and thus the size of the battery required would bring the set to such dimensions that a second valve could easily be accommodated in the waste "space." Perhaps he has overlooked the fact that a very small battery, intended for midget portables, could be used.

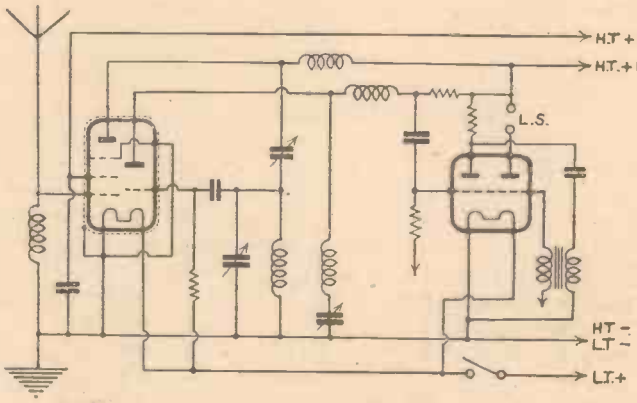


Fig. 4.—Another circuit sent by Mr. Randle. It is a modified arrangement of that in Fig. 3.

A "Two-four"

However, Mr. Randle has, he tells us, recently been "playing about" with a two-valve circuit as shown in Fig. 4. This used the triode-pentode again, but in conjunction with a class B, which is used as two L.F. amplifiers. This removes the need for reflexing, and gives satisfactory reception, according to our correspondent. He admits that his set is not properly laid out at the moment, but is just as good as a standard three-valve short-waver, but adds that if the set were rebuilt and carefully arranged "I can see no reason why it should not be just as efficient as a four-valver."

Well, we hope that we have given you some food for thought, and we shall be glad if any of our other readers would pass on any ideas they might have for "stunt" circuits. We shall be most interested in arrangements that have been tried, but we shall be glad to criticise any circuits that you might wish to send along.

ITEMS OF INTEREST

Shellac

SHELLAC will be familiar to our readers, particularly those who were active constructors in the days when it was customary to finish off all coils with a thick plastering of shellac varnish. Few of our readers are aware that this useful substance is produced by an insect which is about 1mm. in length, and lives in India. It spends its life on the bark of certain trees, from which it extracts the sap upon which it feeds. Certain presumably resinous substances, which it naturally distils from the sap of the tree, are exuded from its skin to form a protective covering, which in a few months attains a thickness of ½in. or more. When the insect has reared its family and died, natives knock off the old "houses," which are collected together in many thousands, washed, heated to a liquid state, squeezed through cloth, and stretched into sheets, and broken into small pieces, when it is known as "Shellac."

Voltmeter Readings

READERS who possess a multi-range voltmeter, when taking a reading will find that a different figure is obtained on different scales. This does not in any way mean that the instrument is at fault, and is brought about by the fact that the actual resistance of the meter is different on each scale. When testing any voltage in a circuit where an additional resistance is between the points under test and the source of supply, it must be remembered that current drawn by the meter must pass through such additional resistance.

One Metre Transmitting Valve

THE BELL TELEPHONE LABORATORIES, INCORPORATED, have just developed a remarkable new valve of the pentode type, intended for transmission on a wavelength of one metre, the rated anode dissipation being 15 watts each anode (there are actually two separate electrode assemblies contained in the envelope).

On Your Wavelength

By Thermion

The B.B.C. Cannot Afford It!

THE B.B.C. states that it has reluctantly come to the conclusion that it cannot for financial reasons undertake to broadcast instruction in physical exercises in the early morning. It will, however, help the National Advisory Council for Physical Training and recreation in all the ways it can within the normal programme hours. With my deference to the B.B.C. I suggest that it can afford it, and it should.

Countries which are less solvent than we afford it, and I see no reason why we cannot do what impoverished countries like Germany and others do. Even though the B.B.C. does not wish to spend more money, by a rearrangement of its programme material it could still give half an hour's physical jerks between 7 and 8 in the morning. This country is behind all others in physical development, and it has belatedly formed this Advisory Council to try and make up for the lost time. It is a national campaign sponsored by the Government, and that being so, if it is to be successful it must be supported by appropriate Government departments. As it is a national campaign, it is reasonable to think that it will attract hundreds of thousands of followers, and the fact that they cannot afford it cannot be offered as an excuse for not doing it. The B.B.C. is a paying concern, controlled by a Government department—the Post Office—and it should be *ordered* by the Government to run physical exercise programmes in the morning. I do not subscribe to the view that the B.B.C. should be permitted to do just as it likes, whilst it belongs to the country. In making these remarks I am not speaking for myself, for I am not interested in intensive physical training. I have long since passed the years where I worry about *embonpoint* or the development of the torso. I loathe anything savouring of dictatorship, and if the Government feels it desirable to push physical development in this country (and I think the Government is right), who is the B.B.C. to say that it cannot afford it, when it trades at a handsome profit every year? Physical exercise programmes would not absorb more than a few thousands of its profits. This, however, is beside the point. If the Government is really interested in physical development, it should see that its departmental underlings do not operate on a policy inimical to its own. As it is, it seems to me that the B.B.C. has placed its hand unto its nose and stretched its fingers out, after the manner of the rude boy who says "yah!"

We have an experience of the B.B.C. not affording things in the case of television, which, in my opinion has been hampered, though not entirely, by a policy of *laissez faire* on the part of the B.B.C.

Dates!

HEREWITH a few more dates to add to those I have previously given :—

January 2nd, 1896, Senatore Marconi came to England.

January 7th, 1927, Transatlantic service opened.

January 22nd, 1775, André Marie Ampère born.

February 4th, 1925, Oliver Heaviside died.

February 9th, 1928, Atlantic bridged by television.

February 11th, 1901, Wireless communication established between Niton and the Lizard; 196 miles.

February 26th, 1900, "Four Sevens" tuning patent taken out by Marconi.

March 13th, 1932, First programme from Broadcasting House.

April 2nd, 1872, Samuel S. M. Morse died.

April 29th, 1932, First demonstration of U.S. ultra-short-wave television by Baird.

May 1st, 1923, First broadcast from Savoy Hill.

June 1st, 1916, Wireless first adopted by New York Police.

June 10th, 1836, André Marie Ampère died.

August 2nd, 1928, First demonstration of telelogoscopy by Baird.

August 3rd, 1898, Communication established between the Royal yacht *Osborne* and Ladywood Cottage, Osborne.

August 4th, 1903, First International Conference on wireless telegraphy held in Berlin.

August 4th, 1914, War declared on Germany and all private radio telegraphy suspended.

August 13th, 1888, John Logie Baird born.

August 15th, 1904, Wireless Telegraph Act of Great Britain passed.

August 19th, 1920, Communication established between an aeroplane in flight to Paris and a telephone subscriber in London.

September 12th, 1923, Sir E. Rutherford's address to the British Association at Liverpool, simultaneously broadcast from all B.B.C. stations.

September 22nd, 1791, Michael Faraday born.

September 28th, 1837, Morse patented his telegraph.

September 29th, 1909, British coast stations taken over by the P.M.G.

October 1st, 1922, First all-British Wireless Exhibition opened.

October 3rd, 1906, Triode patented by Lee de Forest.

October 7th, 1934, Droitwich Station opened.

October 8th, 1908, Russian Company of Wireless Telegraphs and Telephone formed.

October 15th, 1901, First fan aerials erected for experiments between Poldhu and Newfoundland.

October 17th, 1907, Transatlantic stations at Clifden and Glacy Bay open for public service.

October 26th, 1915, Radio telephonic communication effected between Arlington, U.S.A., and the Eiffel Tower.

November 1st, 1902, Marconi Wireless Company of Canada formed.
November 15th, 1899, Communication up to 36 miles between the Needles Station, and *S.S. St. Paul.*
November 15th, 1832, Morse code first made public.
November 22nd, 1899, Marconi Wireless Telegraph Company of America formed. The Wireless Society of London changed its title to the Wireless Society of Great Britain, 1922.
December 1st, 1900, Wireless officially adopted by London Fire Brigade.
December 6th, 1897, Communication established up to 18 miles between a steamer and the Needles.
December 9th, 1932, Empire Broadcasting from Daventry began.
December 18th, 1921, Demonstration of Duplex Radio Telephony between London and Amsterdam.

Another Offer

A GOOD Samaritan, who desires to be nameless, has some wireless components for disposal to a deserving cause. I shall be glad to receive applications which must reach me not later than October 27th. Address envelopes to me marked "Offer" in the top left-hand corner.

"Gratters"

B. E., of Sawbridgeworth, writes: "As one of the first B.L.D.L.C. members (my No. is 14), may I congratulate you on becoming President of this Club. I enjoy also reading your weekly article in PRACTICAL AND AMATEUR WIRELESS. You may be interested to know that I was the winner of the B.L.D.L.C. DX Contest, sponsored by you. I am still going strong on DX reception, and possess 1,590 Q.S.L.-letter "veris" from 93 colonies or countries, all on 'phone or music. About my best 'phone veri is one from VS7JW on 7½ watts. I am trying to get 100 W6 'phone "veris," but so far have only got 95, also 30 W7's, 27 VE4's, 55 W5's, 12 VE5's, 22 VK2's, 17 VK3's, 4 VK4's, 2 VK5's and 7's, etc."

And Another!

"PLEASE accept my heartiest congrats. and best wishes as our new President. I think the B.L.D.L.C. is a fine Club, and I have made dozens of new friends through it. May I also take the opportunity of saying how much I enjoy your article in PRACTICAL AND AMATEUR WIRELESS. I read it first every week, and you have my support re crooners. Believe me or not, but I have *every* number of PRACTICAL AND AMATEUR WIRELESS, from No. 1, up to date, I am only twenty years old, but I have been in radio since I was old enough to hold a dial knob. I am a member of the R.N.W.A.R., and run a transmitter on 3,810 kc/s for naval communication. I have about 300 "veris" from all over the globe, and I never send an I.R.C. If my report doesn't deserve a confirmation without having to enclose postage, then the proper place for it is the 'W.P.B.' By the way, when I was up at the 'Show,' I saw three very grim-looking young men, armed with sub-machine-guns looking for the PRACTICAL AND AMATEUR WIRELESS Stand. They said they were 'out-of-work crooners' and were looking for 'dat guy what calls 'imself Thermion ! ! !' I hope they didn't find you !—H. G. P. W., Hove."

Notes from the Test Bench

Pentode In Corona 4

SEVERAL readers have written to ask whether they can use a pentode in the output stage of the Corona 4 in place of the specified power valve. The use of a pentode would certainly increase the sensitivity, but in most cases L.F. instability would be produced if this substitution were made, and quality of reproduction would not be as good as that obtainable from the specified valve. Constructors having a reliable pentode on hand can try it in the output stage, however, provided that the grid leak of the L.F. valve is in the form of a variable potentiometer. The .01 mfd. condenser should be connected to one end terminal of this potentiometer, the G.B.—1 lead to the other end terminal, and the 100,000 ohm resistance to the centre terminal. If a pick-up is to be used the two pick-up sockets should be connected to the end terminals of the potentiometer, and the latter may then be used as a volume control on gramophone and radio.

Dirty Accumulator Terminals

POOR quality from a battery set is often, unsuspectingly, due to dirty accumulator terminals. The voltage applied to the valve filaments can vary between zero and 2 volts, according to the resistance between the L.T. leads and the accumulator terminals. Cleaning the lead spades does not always suffice—the terminal itself must also be cleaned. Even when no sulphation is apparent the lead terminals can become coated with a film of insulation which can effectively reduce the filament voltage. The best protection against this trouble is to keep the terminals vaselined, and also clean them periodically with a fine wire brush or emery paper.

Automatic Bias

IT is surprising the number of readers who imagine that better results can be obtained from their battery sets by substituting automatic bias for the conventional battery type—actually it is much easier to obtain good quality with battery bias in use. A well-designed auto-bias arrangement will certainly work satisfactorily in most sets, but if a Class B or Q.P.P. valve is used in the output stage results will be poor. The reason for this is obvious when it is appreciated that the current consumed by Class B and Q.P.P. valves varies with the volume. This varying current passes through the auto-bias resistance, thereby producing a varying bias voltage and causing distortion.

After the Flood

ONCE again the international reputation of Philco Radio sets for sturdy construction and stamina has been bolstered by the experience of William Edward Distler, of Louisville, Kentucky. Mr. Distler tells how his Philco set was washed away by floods and buried for months in mud, yet it worked perfectly when connected to an electric main.

"I have just found my Philco radio," he writes, "after it had been buried in mud and water for five months. For several weeks of that time it lay under fifteen feet of water as the result of the Ohio River flood. I thought at first the flood had taken it from me, and had despaired of ever seeing it again.

"Last week my neighbour was cleaning out debris in the back-yard, and he discovered my Philco. Of course, the cabinet was broken, but the mechanical parts seemed to be in good shape. I took it to the store, hooked it up without even a test and, believe me, it was better with age and rough treatment, and performed with a perfect tone."

Although this comes from the home of tall stories, this one, I am assured, really *is* true !

The Amateur Set Designer

Tuning Range, Ganged Condensers, and Selectivity, are Amongst the Subjects Dealt With in this, the Seventh Article of the Series

OBVIOUSLY, the band-width at the top of the curve has a permissible limit which is dependent upon conditions imposed by the adjacent channel stations. If the selectivity of the receiver is to be fixed it will be necessary to consider either allowing for the worst conditions likely to arise, or for average reception conditions. The reader will appreciate that very great benefit is going to be derived if the band-width can be varied at will. Variable selectivity for the highly sensitive receiver is, indeed, necessary if full use is to be made of the receiver's capabilities of picking up very distant transmissions, and if good quality of reproduction is to be obtained on nearer stations. With a variable selectivity control the selectivity can be adjusted to give the best results possible under the particular conditions of reception arising at any time.

The General Purpose Receiver

Knowledge of the lines along which orthodox design is at present running is valuable. The chart, Fig. 31, indicates various stage combinations; it is by no means exhaustive, but can be taken as giving a survey of the most widely used combinations.

All the combinations can be considered as applicable either to mains or to battery operation, and from the chart it is easy to work out the number of valves required for any of the combinations given. A possible number of valves can be found by adding up the number of individual stages indicated, and adding one if a rectifier valve will be used. The use of multiple valves will, of course, reduce the total number of valves necessary, and the dotted lines used for bracketing at several places in the chart indicate where the popular double-diode-triode, and the double-diode output pentode are frequently used.

A pentode or tetrode of high slope characteristic must be regarded as virtually a necessity in all those cases where an L.F. stage is not shown as preceding the output stage.

In the superhet section FC stands for frequency-changer, while in this section HF is used in the sense of amplification at signal frequency. DET indicates what is frequently referred to as the "second detector" of the superhet receiver.

The three-valve combination represented by No. 1 (Fig. 31) has achieved deserved popularity, and is the simplest type of receiver which can have any claims to general purpose characteristics. The one H.F. stage does make it possible to bring in a certain number of distant stations, although it is necessary for the H.F. amplification to be reinforced by reaction at the detector. The use of H.F. pentodes for H.F. amplification and detection and a valve of the high slope pentode type for the output stage gives us the "three-pentode" combination of which there are many examples in existence.

If it were not for one fact it would be safe to prophesy that the HF, Det, Output straight receiver has a long reign of popularity ahead of it. What makes the question one of some doubt, however, is the way in which the three-valve superhet combination (No. 4 of Fig. 31) is proving its worth. The three-valve superhet receiver represents the superhet reduced to its simplest possible form, consistent with general purpose results. It is a "hit or miss" job from the amateur designer's point of view. With very efficient coils, a sensitive detector, a sensitive output valve, and reaction used to assist the amplification at the intermediate frequency, it is a successful type of receiver, but the designer will find no latitude for any weaknesses of design.

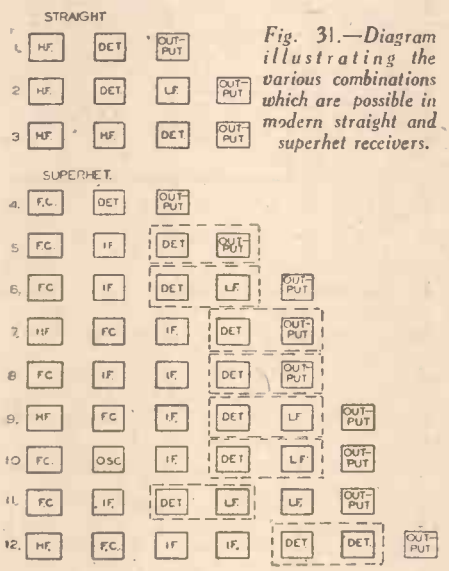


Fig. 31.—Diagram illustrating the various combinations which are possible in modern straight and superhet receivers.

If the reader is considering the use of QPP or Class B output he can regard either of these as a possibility where any of the combinations listed in Fig. 31 terminate in LF, Output. In the case of Class B the "LF" would represent the driver stage. Reaction can be regarded as a necessity in Nos. 1, 2 and 4: A.V.C. is standard in all combinations from No. 5 to No. 12 inclusive.

A word of explanation is called for by No. 10. For short-wave reception there is some advantage in employing a frequency-changer type of valve with a separate oscillator valve. Although the use of a separate oscillator has been shown only in connection with No. 10, it should be understood that it could be incorporated as a modification of any of the other superhet combinations.

Coils

As we are now at the point when we must begin to take up the matter of the H.F. circuits of the receiver, the question arises as to whether the average amateur will want to wind his own coils. In those cases where a number of coils have to be matched to a fine degree for operation with a ganged condenser it is hardly likely that the average amateur will feel disposed to wind the coils himself. In other cases, however, many amateurs will wish to use home-made coils. Those who are interested in coil construction cannot do better than obtain a copy of "Wireless Coils, Chokes and Transformers, and How to Make Them." This important new handbook is published by George Newnes, Ltd., and can be obtained from the offices of this journal or through any bookseller.

Fig. 32 represents a tuned H.F. circuit in its simplest form. The factors of importance in connection with the circuit LC, in so far as they affect the performance of the receiver containing the circuit are:—

(1) The frequency to which the circuit is tuned, or, if C is variable, the tuning range.
(2) The selectivity characteristic.
(3) The magnification.
(4) The dynamic resistance.

Tuning Range

The frequency of resonance is inversely proportional to $\sqrt{LC}$ while the corresponding wavelength is directly proportional to $\sqrt{LC}$.

For the medium and long wavebands, using a .0005 mfd. condenser, the normal inductance values, for coils placed on the market by the component manufacturers, are 157 microhenrys, and 2,200 microhenrys, respectively.

The highest frequency (lowest wavelength), to which the circuit will tune is, for fixed inductance, dependent upon the minimum total capacity. Assuming that the condenser is of variable type it must be understood that its minimum capacity is not zero (it might be something like 25 micro-microfarads); in addition there is the self-capacity of the coil (a medium-wave iron-core coil would be very good to have less than 15 micro-microfarads) and there is also the stray capacity of the wiring. From this it should be apparent that the minimum capacity of the tuning condenser, and the self-capacity of the coil are factors which have an important bearing upon the tuning range obtainable. The smaller these capacities are the wider will be the tuning range. As regards stray wiring capacity it should always be understood that this should be kept as low as possible.

In practice, where the circuit LC (Fig. 32) is used in conjunction with external components there will be the complication that the latter will be responsible for more small and additional capacities.

Fig. 32.—A simple tuned H. F. circuit.

The ratio of maximum to minimum frequency, or maximum to minimum wavelength, is equal to the square root of the ratio of maximum to minimum capacity values, assuming that the inductance is fixed. As an example, consider the range of 1,500 kc/s per second to 545 kc/s per second (200 metres to 550 metres). The ratio of maximum to minimum frequency is 2.75/1. Thus, for condenser tuning, a capacity ratio of 7.57/1 is required.

If a smaller inductance is used with the same tuning capacity ratio, the maximum

and minimum frequencies (or wavelengths) are both less than before, but the maximum/minimum ratio remains the same as with the larger coil. This has an important significance where the superhet is concerned. In this case it is necessary to have an oscillator circuit which is always tuned to a frequency different to that of the signal-frequency circuits (the normal circumstance is for the oscillator circuit to have the higher frequency), and the difference between signal and oscillator frequencies should be constant.

Oscillator Tuning

Let us assume, first, the case where the oscillator tuning is performed by a section of a ganged condenser identical with each section used for tuning the signal-frequency circuits. The requirement that, at any tuning setting, the oscillator frequency shall be higher than the signal frequency suggests the use of a smaller inductance for the oscillator circuit, but this is not sufficient. We saw above that for a signal-frequency range of 1,500 kc/s per second to 545 kc/s per second a capacity ratio of 7.57/1 is required. Suppose the oscillator frequency has got to be 110 kc. per sec. above the signal frequency, implying an oscillator-frequency range of 1,610 kc/s per second to 655 kc/s per second, or a frequency ratio of 2.46/1 approximately. The latter will necessitate a capacity ratio of 6/1 approximately, which is less than that appropriate to the signal-frequency circuit. To compress the capacity ratio, and also to keep the oscillator circuit "tracked" at the correct frequency it will be necessary to employ both series and parallel (fixed or preset) trimming and padding condensers in addition to the variable tuning condenser.

An alternative is to use for the oscillator circuit a condenser of smaller capacity than that used in the signal-frequency circuit, the oscillator condenser having plates specially shaped to give correct tracking. As we are assuming that a ganged condenser is in use it is, of course, to be understood that the oscillator section of the latter would be of the type described. A "shaped plate" oscillator condenser is normally only suitable for direct use with one oscillator coil on one particular waveband. For another waveband with a different coil, or with another coil section switched in, it will normally be necessary to use a padding condenser in conjunction with the "shaped plate" condenser.

Ganged Condensers

Reverting to ordinary signal-frequency circuit tuning, in any receiver: Where two or more tuned circuits are contained in the receiver it is customary for the tuning to be carried by a ganged condenser. If the condenser sections were absolutely identical, the coils were absolutely identical, and the stray capacities of the circuits were exactly equal, then the circuits would keep strictly in tune with one another at all settings of the ganged condenser. In practice, ganged condenser sections and coils are not perfectly matched, in the strict sense, but those turned out by reputable manufacturers are matched to within a very small percentage of error. It would be too much to hope that the stray capacities of various different circuits in a receiver would be equal, but this difficulty is overcome by employing small trimming condensers and, by suitable adjustment of these, balancing up the total stray plus trimmer capacity in the circuits. The designer should note that the use of trimming condensers gives no excuse for carelessness over stray capacity, in so far as it can be controlled, for excessive stray capacity in one circuit might make balancing impossible, due to the trimmers of the other circuits not being big enough. At the least, the excessive stray capacity would lead to the minimum capacity of all the circuits being brought up more than necessary, and this would have the effect of restricting the tuning range.

The reader was reminded at the beginning of this section that the frequency and wavelength of a tuned circuit depend upon the product LC. The accompanying tuning chart gives values of LC (micro-henrys × microfarads) appropriate to a number of frequencies and wavelengths. This chart will be found useful; for example: Will a maximum capacity of .0003 mfd. take a 157 mhy. coil up to 500 metres?

.0003 × 157 gives an LC product of .0471. A wavelength of 500 metres requires an LC product of .0703 (see chart), so it is evident that .0003 mfd. and 157 mhy. will not reach 500 metres.

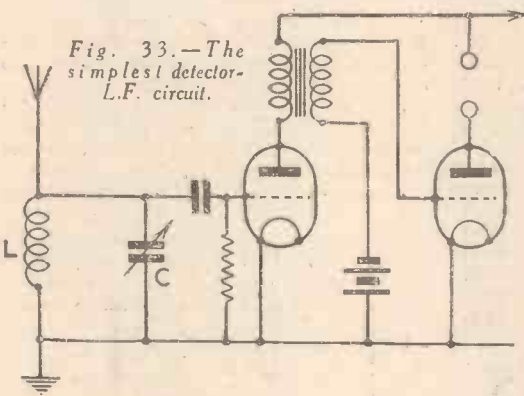


Fig. 33.—The simplest detector-L.F. circuit.

TUNING CHART

Frequency Megacycles/second.	Wavelength. Metres	LC Microhenrys × Microfarads.
20	15	.0000633
15	20	.000113
12	25	.000176
10	30	.000253
7.5	40	.00045
6	50	.000703
3	100	.00282
2	150	.00633
Kilocycles/second		
1500	200	.0113
1000	300	.025
750	400	.045
600	500	.0703
545.4	550	.0851
465	645	.117
333.3	900	.228
300	1000	.281
200	1500	.633
150	2000	1.13
110	2727	2.09

Selectivity

As regards the simple circuit of Fig. 32 the higher the value of the ratio L/R (R is the H.F. resistance of the circuit) the greater will be the selectivity, i.e., the sharper will be the single peaked resonance curve appropriate to the circuit.

The H.F. resistance is made up of quite a number of contributory factors: wire resistance at the frequency concerned, eddy current loss, dielectric losses, etc. The L/R ratio of the coil only is obviously a most important value, and when making coil specification comparisons any information given by the manufacturers in this connection should be noted.

H. F. resistance is not constant over a range of frequencies, and with a fixed inductance coil rises with increase of frequency. As a result the selectivity of the circuit of Fig. 32 will vary as the circuit is tuned over the waverange by the condenser. The selectivity will be greatest at the lower frequency (higher wavelength) end of the range. It should be noted that the increase of the L/C ratio as the circuit is tuned down in wavelength tends to raise the selectivity, but that this tendency is more than offset by the increase in the L/R ratio.

As far as a single H.F. circuit is concerned a wide choice of L is not permitted the designer owing to tuning range limitations, and the one hope of getting the maximum possible selectivity rests upon getting the L/R ratio as high as possible.

Of extreme practical importance is the fact that in a receiver an H.F. tuned circuit will not be isolated, but will be connected or coupled to other components external to the tuned circuit itself. Unfortunately from the amateur designer's point of view, external components can greatly influence the characteristics of the tuned circuit. Any energy consuming load shunted across, or coupled to, an H.F. tuned circuit will effectively increase the H.F. resistance of that circuit. It is for this reason that the selectivity of a detector-L.F. receiver with only one tuned circuit is bound to be low. Fig. 33 shows part of such a receiver arranged in a way that makes conditions about as bad as they could be from the selectivity point of view. The circuit LC has two damping loads upon it, one is the aerial circuit and the other is the triode grid detector. The aerial connection taken to the top of the coil makes the damping effect of the aerial circuit a maximum, and the omission of an anode by-pass condenser makes the damping of the triode much greater than it need be.

The selectivity could be improved by (1) using a small series-aerial condenser, (2) taking the aerial connection to a tap low down on the coil (alternatively use an aerial coupling coil instead of making direct connection to L, (3) tapping down the grid condenser connection, (4) inserting an anode by-pass condenser. All these modifications improve the effective L/R ratio of the tuned circuit. "Tapping down" can, of course, be overdone from the sensitivity point of view.

The question of using reaction will be deferred to a later part of this series.

Circuit Magnification

If the circuit LC of Fig 32 is oscillating under the action of an internally injected e.m.f. then, if the circuit is in the resonant condition, the voltage developed across the circuit (i.e., the voltage across C) will be greater than the e.m.f. in the ratio $\omega L/R$ where $\omega = 2 \times 3.1416 \times$ cycles per second.

Thus there is voltage magnification in the circuit itself. Some amateurs seem apt to forget the fact that voltage magnification can take place even in a circuit *in front* of the first valve of a receiver, but such is the case. In a receiver of simple type, where the number of valve stages is severely limited, such magnification as can be obtained in the first tuned circuit may be quite important where the over-all sensitivity is concerned.

October 23rd, 1937. Vol. 3. No. 71.

AN INGENIOUS MODEL

A Brief Description of a Simple Model Built to Illustrate the Action of a Multiplier Photocell.

MULTIPLIER photo-electric cells are becoming of increasing importance in the commercial world, but in spite of the many descriptions of their operation which have appeared from time to time there are still many who find it difficult to conceive how these devices work in practice. There are three main types to consider, namely, the reciprocal of Farnsworth, where the secondary electrons oscillate between two opposed surfaces in an evacuated tube; the progressive of Zworykin, in which the electrons follow a directed path between successive plates, and the grid type of Weiss, where the electrons are constrained to pass between the meshes of successive grid stages. The last-named type is being developed by Bairds' in this country, and in an endeavour to illustrate the cell's action very clearly to an interested public, working models were designed and featured at both the Science Museum exhibition and Radiolympia. The scheme adopted was so ingenious that a full description of the device is merited.

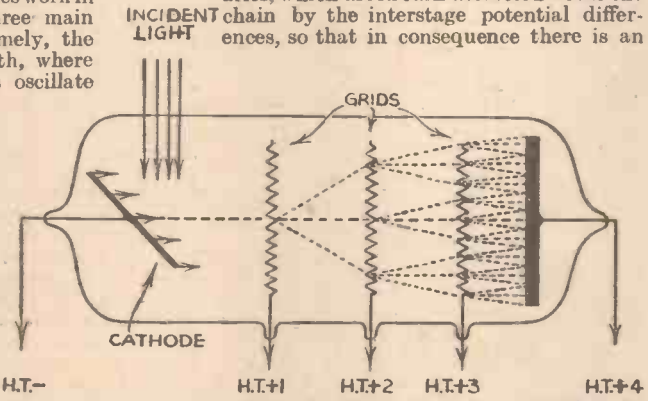


Fig. 1.—Showing the drawing of the cell with the channels indicated by dotted lines.

Cell Action in Brief

As readers may recall, the Weiss type electron multiplier photocell is based on a combination of the principles of secondary and photo-electric emission. Secondary electrons can be made to leave a prepared metallic surface provided the impact of primary electrons is undertaken with sufficient velocity. In the Baird cell, therefore, there is a series of secondary amplifying stages consisting of fine mesh metallic grids treated in such a manner that a high secondary factor exists. These are arranged as parallel circular discs inside a metal screen or tube which has an opening at the front to allow the primary electrons emitted from the cathode to reach the first grid. These electrons incident on the first grid bring about the liberation of secondaries, which are in turn attracted down the chain by the interstage potential differences, so that in consequence there is an amplification taking place at each grid. The measure of amplification is of the order of three at each grid and the overall measure of amplification obtained is a function of the number of stages, and the voltage between the stages. At the end of the multiplier a secondary emitting plate is arranged, and the electrons from the last multiplying grid impinge on this. A secondary factor of 8 can be obtained by a solid surface in this way, and a large multiplication therefore takes place in the last stage. The electrons liberated from this plate are collected by an unsensitised open mesh grid, and pass into the output circuit of the multiplier cell.

Model Working

The light incident upon the cathode releases an enormous number of electrons, but for the purpose of illustrating the cell's action the progress of one electron is watched. In the model a large drawing on white cartridge paper represented a section through the glass tube, with the cathode and grids shown as illustrated in Fig. 1. The whole of the back of this paper was blacked so that light could not pass through except for the thin channels left blank, as shown in the diagram. One channel passed from cathode to first grid, this then branched into three, then nine, and finally twenty-seven, as only three actual multiplying grid stages were shown in operation.

Moving Film

This drawing formed the front of a cabinet, and inside the cabinet was a gramophone motor connected to a vertical driving spindle by bevel gearing. Passing round the spindle and fixed guides was an endless band of black celluloid just like the film used for a box camera. The path of this film can be seen by referring to Fig. 2. At intervals of every two or three inches on this band the black emulsion was scraped off the film so that a number of clear and transparent vertical channels approximately ¼in. wide were made. Inside the band, as shown in Fig. 2, was a metal box housing a 20-watt electric lamp, which illuminated evenly a cut-out area on the box side flanking on to the back of the drawing.

A Form of Scanning

On closing a switch the lamp lit up and the motor started, so that the band of film was driven across the back of the drawing at a slow speed from left to right. As each vertical transparent film channel passed across the series of channels at the back of the drawing a tiny area of light was visible at each point of overlap. For example, if reference is made to Fig. 3, three vertical channels are shown together with the slots on the back of the drawing. At the junction of the first channel and slot, therefore, that is point A, the overlap is the only transparent section and a tiny area of light is seen. For the second and third channels shown, three- and nine-light areas will be seen. As the film moves, therefore, the "scanning effect" is first of all a spot of light moving from the cathode towards the first grid. This is the single electron and when the band channel reaches the drawn grid the single spot emerges as three to give the impression of a triple multiplication at that grid. Continuing to the second grid, the three "light electrons" become nine when they emerge, and so on. In the model only a cathode, three grids and a collector plate were shown, because the channels were difficult to space out unless the model assumed rather big dimensions.

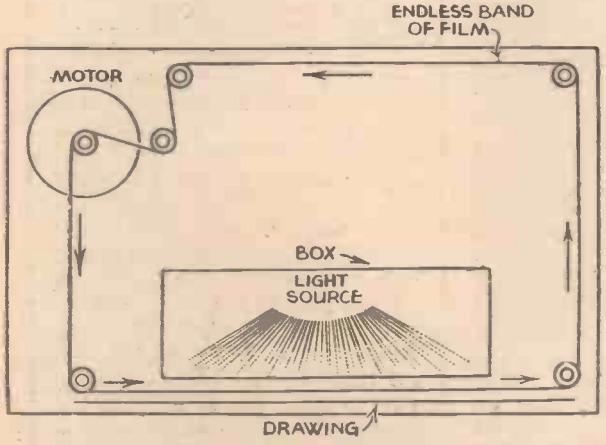


Fig. 2.—(left) A plan view of the model showing the endless band of film.

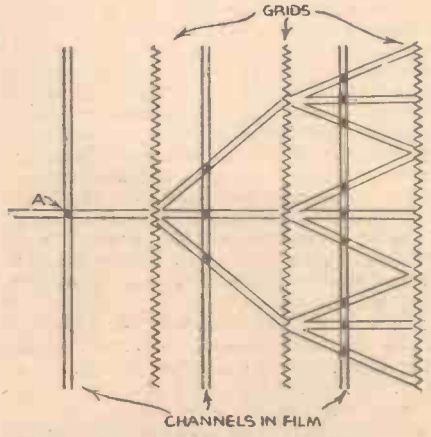


Fig. 3.—Illustrating how the overlap of the channels gave moving spots of light when the film band moved.

Televiews

Successful O.B's

THE B.B.C. are to be congratulated on their outside television broadcast efforts. This enterprising policy is widening the scope of the programmes very materially, and adding to the viewing public interest in a marked degree. The transmission from the Pinewood studios was the longest directional radio link so far attempted—between 17 and 18 miles—but in spite of very considerable difficulties the experiment was rated a success. In a well chosen high situation the local transmitting aerial at Pinewood was a conspicuous landmark but the first test showed that the pictures re-radiated from Alexandra Palace, after being picked up by the receiving aerial surmounting the two transmitting aerial arrays, were marred by very considerable interference. In no way disheartened, the B.B.C. engineers tackled the problem, and by the judicious use of filters and rejector circuits at the Pinewood end, the trouble was cleared. A great gale was instrumental in blowing down the local transmitting aerial at Pinewood, and as a spare was not available a temporary structure was erected so that the service was in no way interrupted.

The recent transmission of the car race at the Crystal Palace served to recall the daily experimental transmissions made by the Baird Company from the same site before the fire of last November destroyed completely both the studios, and radio plant. The transmitting aerials which still surmount the South Tower are a reminder of the pioneer work undertaken in the development of high definition, for it was here that the first 180-line pictures were produced, observations being undertaken over a wide area where test sets were located. Another very important point in connection with outside broadcasts is that they provide suitable programme material to enable the hours of transmission to be increased beyond the three hours which now represent the daily schedule.

Jessie Matthews sang a duet with herself during the television transmission from Pinewood on October 4th. The illustration, which was taken in the cutting room, shows her singing "My River" from the new film "Sailing Along" to the accompaniment of her own voice on a sound track. On the left is Louis Levy, musical director of Gaumont-British, famous for his broadcasts "Music from the Movies."

Signal Separation

AS readers know, the radiated television signal embodies both the picture modulation, which is a continuously varying signal, together with the synchronising pulses (line and frame) comprising peak signals of consistent amplitude. In the receiver these two types of signal must be separated, for each has a specific function to perform. In the case of the former, the picture signal—modulation—must be applied to the modulator electrode of the cathode-ray tube to give the required spot intensity variation. The synchronising pulses, however, are required to govern the correct timing of the line and frame sweeps which impart the scanning motion to the spot. Many schemes have been developed to bring about this segregation of the signals, but one very efficient method is to apply the combined television signal to a pair of diode valves connected up in a push-pull circuit. The output from the diodes then passes to a pentode valve which is arranged in such a manner that the line and frame synchronising voltages are developed across some form of cathode circuit impedance. From here, signals pass to a valve set up in such a manner by biasing to cut-off point that only current peaks pass. These then trigger the valve grids of the dual time-base generator equipment. The modulated picture signals, however, make their appearance across an impedance in the anode circuit of the same pentode valve, and from here they pass to the cathode-ray tube modulator electrode. The scheme is a very simple one, and in practice is most efficient.

More Space

THE long-awaited extensions to Broadcasting House are now about to begin, and this raises the important question of the amount of space which is to be allotted to television. Although the development may be gradual, it is certain that future broadcasts will see the fusion of sound radio and vision radio. If that is the case then there should be one central home for both in an enlarged Broadcasting House. The present studios, control room and dual radio transmitters will remain situated at Alexandra Palace, but instead of an ambitious scheme for new studios, etc., in North London, as contemplated originally, it is thought better to have these at a more convenient position as represented by Broadcasting House, and use both cable and directional radio links. Programme ideas could be broadened, and economies effected, by having a combined radio and vision broadcast, while enjoying the facilities of easier access than is provided by journeys to Alexandra Palace. It will take some time for these new plans to come to fruition, and in the meantime programmes must proceed on similar lines to those now available.

Which Type?

THE technical details which were made available at Radiolympia concerning the various types and makes of television receiver failed to solve a problem which has engaged the attention of set designers for a long time. With the vision chassis, is it better to use the so-called straight set, often referred to as the T.R.F., or can better results be achieved with the superheterodyne? At present there are two distinct camps of thought, both for the commercial models of this country and the experimental sets used for test purposes on the Continent, and in America. In the straight set, pre-detector amplification is undertaken at the carrier frequency of 45 megacycles, while in ordinary radio practice the superheterodyne principle enables the frequency handled to be reduced to a lower figure. Both designs present their own inherent difficulties, and sufficient experience has not been obtained to adopt any dogmatic attitude on the question. If we refer to the case of aural radio, it is only within the last two or three years that the superhet has achieved any marked degree of popularity, and even now there are designers who refuse to depart from the straight circuit where outstanding quality is demanded by the set user and listener.

MINOR MUSIC-HALL

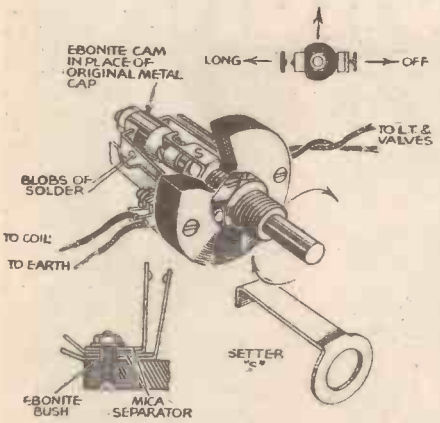
Television, youngest of the arts, is already notable for the youthfulness of many of the artists. Reginald Smith is definitely "in the movement," then, in introducing a Minor Music-Hall show on October 30th, in which all the artists will be under 17 years of age. They will include Pat Malkin, a girl pianist whose playing of the classics made a great impression at a recent audition in the television studios. Dennis Gilbert, also in the bill, is a boy of 15 who is equally skilled in dancing and playing the xylophone. Howard Graham and Muriel, a dance team of two whose combined ages amount to 31, will also appear, and it is hoped to book some more talented people still in their 'teens before Minor Music-Hall comes to the television cameras.

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — **READERS WRINKLES** — THE HALF-GUINEA PAGE

A Push-pull Switch Conversion

THE accompanying illustration shows how I converted a two-point push-pull switch into a four-point wavechange and L.T. switch. It will be seen that the metal

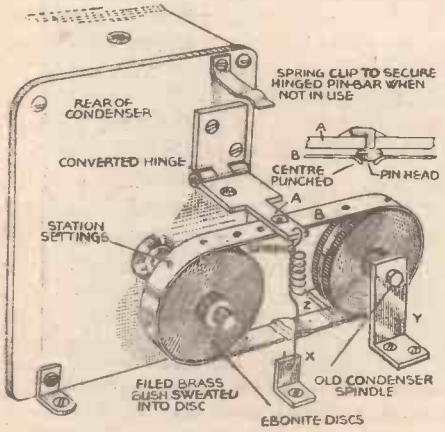


A method of converting a push-pull switch.

contacts and insulated end cap of the plunger are removed, and in place of them an insulated sleeve is fitted. This is filed flat on one side, and additional contacts are mounted so that a form of jack-switch is obtained. By rotating the spindle (instead of pushing it) the flat on the sleeve will open or close the contacts at the side of the switch and by this means various functions may be carried out. In my receiver I use the switch for long-medium wavechange purposes, plus on/off switching. The diagram should make all the incidental details clear.—R. PATE (Kirkdale, Liverpool).

A Novel Station Locater

I HAVE often seen illustrations on this page, depicting station location dials employing the ball-catch principle, and it occurred to me that closely related settings cannot be efficiently handled in this manner. I therefore contrived the improved



An improved station locater.

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.

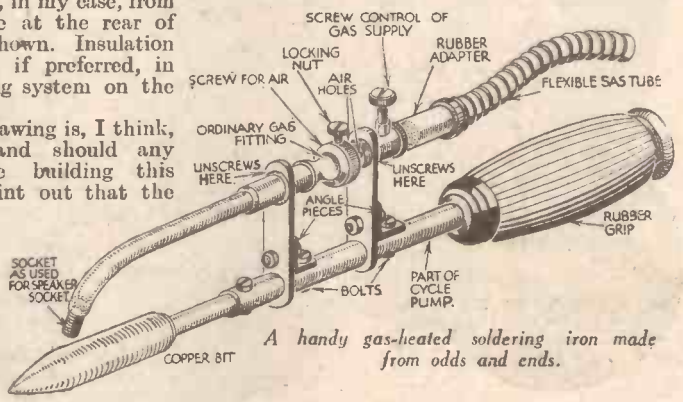
arrangement shown in the accompanying illustration.

A thin brass band constituted the locater, and this was driven, in my case, from the ganging spindle at the rear of the condenser as shown. Insulation tape may be used, if preferred, in place of the grooving system on the edge of the discs.

The rest of the drawing is, I think, self-explanatory, and should any reader contemplate building this model, I would point out that the correct alignment of the punch dents or holes is essential.—H. A. MANFRED (Derby).

A Gas-heated Soldering Iron

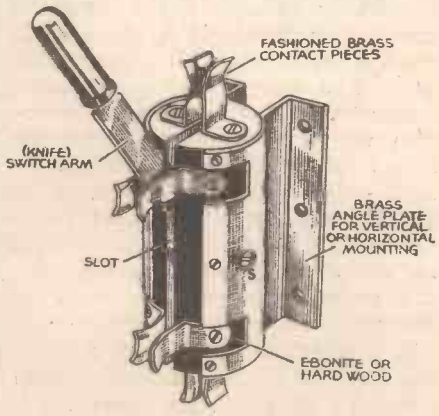
THE accompanying sketch shows how I constructed a handy gas-heated soldering iron from the following odds and ends: A copper bit, part of an old bicycle pump, a cycle handlebar grip, two small brass angle-brackets, and two supporting strips, five small nuts and bolts, an ordinary gas fitting, and a small socket as used for plug connections. After drilling the two supporting strips, as shown, the various parts are assembled and screwed in place, and a convenient length of flexible metallic tubing attached by means of a rubber connector. When the gas-control screw is turned half round, the gas flame impinges on the copper bit, quickly bringing it to the required heat, and when the screw is turned back it allows just enough gas to pass to supply a small pilot flame which is sufficient to keep the bit hot between soldering operations. I have found this soldering iron very useful for light soldering work, especially in the building of radio sets.—J. ROBINSON (Workington, Cumberland).



A handy gas-heated soldering iron made from odds and ends.

A Four-position Change-over Switch

A SIMPLE four-position single-pole change-over switch can be constructed in accordance with the accompanying sketch, which shows a large model I have just made for a number of useful purposes. In this model I made the knife arm, but for smaller designs the arm of a disused knife switch may be recommissioned to do the job. The contacts have, of course, to be fashioned to permit ease of engagement by the switch arm, and this is a simple matter for the pliers, finally smoothing any possible burring which would impede the action. The slot should be about two-thirds across the diameter of the ebonite



A novel four-position change-over switch.

or wood block, and the reason for this will be apparent from the drawing. The arm-clamping screw (S) should be sufficiently long enough to permit securing with one or two nuts at the other side.—C. H. COLLINSON (Wembley).

PRACTICAL NOTES ON ADDING A PICK-UP, AND HOW TO OBTAIN THE BEST QUALITY.

F. J. CAMM'S ALL WAVE "CORONA" 4

IT is impossible to design a receiver which will meet the requirements of every listener. If a large output is the main feature of a set, then probably half of the amateurs who are interested in the design will ask for a similar set but with a smaller output. Similarly, if the output is small, then hundreds of readers will want a similar set with a larger output. The analysis of circuit features, which was recently made in connection with our Speaker competition shows that all-wave tuning is now the most popular feature of design, and in the Corona this is the main point. Quality of reproduction came next in order of popularity, and the majority of listeners seem to prefer the ordinary triode-output stage in this connection, as it gives a really good output when suitably fed from the L.F. stages. To provide this feature in the Corona receiver "mixed coupling" is employed. That is to say, the first L.F. valve is fed from a resistance-capacity coupling, and the second from an L.F. transformer. Still further to level up the characteristic response a high resistance is joined across the secondary of the transformer. Therefore, if this receiver is fed from a suitable H.T. battery it should provide a quality of reproduction which is

AN IDEAL RECEIVER FOR THE BEGINNER AND THE 'OLD-HAND'

almost impossible to improve upon with an ordinary battery receiver.

Use Good Batteries

The problem of a suitable H.T. battery is, however, the main stumbling block. Many listeners are concerned with the initial outlay for the battery and purchase low-priced batteries of doubtful origin. The result is that when first connected, results may be all that are desired, but within a very few hours the capacity of the battery is practically exhausted and the voltage accordingly drops to a very low figure. You cannot expect to obtain good quality with 60 volts H.T., and it should be borne in mind that the majority of modern output valves will take 150 volts on the anode. Accordingly, the output valve should be provided with at least 120 volts and the correct value of grid-bias, when it may be relied upon to handle the output from the previous stages without distortion, and will provide the W.B. speaker, which is recommended for this receiver, with a quality and volume which will be hard to beat. Remember, however,

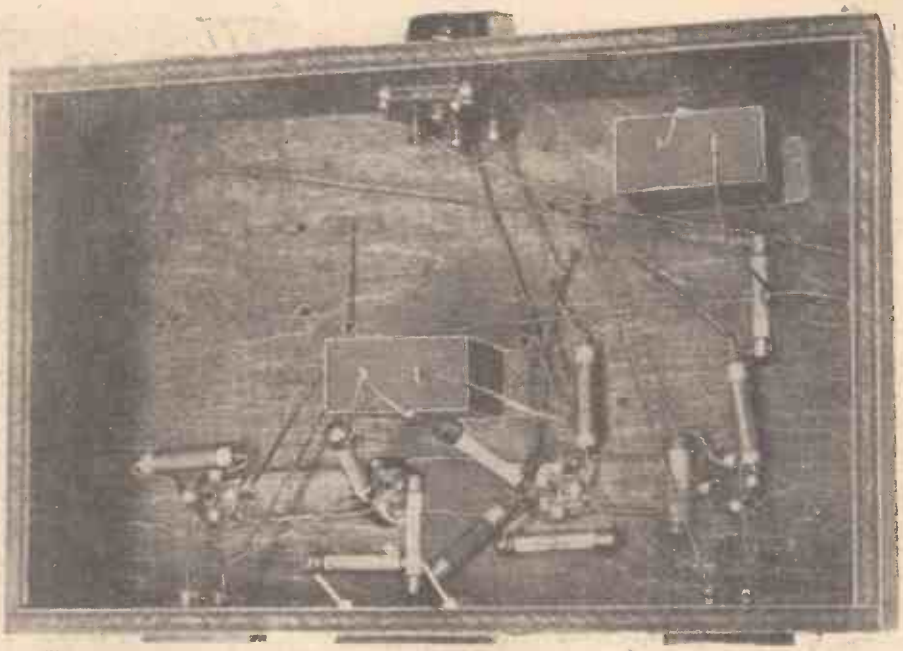
that the grid bias is as important as the high tension. Under-running the bias will result in the current passed by the valve rising to a high value. This may exceed the recommended emission for the valve and the life of it will be shortened, or the excess current will provide an unnecessary drain on the H.T. battery, and this will accordingly need replacing more often. A good meter will enable you to keep a check upon these points.

Using a Pick-up

In view of the fact that there are two good L.F. stages, many readers have written to ask whether it is possible to incorporate this particular receiver in a radiogram design. This is, of course, quite a simple matter, and no difficulty should be experienced in adding the wiring necessary to enable a gramophone pick-up to be used. The simplest way of incorporating this device is to fit another two-socket strip on the rear chassis runner, in a central position. Two short leads are then attached to the sockets and joined to each end of resistance R6 (the grid leak which is joined to V3). The accompanying illustration shows the additional socket strip and also the two leads which are required. The type of pick-up to use under these conditions is not very important, but it should be of the pattern which incorporates a volume control so that the very loud records may be reduced in strength to avoid overloading the output valve. Certain modern records—especially those of military bands and similar combinations—will be found to provide such a good signal that a single L.F. stage will often give adequate volume and, therefore, a volume control becomes a necessity.

Avoiding Break-through

If you adopt the method of connection indicated you will find it necessary in many cases to detune the broadcast section in order to prevent a powerful signal from breaking through when record reproduction is being obtained. This is not a difficult matter, but it may be overcome, if desired, by fitting a change-over switch. The only difficulty with this arrangement is that the additional leads required might introduce some form of trouble or signal loss. If you fit such a switch it should be mounted close to the additional socket strip, and the arm of the switch should be joined to the end of resistance R7, which is now connected to condenser C8 and resistance R6. (It should, of course, be disconnected from those two points before joining it to the switch.) One side of the switch is then joined to the junction C8 and R6, whilst the other side is joined to one of the pick-up sockets. The other pick-up socket should be provided with a flexible lead for insertion in the grid-bias battery, and the voltage will be the same as is normally used for the valve—G.B.—1. The two leads may, in fact, be joined together for this purpose. If there are any other points concerning this receiver which are not clear, do not hesitate to write to us, enclosing the Coupon which appears in this issue, and if a postal reply is desired, a stamped, addressed envelope should also be enclosed.



The white lines show the additional leads required for the connection of a gramophone pick-up. The additional socket strip is also shown.

19-48; 200-550; 900-2,100 metres

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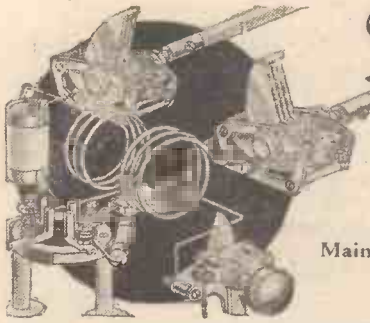
One 2-gang condenser, bar type .0005 mfd. (C1, C2) (Polar), 12s. 0d.
One S.M. drive, V.P. horizontal with station names (Polar), 6s. 6d.
One differential reaction condenser .0003 mfd. (C3) (B.T.S.), 2s. 6d.
One potentiometer, 50,000 ohms, with 3-pt. switch (R1) (B.T.S.), 4s. 6d.
One L.F. transformer, type AF8 (Ferranti), 11s. 6d.
Seven fixed condensers: Two 2 mfd. (C7, C10) (type 65); One .0001 mfd. (C6); One .0005 mfd. (C4); One .005 mfd. (C9); One .01 mfd. (C8); One .1 mfd. (C5) (tubular) (T.C.C.), 10s. 8d.
Seven fixed resistances: One 1 meg. (R3): Three .5 meg. (R2, R6, R8); One 100,000 ohms (R7); One 50,000 ohms. (R4); One 15,000 ohms (R5) Type F½ (Dubilier), 3s. 6d.
Four valve-holders, 4-pin chassis mounting type (Clix), 2s. 8d.
Two socket strips, A.E. and L.S. (Belling and Lee), 1s. 6d.
Two component brackets (Peto-Scott), 8d.
One Plymax chassis, 12in. by 8in. by 3in. (ready drilled for valveholder) (Peto-Scott), 5s. 9d.
Eight plugs: H.T.—, H.T.1, H.T.2, H.T.3, G.B.+, G.B.—1, G.B.—2, G.B.—3 (Belling and Lee), midget type, 1s. 4d.
Two spades, L.T.—, L.T.+ (Belling and Lee), 4d.
One fuse and holder, 100 mA (Microfuse), 1s. 6d.
Four valves: 210VPT (met.), 210DET (met.); 210DET (plain), 220P (Cossor).
One speaker, Stentorian Junior (W.B.).
One H.T. battery, 120v.; One G.B. battery, 9v.; One accumulator, 2v. (Exide).



Short Wave Section

A DE-LUXE SUPERHET

Main Features of Design of a Multi-valve Set Suitable for Experimenters and Overseas Listeners.

By W. J. DELANEY

IN America there is a type of short-wave receiver generally referred to as a "Communications Receiver," but this has not received the popularity it deserves in this country. The main reason is, probably, the costliness of the complete apparatus, but for all-round reliability this type of apparatus is hard to beat. Apart from the fact that it forms a most serviceable instrument for those who are anxious to listen regularly to amateur transmitters using code signals, there are many valuable features included in this type of apparatus which will also be found of value to those who are anxious to receive regularly long-distance broadcast stations. It therefore follows that this type of receiver is ideal for colonial listeners who must rely upon the short waves for their main broadcast entertainment. The principal features of this type of receiver are as follows: a superhet circuit is employed, with a separate beat-frequency-oscillator for use when receiving code signals. To these essentials may be added many incidentals, such as variable selectivity, controllable regeneration in the mixer stage, and many other features such as are found in normal short-wave design.

A Suitable Circuit

In the main, automatic volume control is not desirable for various reasons, and to ensure adequate selectivity, sensitivity and good signal-to-noise ratio, at least one signal-H.F. stage should be employed. The number of intermediate-frequency stages may be two or three, the latter giving higher sensitivity but generally resulting in greater difficulty in design. The L.F. stages will be governed by the quality and power required.

The mixer stage may utilise one of the modern pentagrid or heptode valves, although if the receiver is to be used down to 10 metres or so there is much to be said for the separate oscillator. This is the general type of circuit which is employed and it enables certain features to be made use of which give increased stability, and although further controls are needed, the apparatus is capable of giving a wider scope to the user. The best all-round circuit of the type mentioned will, therefore, have a signal-H.F. stage, first detector, oscillator, one I.F. stage, second detector, and output stage, with the separate beat-frequency oscillator capable of being connected or switched in as required. A suitable circuit is given in Fig. 1 from which it will be seen that band-spread tuning is recommended. As the coils will doubtless have to be home-made, it will not be practicable to gang both band-setters and band-spreaders, and this may entail some difficulty in regard to layout and design.

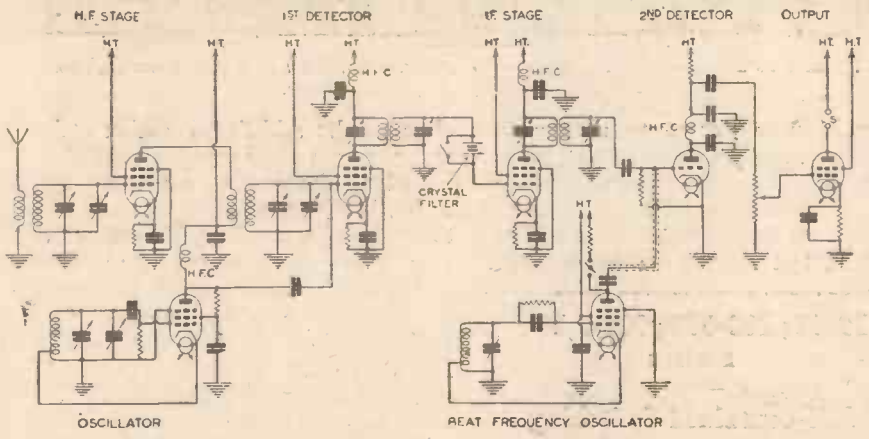


Fig. 1.—The theoretical circuit in outline. The H.T. positive points will be joined to the H.T. output through decoupling components.

What to Gang

Three separate adjustments will be required for the tuned circuits or, alternatively, small trimmers or padders may be joined across the coil terminals inside the coil formers.

After experiment my preference is to gang the band-spreaders and use separate band-setters, although this means four adjustments for tuning alone. Small trimmers may be joined across, say, the first detector and oscillator coils, with the band-setter for the aerial tuner mounted on the panel as a variable control in order to reduce the number of panel controls. The sensitivity of the first three valves may be controlled by using H.F. pentodes of the variable-mu type and fitting a bias control, whilst the L.F. gain may be controlled by the standard type of L.F. volume control. The pitch of the beat-note produced by the B.F.O. may be controlled by means of a variable condenser and this will add a further knob to the panel which, it will already be noticed, is assuming rather large dimensions. It will be obvious, however, that with all these separate controls at one's disposal the receiver is capable of being adjusted for every possible condition and thus may be relied upon to give a very high performance. Although batteries could be used to operate a receiver of this type, the high consumption will prove a stumbling block, and therefore it will be assumed that this type of receiver will only be used where mains facilities are available. The mains unit may be built as a separate section, preferably with the loudspeaker mounted upon it, although if the overall size of the receiver is not of great importance it may be mounted on one end of the chassis.

Crystal Unit

One further addition is often found in this type of apparatus, and that is a crystal filter, connected generally in the grid circuit of one of the I.F. stages. To cut this out when it is not required a simple on/off switch is joined across it so that it may be short-circuited. So much for the general considerations of the design. The receiver should preferably be built on a metal chassis, using stout gauge aluminium for this purpose, and cutting pieces of the metal to form screens to separate the various stages. In spite of the fact that the I.F. transformers will be in metal cases, it is advisable to isolate each separate I.F. stage, placing the I.F. valve and transformer in each section of a screen. A layout of suitable form is shown in Fig. 2, although there may be several modifications of this according to the type of receiver eventually decided upon. To ensure reliability a metal cabinet should be used in which to house this type of receiver, and by this means you will avoid direct pick-up on the wiring—a common cause of noise and interference.

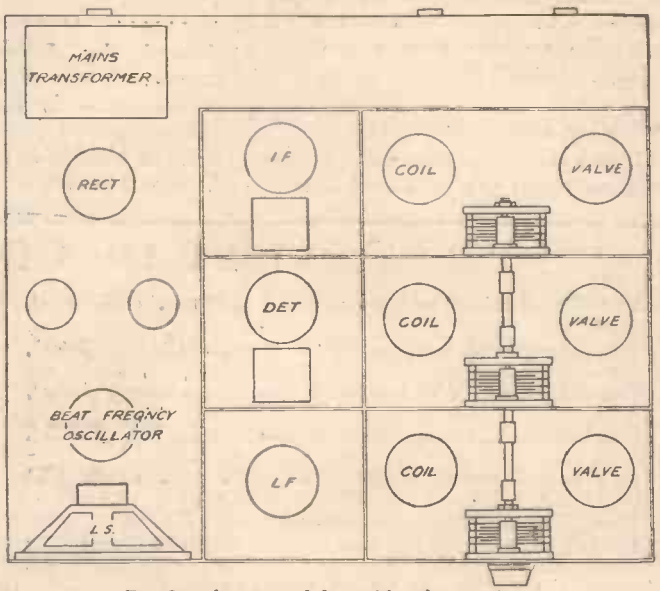


Fig. 2.—A suggested layout for the superhet.

Leaves from a Short-wave Log

The Moscow October Broadcasts

SLIGHT alterations have been made in the schedule of the Moscow RNE station working on 25 m. (12 mc/s). On Mondays, Wednesdays, Fridays and Sundays broadcasts in foreign languages are now carried out from G.M.T. 01.30-02.15; on Sundays at G.M.T. 14.00, and on Wednesdays, Thursdays and Saturdays at G.M.T. 21.00.

More War News from China

ZBW3, Hongkong, on 31.49 m. (9.525 mc/s), is on the air on week-days at the following time, viz., G.M.T. 04.30-06.30. In addition, on Mondays and Thursdays a transmission is made between 09.00-15.00; on Tuesdays, Wednesdays and Fridays it starts one hour earlier, and on Saturdays it is extended one hour. On Sundays the programme is regularly given from G.M.T. 02.00-06.30, and again from 08.00-14.30. A special war news bulletin is transmitted at G.M.T. 11.30 daily. At G.M.T. 14.00 you may hear a time signal of chimes of the "Big Ben" type.

European Listeners Hear Fiji Calling

VPD2, Suva (Fiji Isles), now definitely down on 31.45 m. (9.54 mc/s), gives a gramophone concert daily from G.M.T. 10.30-12.00. The interval signal consists of two strokes on a gong, and the station closes down with the *Song of the Islands*, followed by *God Save the King*. The call is put out fairly frequently in the course of the broadcast.

The Argentine Propaganda Programmes

Through LSY, Monte Grande, on 16.56 m. (18.115 mc/s), a 10 kW transmitter used for a public telephone service with Europe, special talks on the activities of the Argentine Republic are radiated between G.M.T. 22.00-23.00 every Monday and Friday. A relay of this broadcast is also made simultaneously by LRX, the *Radio el Mundo* station at Buenos Aires, operating on 31.06 m. (9.66 mc/s). This station, in the ordinary course of events, takes the LRI medium-wave radio entertainments daily from G.M.T. 14.30-04.30. It may be identified by its peculiar and very distinctive interval signal of four notes on a vibraphone.

Madagascar's New Call-sign

The Tananarive station previously known under call-sign FIQA is now registered in French lists as FIU, working on 31.5 m. (9.523 mc/s). During the winter months the station will be operating daily between G.M.T. 03.00-05.30 and from 14.30-15.15. Call: *Ici Antananarive, Station Française de radiodiffusion Coloniale et Equatoriale*.

New U.S.S.R. Transmitter

Listeners report the reception of a programme of talks in the French language emanating from RAG, Kiev (U.S.S.R.), on 24.69 m. (12.15 mc/s). This would appear to be a new transmitter recently brought into action.

Another S.W. Relay of P.T.T. Programmes

Special broadcasts made by the Poste Colonial, Paris, for French Nationals overseas, and of interest to other listeners, especially on the American continents, are simultaneously transmitted through TYEI, Paris, a 23 kW station operating on 16.58 m. (18.09 mc/s).

Java's Night Broadcast

PMN, Bandoeng (Java), in addition to special transmissions which are heard in Europe during the afternoon hours, will be found transmitting a radio concert for "local" consumption nightly from midnight onwards. At G.M.T. 00.20 you may pick up chimes giving the time signal for 7.0 a.m. (local time). PMN, Bandoeng, works on 29.24 m. (10.26 mc/s).

India's Proposed Short-wave Stations

In addition to the construction of medium-wave transmitters at Madras, Lahore, Dacca, Trichinopoly and Lucknow, All-India Radio proposes to erect short-wave stations at Madras and Delhi, and to replace by more powerful plant those which have been radiating at Calcutta and Bombay.

Nova Scotia Comes Through

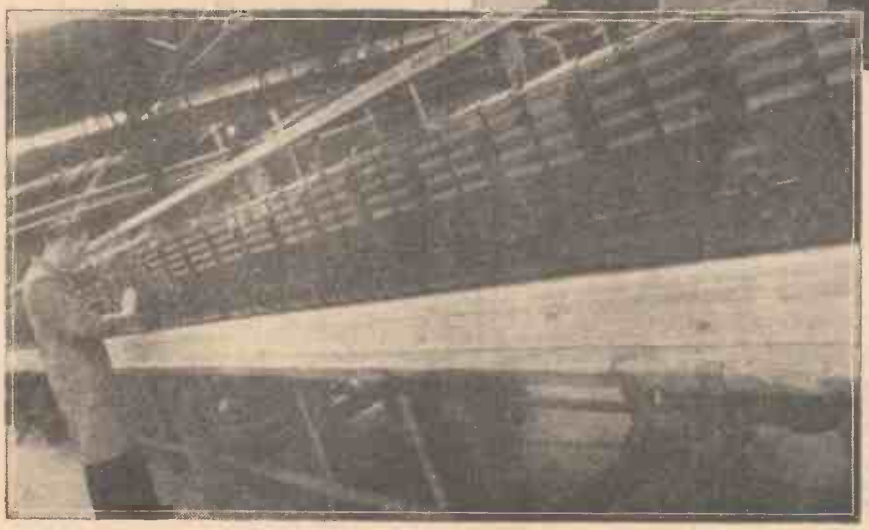
What would appear to be the resumption of broadcasts by an old short-wave transmitter was observed a few nights ago when the call CJCB, Sydney, was logged on 49.89 m. (6.01 mc/s). CJCB is a medium-wave transmitter situated at Sydney (Nova Scotia) and working on 241.9 m. (1,240 kc/s). The broadcast was apparently being relayed by CJCX, which was regularly on the ether a year ago.

HOW THEY ARE MADE!

The hydraulic pumps on the right build up the great pressures needed to operate the Ekco cabinet moulding presses. On the left are pressure cylinders.

To ensure a rigid chassis for the receivers, the chassis is bent and the edges welded, whilst various shields, screens, etc., are also spot-welded into position. This avoids noises due to poor contacts on the earth side.

Corner of an Ekco research room where highly-skilled engineers are constantly experimenting with new ideas and designs. The most elaborate apparatus is required in a laboratory of this nature in order to conduct the many tests which are necessary.



A modern system employed for checking Ekco radio sets—the "Soak" Test. An overhead "live" line supplies A.C. current as the sets move slowly along, towing their mains leads with them. This test under working conditions ensures that all receivers are faultless when they leave the factory.

HOW "IN TOWN TONIGHT" IS MADE

All Day—Every Day—Morning, Noon and Night—The B.B.C. Searches for Novelty and Talent!

DURING the next few months several hundred people are going to broadcast for the first time—and none of them knows it. They have yet to be found by the squad of B.B.C. scouts in search of interesting characters and newsy celebrities who will be invited to talk about themselves, their work, their experiences, in one of the most popular features of Saturday evening broadcast programmes—"In Town Tonight."

On October 30th its fifth season begins with the 132nd edition. It has already brought to the microphone more than one thousand people, throwing upon each for a few minutes the spotlight of public attention; presenting, week by week a kaleidoscopic cross-section of life here, there, and everywhere. Along a carpeted corridor on the sixth floor at Broadcasting House, there is a foyer where dustman and rajah, film star and chimney sweep, tribal chief and flower-seller, explorer and night watchman, have sat together awaiting their call to the studio. . . .

Altogether almost every trade, profession, calling, occupation, has been represented during the run of "In Town Tonight." Though it may not be generally known, every programme is recorded and radiated subsequently to Empire listeners.

A. W. ("Bill") Hanson, the man behind each broadcast, will again be editor during the forthcoming season, and "Mike" Meehan, his right-hand man, recently discussed plans and recalled some of the countless good stories of things that have happened behind the scenes of "In Town Tonight" broadcasts.

"First of all," he said, "we should rather like to make the point that 'In Town Tonight' is going to be more topical than ever, and we hope to include in it a good percentage of people in the news. We shall also welcome with open arms visitors from the Empire overseas who have good 'human' stories to tell. We want to get in touch with interesting people from the provinces, too; once they have been discovered it might not be easy for them to come to London for the broadcast, but we can see to it that when necessary their voices can be sent by land line to Broadcasting House from one of the Regions. If all goes well, a number of outside broadcasts will be heard during the programmes.

No Records

"Recordings? We never use them—that is one of our few boasts, although quite a lot of people have suggested from time to time that such-and-such an item was broadcast from a disc. Quite wrong!

"Almost every week we use three studios for 'In Town Tonight'—studios grouped together rather in the shape of a clover leaf. There is a central listening cubicle from which the producer and announcer can keep an eye on each microphone. Upstairs on the fifth floor, a dramatic control panel links the output of every studio, the effects room, and microphone turn-tables which are used only for reproducing incidental music. Now and again we have also found St. George's Hall useful—once for a man playing a post horn and again for 'the porter with the loudest voice.' They could let themselves go in the Hall, which was big enough to cope with their—er—outbursts.

"Several people not actually on the staff of the Corporation act as scouts for characters who might usefully find a place in the programme. And a large number of listeners write to us and suggest themselves

as broadcasters; we have actually used many of them. Besides keeping close watch on the news columns of the papers, we get passenger lists from shipping companies, so that we know in advance of the interesting folk that are reaching this country from abroad, and we keep fairly close check upon arrivals at Croydon aerodrome from the Continent, and so on.

"There is good hunting to be had at big exhibitions, and I, for one, have spent many hours at them looking for the man or woman who really has the material we want. A few moments' conversation is usually long enough to disclose whether one's search is ended. Of course, we don't say who we are until we have found the right person. But, strolling from stall to stall, chatting with people here and there, often leads us to the very story we are after. Having found it, the very mention of 'In Town Tonight' is usually enough to make anyone keen to broadcast.

"It is because of this willingness, perhaps, that I particularly remember a very 'sticky' quest I once made. There had been some severe flooding in Kent, and I went to the village most affected and tried to find a villager who would talk about it in 'In Town Tonight.' For hours I could find nobody to do it; no one wanted to say anything that might damage his village. But at last when I *did* get an old chap to agree to come to the microphone, all his cronies were only too eager to try to steal his thunder.

"It is curious, but true, that people like dustmen, chimney sweeps and night watchmen, are far less scared by the microphone than the typical 'little man' from Suburbia. I suppose the reason is that they have a pretty small circle of friends, and consequently fear little leg-pulling; whereas people who are well known to many business and social acquaintances feel that they have to watch their words or put up with a lot of criticism—good-natured though it may be—as a result of their broadcast.

"When 'In Town Tonight' was revived for five nights during Coronation week, one of the most interesting characters who came to the microphone was Chief Yeta of Barotse, Northern Rhodesia. He specially asked if he might broadcast, in his native tongue, a message to his followers in the middle of Africa. We agreed, and about a fortnight before the broadcast took place he had special wireless sets rushed out to his part of the world in the middle of the jungle, so that hundreds of tribesmen, squatting round, could hear their Chief speak. Afterwards we had a cable saying that reception was marvellous, and that the natives were extremely excited, more particularly because they were reassured that their Chief would come back to them; a cause of great jubilation, as it had been feared that he had gone so far away from home that he might never return. . . .

"I remember that two or three years ago I went out to find two of the old flower-sellers in Piccadilly. I came across them and invited them to broadcast. They were quite pleased about it, but when it came to programme time, one was frightfully nervous—shivering and perspiring at the same time. Her companion, on the other hand, was perfectly calm. We did all we possibly could to assure the frightened one that there was nothing to be scared about, but she

went on shaking and became speechless. We left the two women together for a few minutes, and we could not help hearing the calm one saying, confidentially to her friend: 'Emma, didn't you never have measles when you was a kid?' 'Yus,' said Emma. 'Well,' said the other one, 'you got over that; you'll get over this.'

"That absolutely did the trick. With only a few seconds to go, the flower-seller who had been quite a pathetic object, had fully recovered and was joking and chatting with everyone. The broadcast was a great success."

TWO-WAY 'PHONE EXTENSION

A Novel Use for an Extension Listening Point

THE majority of listeners are now using an extension speaker with their receivers, and few realise that when this combination is employed everything is in position for two-way communication between one room and another. The requirements for such a device are simply two loudspeakers and an amplifier, the speakers acting alternately as reproducers and microphones. In the normal position for listening in another room the extension speaker will act as a reproducer, and if a microphone is joined to the pick-up terminals of the receiver it would be possible to talk to anyone in the room in which the extension speaker is situated. Therefore, all that should be required to use the speaker as a microphone is some form of change-over switch to join the self-contained speaker to the pick-up terminals. This should not be difficult, and the exact arrangement will depend upon the circuit employed, and whether or not the speaker transformer is used as an output choke when the extension speaker is in use. Similarly, to talk back from the distant listening point, the extension speaker must be joined to the pick-up terminals and the original speaker re-connected to the output terminals. There are two methods of doing this. In one case the operator at the distant listening point will be able to make the change, and for this purpose additional leads will have to be taken to that point in order that the leads may be changed as desired. In the other case, the operator at the receiver end will make the change, and this will avoid the necessity of additional extension wiring. This scheme will also give more stable results, and radio results will remain unimpaired. The rough scheme is shown in outline in the attached diagram, and the exact manner of making the changes must be left to the individual case. It will be seen that the scheme follows the arrangement now commonly employed commercially for room-to-room communication systems which are in growing use. It is unnecessary to outline the many uses which such a scheme offers to listeners, which includes the calling of members of the family to meals, making requests for various articles and thereby avoiding journeys between one room and another, or giving orders to domestics where the extension speakers are installed in servants' quarters. In the latter case there may be more than one extension speaker, and by a suitable arrangement of the change-over wiring it will be possible to effect not only communication between the room in which the receiver is installed and a single distant listening point, but also between separate extension points.

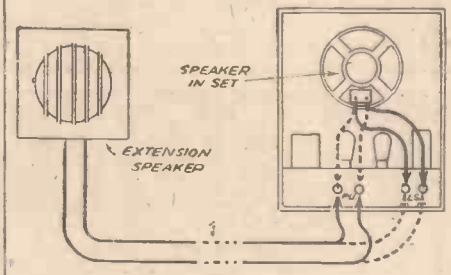


Diagram showing how the two-way phone scheme operates.

TOPICAL NOTES

Popularity of Short-wave Listening

THAT many persons are having electric lighting mains installed in their homes in order that they may enjoy the pleasures of improved radio reception, was a fact disclosed in a recent survey, according to Philco Radio officials. It is estimated that more than 500,000 homes were wired for electricity in the past year. A vast majority of these have been modernised in order that the owners can use wireless receivers on their new mains. The desire for electric lighting of the home was found to be a secondary reason for the improvement in many instances.

Figures have been compiled to show that there are approximately ten million homes in which it is reasonable to suppose wireless sets might be installed. As there are now more than eight million licences for receivers issued by the Post Office, many persons feel that the saturation point has almost been reached.

However, this reasoning is not based on fact. Philco officials claim that practically two-thirds of its output is now going into a replacement market. Many former battery set owners are now purchasing mains sets and especially all-wave sets. The desire to be independent of entertainment originating solely from B.B.C. stations has caused more than 75 per cent. of the radio audience to become acutely short-wave minded. Short-wave listening has ceased to be a fad engaged in by those who sit up all night trying to bring in "just one more station." It has become a serious business of logging stations which broadcast good entertainment and features which command attention from one week to the next.

Modern Condenser Construction

WE recently came across a variable condenser about ten years old, with spacing washers between the vanes fully ⅛in. thick, which serves to accentuate the remarkable progress made in the design of variable condensers. In a modern twin gang condenser which we examined, the clearance between the moving and the fixed vanes was only .0285in, which is just a shade more than 1-40th of an inch. These condensers are die-cast, and in order to get a perfectly uniform surface it is necessary to pump the metal into the die at a pressure of 1,000 lbs. to the square inch.

Preventing Transformer Breakdowns

A NUMBER of complaints have recently come to our notice of premature breakdowns in the transformers attached to moving-coil loudspeakers. Modern battery sets accommodate batteries in the same compartment as the loudspeaker, and care should be taken to see that the accumulator is placed as far away from the loudspeaker as possible. If the accumulator is placed quite close to the loudspeaker, trouble is likely to follow. It is admittedly a very elementary practice, but we understand from trade sources that carelessness in this direction has certainly manifested itself.

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.

D. L. (N.W.6). We cannot supply a blueprint but hope to publish an article on the subject in the near future.

H. B. G. (Llanelly). The only set we can recommend is the All-World Ace—a three-valve all-wave A.C. set. The blueprint is number P.W.80, price 1s., and the construction was described in our issue dated August 28th last.

P. H. (Birmingham). 465 kc/s is the most useful intermediate frequency for the type of set mentioned by you. We note your comments on a receiver design.

W. P. (Wolverhampton). For your purpose we suggest an H.F. Detector, L.F. Push-pull circuit, with all-wave coils. We cannot supply a blueprint of such a set, but you could no doubt modify the All-wave Corona 4 to meet these requirements.

R. M. J. (Redhill, Surrey). We regret that we have not used the coils mentioned by you, but they could, no doubt, be incorporated in the Prefect design, for which a blueprint is available.

E. W. S. (Heaton). We regret that we cannot now trace the firm in question and therefore think they are no longer in business.

T. P. (Dennistoun). It is first necessary to decide what type of noise causes the trouble. Lead-in or earth filters may not cure it in your case as it may be mains borne. Screened leading-in cable or transposed feeders will enable the aerial to be erected out of the field of interference.

C. J. H. (Bradford). It should be possible to carry out the idea outlined in your letter, but we have not tried it out and cannot therefore give any definite guarantee. Care would have to be taken to avoid losses and other difficulties in the switching.

W. E. W. (Leeds). We do not think the makers would have put the set out in the condition indicated in your letter. We suggest you get into touch with the nearest agent of the firm with a view to having the set overhauled.

A. R. H. (Manchester). Your arrangement is quite in order theoretically but the input transformer is of the wrong type. You will have to remove this and replace it with a push-pull input transformer, with a ratio of about 3 to 1.

M. C. (Dagenham). We regret that we cannot supply blueprints of commercial receivers. We suggest you write to the makers for details.

W. F. L. (Christchurch). The Prefect S.W. Three is about the best set we can recommend for your requirements. We cannot supply blueprints of transmitting apparatus.

A. C. (N.W.3). The Signet Two, blueprint P.W.76, is the most suitable for your requirements.

R. W. G. (Dover). The blueprint you require is number P.W.72, and full details were given in the issue dated 5.12.36.

W. B. (S.E.26). We regret that we cannot recommend a blueprint for your purpose, and the best plan is to dispose of the present set and obtain new parts for a more up-to-date receiver. Your present results may be due to a faulty part and by incorporating this in a new set you would only be transferring the trouble.

F. G. B. (E.3). We do not anticipate modernising the set in question, but will endeavour to assist you if you will write and state just what troubles you are experiencing. The hum you refer to was no doubt instability due to the low voltage on the filaments. You do not state the current output of the mains unit and we cannot therefore state whether it is suitable for the set in question.

BOOK RECEIVED

Music Programmes, Autumn, 1937

THE B.B.C. have just issued a booklet containing full particulars of its Music Programmes and other general information concerning music to be broadcast during the fourth quarter of 1937. The pamphlet includes details of the new series of Symphony Concerts—the most important event of which is the return of Toscanini, who will conduct two concerts; the Sunday Orchestral Concerts; and the most important "outside broadcasts," such as those of the Royal Philharmonic Society, the Liverpool Philharmonic Society and the Hallé Society.

"B.B.C. Music Programmes, Autumn 1937," may be obtained free and post free on application by post to the B.B.C. Publications Department, at 35, High Street, Marylebone, W.1. Envelopes and postcards should be marked "Pamphlets" in the top left-hand corner.

OUR FREE CATALOGUE SERVICE

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL AND AMATEUR WIRELESS, Geo. Newnes, Ltd., Tower House, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.

ARDENTE SOUND SYSTEMS

IN an attractive catalogue recently issued by Ardente Acoustic Laboratories, Ltd., particulars are given of the full range of Ardente Sound Amplification Apparatus and Accessories, which are widely known for their efficient and trouble-free service. No matter where, or on what scale a public address equipment is required an "Ardente" outfit will meet the requirements. For small halls or restaurants there is the "Multi-diffusion" system, and for the amplification of band music the "Equi-diffusion" system is applicable. This system restores the balance, and gives brilliance and depth without the presence of the amplifiers being detected. Another system, the "Unitype," is suitable for stadiums, swimming pools, etc., while for addressing and entertaining large crowds, and for use at railway stations, there is the "Ardente" Super-power Sound Amplifying System, which includes an amplifier pack fitted with a radio tuner unit; a mixer pre-amplifier controlling microphones and gramophone inputs; a driver amplifier, and a power bank. Other systems detailed and illustrated in the catalogue include a Centralised Radio Relay System, suitable for hospitals, blocks of flats, etc.; a School Broadcasting System, designed for relaying radio programmes, speech or gramophone recordings to school class rooms, etc.; various portable systems for use with dance bands, travelling shows, and public speakers; and a Mobile Public Address System suitable for police traffic control cars, advertising, etc. Particulars are also given in the catalogue of the "Ardente" two-way loud-speaking inter-communication system suitable for use between executives and for inter-departmental work. At the end of the catalogue a range of high-gain amplifiers, and various accessories including microphones and stands, loudspeakers (indoor and outdoor types), turntable units, and rotary converters, are listed.

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 Tribute from Mitcham

SIR,—Many thanks for the book prize, which I have just received.

While writing I should like to comment on the issue of your journal for September 25th; it is to me one of the most interesting and informative I have seen, although PRACTICAL AND AMATEUR WIRELESS is always good value. The articles that particularly interest me are "The Amateur Set Designer," "PM or Energised?" and "What Output Shall I Use?" as to me the greatest fun in wireless is to take an odd set of components and make a set that will work.—W. DEVONSHIRE (Mitcham).

New S.W. Transmitter in Guatemala City

SIR,—Readers of PRACTICAL AND AMATEUR WIRELESS may be interested to know that the Camden, New Jersey, office of the Radio Corporation of America have announced the opening of a new RCA 10 kW short-wave broadcast transmitter in Guatemala City. This transmitter is a duplicate of XEWW in Mexico City, which was opened a year or so ago. The operating frequencies of this station are 9,685, 11,760, 15,170 and 17,800 kilocycles. At the present time the broadcast is scheduled from 7 to 11 Central Standard Time, which would make it somewhere between 1 and 5 a.m.

Our headquarters at Camden are interested in receiving reports of the reception of this station, and I thought that readers who listen to these transmissions might like to send reports to them.—RCA PHOTOPHONE, LTD. (Electra House, Victoria Embankment, London, W.C.2).

A Five-valver for Overseas

SIR,—I have read Mr. D. D. Wiggill's letter in your issue dated July 3rd, 1937, and Mr. D. T. Smith's letter in your issue dated July 24th, 1937. As an amateur residing in India, and as one voicing the wishes of several other amateurs here, I wish to make the following suggestions.

In India we are regularly hearing the Empire Broadcasts, and we are going to have new transmitters erected in the principal cities in India. The wavelengths would be 25 to 100 metres on the short waves and 190 to 550 metres on the medium waves. We do not want a receiver for long-wave reception. I would like you to publish details of three set designs embodying the following features:

Five valves—superheterodyne—wave-change switching for the different wave ranges; 9 to 100 metres and 190 to 550 metres in 3 or 4 wavebands.

Since the facilities for the supply of electrical energy differ in different parts of India, I would suggest that there should be 3 types of receiving set as follows:—

(a) H.T. by means of dry batteries.

(b) A six-volt battery operated receiver with the necessary apparatus for the H.T. from the same source of supply, and

(c) An AC/DC set to be used in towns where there is a supply of electricity from the mains.

Constructional details of the above types of set will prove very useful to us in India.—P. GANESA IYER (Devakotta, Ramnad Dist., S. India).

SIR,—I should like most strongly to support the suggestion of Mr. Wiggill for a 5-valve S.W. circuit. I have found that anything with less than 5 valves is of little programme value for three-quarters of the year in these latitudes; also that any frequencies below 6,000 kc/s are mostly "noise." There should certainly be a battery version. The L.S. and suggested vibratory rectifier (if used) should be separate from the set.

With regard to the latter, Mr. Damigan must be under a misapprehension, as I obtained one from Messrs. Bulgin by return of post.—C. F. ARMSTRONG (Kitale, Kenya Colony, S. Africa).

Progressive Superhet Construction

SIR,—Following up M. H. Walters and J. F. Hitchcock in recent issues, I also would like to see in the near future a series of articles on progressive superhet construction.

CUT THIS OUT EACH WEEK

Do you know

—THAT as a general rule, hot sealing wax should not be used to seal a trimmer.

—THAT variations in tuning can sometimes be traced in a modern set to movement of inter-circuit leads due to vibration from the loud-speaker.

—THAT friction between metallic surfaces in a short-wave set can often produce a noisy background.

—THAT this may be overcome by using a lubricant, but if electrical contact has to exist between the two surfaces a non-inductive flexible connection should be made.

—THAT an earth lead should not be permitted to come into contact with an earthed surface until it joins the actual earth connection.

—THAT non-metallic electrolytic condensers should not be placed near power valves or other sources of heat unless adequate ventilation is provided.

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.

I have your "Wireless Constructor's Encyclopædia" and also "Everyman's Wireless Book," two excellent and very valuable publications I must admit, but, being complicated and involved, the superhet, to me so far, remains somewhat of a mystery.

By the way, your "Simple Formulæ" page is excellent.—A. S. CRESSEY (Newcastle-on-Tyne).

Programmes in Esperanto!

SIR,—I have read your recent introduction to the Corona All-wave set, and noticed the remark that all programmes be broadcast in Esperanto. I agree with you that this is hardly practicable, but at least the small announcements, which are at present given in only three or four of the chief languages, could be also given in Esperanto. This language is understood by many radio fans who know no foreign languages, and if my suggestion were carried out, logging of foreign stations would be made much simpler to a large body of listeners.—WALTER FARRAR (Leicester).

A Good S.W. Log from Chiswick

SIR,—I have been a reader of your excellent publication for some years, and having seen many logs submitted from various parts, I enclose mine from Chiswick, received on loudspeaker on the 20-metre band between 1/9/37 and 26/9/37. My receiver is a 6-valve superhet with matched A.W. aerial, 50ft. high, running due E-W.

Africa: FA3HC, FA3JY, SU1KG, SU1SG, SU1RO, CN8AL, CN8AM, CN8MB, VI2BA, FT4AR, FT4AM.

Australia: VK2XU, VK3KX, VK3WA.

S. America: PY2AL, CE1AO, HK3JA, HC1FG, HC1JB, YV5AA.

N. America: 15 stations, including LU3EJ, NY2AE and CO2AY.

WI's—18 stations; W2's—17 stations; W3's—17 stations; W4's—12 stations; W5's—2 stations; W6's—4 stations; W8's—7 stations; and W9's—7 stations.—E. H. WALKER (Chiswick).

A "Pirate" on the 25m. Band

SIR,—Perhaps a reader can help me and maybe many other short-wave enthusiasts. For some weeks now I have continually listened on the 25-metre short-wave band and heard a "pirate" relaying the record hit of yesterday, "Ramona"; and also a similar tune over and over again. There are no announcements and no call. The time was between 8 and 9 any evening. I would be interested if any reader could help in finding the mystery station's identification.—S. C. FISHER (Billericay, Essex).

Logged at Watford

SIR,—As I have not seen a short-wave log from my district for some considerable time, I am submitting my humble attempt at DX reception. Most reception was on a 22-48 metre coil, tuned by a double-spaced .0005 mfd. condenser with an 8-1 slow-motion drive, and the stations were received mostly in daytime.

RV96, HAT4, IDJN, RV59, OLR4A, W8XK, DJA, 2RO, GSD, GSB, JZ1, SPW, HBL, HBJ, PCJ, DJD, TPA4, OER2, HBP, CT1AA, W2XAF, TFJ, W2XE, RNE, EA8, and LZA.

In addition to these I have picked up many amateurs on 40 metres. The receiver used is an 0-v-0 with a dipole aerial, consisting of two expanding copper wire aerials pulled out to 15ft. each and directed W.N.W.—E.S.E.—J. NORWOOD, Junr. (Watford).

Impressions on the Wax

H.M.V.

RICHARD CROOKS, the well-known American tenor, makes a welcome return to the H.M.V. lists this month with two of Stephen Foster's famous plantation melodies, "My Old Kentucky Home" and "Old Folks at Home." They are sung with an effective chorus, The Balladeers, to the accompaniment of piano and banjo on *H.M.V. DA* 1578.

Nelson Eddy, usually associated with songs from the films, sings two ballads this month that have, so far, not found their way to the sound screen. They are "Trees" and "By the Waters of Minnetonka," which last song was a great favourite of the late Dame Melba. The number of the record is *H.M.V. DA* 1579.

Peter Dawson sings a charming setting by Travers of the opening stanzas of Shakespeare's "Twelfth Night," "If Music be the Food of Love," coupled with the vocal transcription of the "New World" Symphony, "Goin' Home" on *H.M.V. B*8620.

Songs from the Shows

THERE are some excellent records this month from Ivor Novello's new Drury Lane success, "Crest of the Wave," which has some fine songs. The records are a selection from the show by the Drury Lane Theatre Orchestra on *H.M.V. C* 2921, "If You Only Knew," sung by Dorothy Dickson and chorus, and "Why Isn't It You," sung by Dorothy Dickson and Walter Crisham—*H.M.V.* B 8623, and finally "Haven of Your Heart," sung by Olive Gilbert, and "Rose of England," sung by Edgar Elmes, with chorus, on *H.M.V. B* 8624.

The London Palladium Orchestra plays a selection (with vocal refrain) from the new show "London Rhapsody," on *H.M.V. B* 8626, and Billy Mayerl conducts the Shaftesbury Theatre Orchestra in a selection from "Crazy Days," Marjorie Browne and Fred Conyngham being the vocalists—*H.M.V. C* 2920.

New Films

NEW films are well represented. Paul Robeson, who has recently returned from a visit to Russia, sings "Deep Desert" and "My Way," from "Jericho," on *H.M.V. B* 8621. Keith Falkner, who stars in the film "Mayfair Melody" sings for his songs, "San Diego Betty" and "Without the Moon," on *H.M.V. B* 8618, and "Wings," coupled with "A Song Doesn't Care"—*H.M.V. B* 8619.

Dan Donovan's pleasant voice suits "September in the Rain" and "Little Irish Home" on *H.M.V. BD* 448, and another attractive coupling is "Shake Hands with a Millionaire" and "Night Over Shanghai," both sung by Monte Rey on *H.M.V. BD* 451.

Max Miller adds to his growing record repertoire with two of his latest "Maxims," "The Old Oak Tree" and "Put It Down," on *H.M.V. BD* 450.

"Artist's Life"

MAJOR and Minor have commenced a very happy association, and have made a record of their first successes, "Tricky Little Tune" and "A More or Less Volga Boat Song," on *H.M.V. BD* 447. Alex McGill is Minor, Fred Yule being Major.

Mention must also be made of the splendid record of "Artist's Life" waltz by the Boston Promenade Orchestra—*H.M.V. C* 2919, "On the Avenue" selection by Louis Levy and his Gaumont-British Symphony—*H.M.V. BD* 452, and two light pieces, "Blue Skies" and "Siciliana," played by Barnabas Von Geczy's Orchestra on *H.M.V. B* 8622.

Light piano records include "Tea for Two" and "Keepin' Out of Mischief Now," by the famous hot pianist "Fats" Waller—*H.M.V. B* 8625, and "Midnight in Mayfair" and "Deep Purple," played by Vera Guilaroff on *H.M.V. BD* 449.

Reginald Foort is very much at home with the B.B.C. Theatre Organ in selections from two new films—"The Singing Marine" and "Broadway Melody of 1938."

New Dance and Swing Music

THERE is a very big list, which includes Jack Hylton and his Orchestra playing "Gangway" and "Moon or No Moon," on *H.M.V. BD* 5255, and "When You Gotta Sing" and "Lord and Lady Whoozis" on *H.M.V. BD* 5256—all four tunes being from the film "Gangway." "I Know Now" and "Yours and Mine"—*H.M.V. BD* 5261, and "My Cabin of Dreams" and "So Rare"—*H.M.V. BD* 5263, are all played by Roy Fox and his Orchestra. Jack Harris and his Orchestra, which is fast becoming a very popular band in the West End, have recorded "Stardust on the Moon" and "Let Us Be Sweethearts Over Again," on *H.M.V. BD* 5264. Also "Caravan," coupled with "Toy Trumpet" on *H.M.V. BD* 5265. A newcomer to the H.M.V. list is Billy Mayerl and his Orchestra, who have recorded two numbers from "Crazy Days"—"Love was Born" and "Stranger in a Cup of Tea," on *H.M.V. BD* 5268. Ronnie Munro and his Orchestra contribute two records this month—"If You Only Knew," from "Crest of the Wave" and "A Little Co-operation From You," from "Going Greek"—*H.M.V. BD* 5266, also "Moon at Sea," and "You Needn't Have Kept it a Secret," on *H.M.V. BD* 5267.

For swing enthusiasts Benny Goodman and his Orchestra have recorded "Peckin'" and "Can't We be Friends," on *H.M.V. B* 8615. The Quintette of France offer "Runnin' Wild," and "Miss Annabelle Lee," on *H.M.V. B* 8614. "Stomp" and "Givin' the Vibres" have been recorded by Lionel Hampton and his Orchestra on *H.M.V. B* 8616, and Benny Goodman Quartet add "Avalon" and "The Man I Love" on *H.M.V. B* 8617.

FREE ADVICE BUREAU

COUPON

This Coupon is available until October 30th, 1937, and must be attached to all letters containing queries.

PRACTICAL AND AMATEUR WIRELESS, 23/10/37.

NEW RADIO CLOCKS

Details of the Improved Range of Radiochron Receivers and the British Tempovox Radio Clock.

WE recently reviewed the Radiochron receiver, which combines an A.C. synchronous mains clock with a broadcast receiver. Several new models of this receiver are now available, and the most prominent of these is an improved version of the original set, into which has now been incorporated tuning for a short-wave range from 16 to 31 metres and the long-wave band. In addition, an improved aerial arrangement is incorporated, providing greater signal pick-up. In other respects the model is unchanged, and the price remains at 15 guineas. A special colonial model of this set is also now available, the long-wave band being replaced by a second short-wave band, so that a total short-wave coverage from 13 to 50 metres is available in addition to the medium waves.

The other sets are improvements on the original model, and the prices are 10½ guineas. The medium-wave band only is covered.

British Tempovox

In the Tempovox clock a 2-waveband superhet circuit is also employed, together

The Radiochron combined clock and receiver.

with a miniature Celestion speaker. The circuit is designed to operate from A.C. or Universal (A.C./D.C.) mains and a synchronous (Smith's) clock is fitted to the A.C. model, whilst an 8-day movement is provided on the Universal model. The circuit incorporates an Octode frequency-changer, I.F. pentode, Westinghouse W.X.6 second detector with A.V.C., and output pentode. An important feature is that the specially designed loudspeaker is mounted on an inclined baffle at the base, whilst the radio chassis is rubber mounted and isolated to avoid difficulties due to vibration and resonance. The controls are in the form of knurled edge drums, operated through a recess in the sides of the cabinet, and are thus inconspicuous. The wavelengths are marked on the edge of the right-hand drum, which operates the tuning condenser through a 2 to 1 reduction drive, and the left-hand drum operates the mains switch and volume control, and this is also provided with indications so that exact settings may be reproduced. The wave-change switch is situated at the rear of the cabinet. To enable the clock to be started or to re-set the hands, the front panel swings open. The overall width is 12¾in., the height 9½in. and the depth 6¾in. The price is 11 guineas, and special models are available in art-coloured cabinets at an additional charge of one guinea.

RADIO CLUBS AND 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.

Tottenham Short-wave Club

THE above club will be holding three visitors' evenings on the 11th, 12th and 13th of November from 7.30 to 10 o'clock, and welcomes all radio enthusiasts to the club on those dates. Members' apparatus made on the club's premises will be on view with other items of interest.

Complimentary tickets will be gladly forwarded on receipt of a post card to the Hon. Sec., Edwin Jones, 60, Walmer Terrace, Palmers Green, N.13.

The Croydon Radio Society

"ACOUSTICS and Modern Sound Reproduction," with the President, Mr. H. R. Rivers-Moore, as its donor, was an attractive enough title for the Croydon Radio Society's opening meeting of the session on Tuesday, October 5th, in St. Peter's Hall, Ledbury Road, South Croydon.

Mr. Rivers-Moore's standard paraphase amplifier, together with a microphone, afforded him and the meeting a good opportunity for experiments. Discussing the uses of public address systems, he said that they were particularly useful for the so-called art of crooning. The crooner's aim was to whisper and yet be heard in a large hall, so microphone and loudspeaker helped him. Nevertheless, one member thought that "Thermion" would consider it a good thing if a crooner whispered and was not heard. On October 26th the hon. secretary, Mr. L. F. Marshall, will talk on "Making Electrical Measurements," illustrated by his own practical experiences.—Hon. Pub. Sec., E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

Bradford Short-wave Club

ON Friday, October 8th, a meeting of the Bradford Short-Wave Club was held, and a little experimenting with the club receiver was indulged in. There was also some morse practice, and it appears that a number of members are ardent stamp collectors.

The high light of the evening, however, was immediately after the regular session, for then almost all the club went to the neighbouring fairground. Years ago showmen at these fairs possessed sometimes remarkably good organs, but to-day these have been replaced by loudspeakers, and the previous standard is far from attained. In fact, to put the matter in a nutshell, it might be said with regard to the sound issuing from the speakers, that the quantity (not to be confused with the quality) was magnificent.

Those interested are asked not to forget the "Eddystone" demonstration on Friday October 22nd.—S. Fischer (Hon. Sec.), 33, Napier Road, Thornbury, Bradford, Yorks.

Southall Radio Society

THE first meeting of the winter session was held on October 5th, when the President, Mr. Douglas Walters, presented the magnificent silver D.F. trophy to Mr. L. T. Swan, who won it in the open contest held during the summer. Mr. Swan followed the old tradition by filling the cup with champagne. Meetings are held each Tuesday at 8.15 p.m. at Southall Library, Osterley Park Road, Southall. Visitors are welcome and can obtain a programme on request to the Hon. Secretary, Mr. H. F. Reeve, 26, Green Drive, Southall.

Wirral Amateur Transmitting and Short-wave Club

NOW that the club has secured commodious new headquarters at Beechcroft Settlement, Whetstone Lane, Birkenhead, it has been decided to hold meetings twice a month during the winter instead of once. These will be convened on the second and last Wednesdays.

On September 29th a successful junk sale was held, when there was a record attendance and a good "trade" in transmitting and receiving components, Mr. Cumberidge (2ACU), acting as auctioneer.—W. Rogers (G8OC), Hon. Publicity Sec., 12, Meadowside, Wallasey, Cheshire.

Exeter and District Wireless Society

AT the last meeting of the Exeter and District Wireless Society, held on Monday, October 4th, the lecture and demonstration was given by Mr. Cholot, of Messrs. Lissen, Ltd.

The lecturer described in detail the manufacture of the new Lissen short-wave components, and demonstrated both their commercial receivers and short-wave sets which can be made by the amateur.

The next meeting will consist of a talk and demonstration by Dr. Wroth on high-frequency apparatus, and members will be taken to the Royal Devon and Exeter Hospital, to inspect all the apparatus in use there. All those interested should get in touch with the Hon. Secretary, Mr. L. Ching, 9, Sivell Place, Heavitree, Exeter, and meetings are held each Monday, at No. 3, Dix's Field, Exeter, at 8 p.m.

Eastbourne and District Radio Society

THE winter session of this society will open shortly with an attractive programme. It is hoped to secure a record number of new members this year, and already between 15 and 20 have joined, which augurs well for the prospects of a renewed vigorous life for the society—one of the oldest in the country. It is intended to cater for the beginner as well as the advanced student of radio. Those interested are asked to write to the Hon. Sec., S. M. Thorpe, 74, Brodrick Road, Eastbourne, or to call at Dowsett and Co., Ltd., 48, Grove Road.

Liverpool S.W. Radio and Transmitting Club

THIS club now holds its meetings each Monday and Thursday evening at 8 p.m. The Thursday meeting is reserved for morse instruction, and several lectures are being arranged for Monday evenings. All persons interested in the club are invited to write to the Hon. Secretary, C. E. Cunliffe, 368, Stanley Road, Bootle, Liverpool, 20.

Glasgow Short-wave Radio Society

THE meetings of the Glasgow Short-wave Radio Society, are held every Thursday in Masonic Hall, 75, Berkeley Street, C.3, at 8 p.m. Instruction on short-wave radio reception and transmission is given, including morse. Ample opportunity is available for all interested in this branch of radio. Beginners are cordially invited. The annual subscription is 7s. 6d.—James Neilson, Secretary, 14, Bolivar Terrace, Glasgow, S.2.

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.

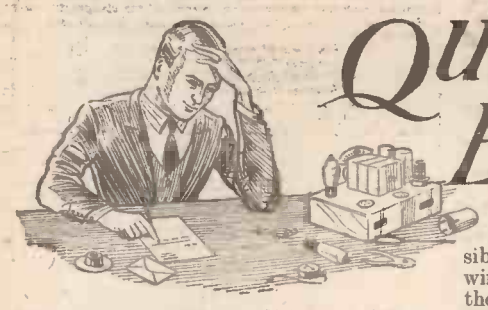
Issues of Practical Wireless .. 4d. Post Paid.
Amateur Wireless 1¾ .. 4d. " "
Practical Mechanics .. 7½d. " "
Wireless Magazine .. 1/3 " "

The index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus PW refers to PRACTICAL WIRELESS, AW to *Amateur Wireless*, PM to *Practical Mechanics*, WM 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	*Date of issue.*	*No. of Blueprint.*
CRYSTAL SETS.		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-Valve : Blueprint, 1s.		
All-wave Unipen (Pentode)	—	PW31A
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36B
The Signet Two	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-Range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-mark Three (SG, D, Pow)	12.6.37	PW41
Hall-mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2LF (Trans))	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	—	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	20.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW4
Fury Four (2 SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl.B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
All-Wave "Corona" 4 (HF Pen, D, LF, Pow.)	9.10.37	PW79
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW29
A.C. Leader (HF Pen, D, Pow)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2LF (RC)	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, H.F. Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
SUPERHETS.		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet Two-valve	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three-valve)	—	PW44
F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprints, 1s.		
Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans)	7.8.37	PW68
The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
F. J. Camm's Oracle All-wave Three (H.F., Det., Pen.)	28.8.37	PW78
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE	*Date of issue.*	*No. of Blueprint.*
CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det., Pen)	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher; Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Economy-Pentode Three (SG, D Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.*, '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* '35	WM389
Certainty Three (SG, D, Pen)	—	WM393
Minitube Three (SG, D, Trans)	*Oct.* '35	WM400
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM396
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2HF Four (2 SG, D, Pen)	—	AW421
Crusader's A.V.C.4 (2 HF, D, QP21) (Pentode and Class B Outputs for above: Blueprints, 6d. each)	18.8.34	AW445
	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
New Class-B Five (2 SG, D, LF, Class B)	*Nov.* '33	WM340
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
Consolectric 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) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	—	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)	—	WM379
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	*Apl.* '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)	1.7.33	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-wave (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-valver Short-waver (SG, D, LF, P)	*Mar.* '35	WM383
Superhet : Blueprint, 1s. 6d.		
Simplified Short-waver Super	*Nov.* '35	WM307
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 amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar* '36	WM403
New Style Short-Wave Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW462
Short-Wave Adapter (1/-)	*Dec.* 1, '34	AW456
Superhet Converter (1/-)	*Dec.* 1, '34	AW457
B.L.D.L.C. Short-wave Converter (1/-)	*May* 30	WM405
Wilson Tone Master (1/-)	*June* '36	WM406
The W.M. A.C. Short-Wave Converter (1/-)	—	WM408



QUERIES and ENQUIRIES

Choosing a Circuit

"I have for the last month been trying to decide what set I shall build—I cannot make up my mind. The nearest is the "All World Ace," but I have never yet been able to get good results with only two coils on the long waveband. I have tried wavetraps, but always come back to a band-pass circuit. Can you suggest a way out?"—W. Y. (Birmingham).

A BAND-PASS tuner consists of two tuned circuits, and you state that these give you the desired results. Theoretically, therefore, an H.F. and detector stage with a tuned circuit for each should be approximately the same, although in many cases it is found that such a combination is better than a detector with band-pass tuning. There is a possibility, however, that you refer to a three-circuit tuner (band-pass input to an H.F. stage), and in that case we regret that we have no modern design which would suit you. It would not be practicable to build the All World Ace with a band-pass input circuit, although you could use such an arrangement for the long-waves and only a single coil for medium and short waves. Unfortunately, the long waveband does introduce difficulties to those listeners living close as you do to the Droitwich transmitter, and therefore it is necessary to decide definitely whether you wish to listen to the Luxembourg transmitter or are content to sacrifice that station to hear the dozens of other stations brought to you on the short waves which are available on an all-wave receiver.

Extension Speaker and Q.P.P.

"I wish to instal an extension speaker about 50ft. from my set. A two-hole socket is provided and the output valve is a Q.P. 240. I have on hand a Rola moving-coil speaker suitable for power or pentode. Can this be adapted to make a fairly satisfactory extension speaker—if so, what extra do I require?"—R. D. F. (Guildford).

WE cannot give you exact information, as you do not state what type of output circuit is fitted to the receiver. Generally speaking, with a push-pull stage (which your receiver apparently employs), all that is necessary is to connect a 2 mfd. condenser to each anode of the output stage, and to connect the extension speaker to the other sides of the two condensers. The existing speaker must be retained, as the H.T. is applied to the centre-tap of the speaker transformer. You should use the pentode terminals of the speaker in order to provide the necessary matching impedance.

Makeshift Push-pull

"I have two identical parallel-fed transformers. Can I use these as a push-pull transformer, and, if so, would the performance curve of the transformers be altered? Should the primaries be connected in series or parallel? I would, of course, reverse the secondary connections to one valve."—L. R. (Southgate).

ALTHOUGH the transformers are identical in make there is a possibility that the primary and secondary windings will vary slightly, and although they might function in a push-pull circuit, the best results would not be obtained. The primary windings should be joined in series in correct phase, and the secondaries also. The junction of the two secondaries will be regarded as the centre-tap for connection to grid-bias or earth.

Noisy Backgrounds

"I have been told that it is bad to use a pentagrid frequency-changer in a short-wave set on account of the fact that it is very noisy. I do not understand the technical side but I understand that it is something to do with the conversion of the signal. As I am going to build a short-wave set and would like to use the superhet principle, I should be glad to know whether these facts are true, and if so, how to overcome them, as I am anxious to go in for real long-distance reception."—F. Y. P. A. (Great Yarmouth).

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.

THE gain of the modern frequency-changer valve is considerable, and the total noise in the receiver may be considered to originate in the grid tuned circuit of the frequency-changing valve. The actual noise can be measured and it is found that by reducing the gain in the stage the noise can be reduced. There is a limit, however, to the amount of reduction which can take place as the efficiency of the stage is needed for maximum results. However, the trouble may be overcome in a very simple manner. By providing ample H.F. amplification before the frequency-changer the noise is reduced and a much cleaner signal will be obtained. If, therefore, you wish to build a superhet for long-distance reception on short-waves, you should use at least one H.F. stage in front of the frequency changer, and an "outline" circuit of a suitable set will be found in this week's short-wave section.

Loudspeaker Cone

"After some tests with an old spare loudspeaker which I have by me, I have found that the substance of the cone is of the greatest importance in the reproduction of the musical scale. I made several different sizes of cone and from various materials, and my tests have led me to believe that a graduated cone, that is, one with a very thick centre portion, thinning out to the periphery would be ideal. I am, unfortunately, unable to graduate paper in this way and I wonder if you can tell me how to arrive at this material for further tests. I do not think it would be advisable to stick together rings of varying thickness as this would destroy the idea."—G. E. P. (Cardiff).

IT is quite possible that your experiments have been on the right lines, and we believe that there are certain speaker cones now available in which the idea you outline is incorporated. It should be possible to graduate a stout paper cone by ordinary means. We suggest you try the effect of building up a former of cone shape to the desired size, using successive thicknesses of thin card or thin plywood. Then make a cone from a paper having the maximum thickness required and place this over the former just mentioned. A very fine grade of sandpaper could then be used to thin down the cone, as you would have a solid surface upon which it rests and by selecting a well-worn grade of paper quite a good surface could be obtained. Alternatively, perhaps, the Grantona Company could supply you with a suitable cone. Write to them about the matter—the address is R. O. Bridger and Co., 4, Shelford Place, Church Street, London, N.16.

Extension Speaker

"I have a commercial receiver fitted with an energised loudspeaker. I wish to fit an extension speaker (permanent magnet), but also wish to fit a silencing switch in order that the fixed speaker may be cut out when the extension is used. I am faced with the difficulty of knowing where to connect the extension. There are five leads on the speaker; which of these must I break in order to fit the switch. There is a tablet on the set which states that the extension speaker should have a resistance of 3 to 6 ohms and I have acquired one of this value."—E. O. (Watford).

A SILENCING switch in your case will have to be fitted to the speech-coil circuit of the existing speaker, as you could not fit a change-over switch owing to the low resistance of the extension speaker. The five leads referred to are no doubt the primary transformer leads (2), field leads (2) and a single H.T. positive lead. Therefore you will have to take the speaker off the baffle in order to obtain access to the speech coil leads which are generally led away from the transformer to a point about half-way along the cone. They are then cemented to the cone and taken down to the speech coil. One of these leads should be cut and the simple on-off switch used for open-circuiting the speech coil fitted in a convenient position. Make certain that the leads are not tightened to interfere with the movement of the cone and are not slack enough to buzz and spoil reproduction. The extension speaker may then be joined to the extension speaker sockets, provided that the break just referred to is on the speech-coil side of the extension leads fitted by the makers. A simple test with small battery and meter or 'phones will enable you to check this point

The coupon on page 168 must be attached to every query.

RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

RADIOMART

SHORT-WAVE MANUAL

Packed with short-wave information and circuits of mains and battery receivers, including straight, superhet and 5-metre transmitters, modulators, etc. Information on transmitting licences, aerials, Class B amplifications, neutralizations, superhet alignment, etc. The most comprehensive manual published, written by practical engineers, price 6d., post free, 7½d. including catalogue.

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CONVERSION UNITS for operating D.C. Receivers from A.C. Mains, improved type, 120 watt output at £2/10/0. Send for our comprehensive list of speakers, resistances and other components. **WARD**, 46, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

THE largest stock of components in England, over 500 lines, new catalogue now ready 1½d.—J. Bearfield, 105, Upper Street, London, N.1.

HEADPHONES.—Brown, Ericsson, G.E.C., B.T.H., Standard Telephones, Nesper, Western Electric, Sterling, etc., 2,000 ohms, 2s. 6d.; 4,000, 5s. Postage 6d. **SPECIAL.** Ericsson, 4,000 ohms, as new, 7s. 6d. Telefunken, lightweight, adjustable, 7s. 6d. **CRYSTAL SETS.** Burne-Jones. Complete, Guaranteed, 5s. 6d. Ditto, double circuit, 8s. Sensitive permanent detectors, 1s. 6d. Crystal Detectors, complete, 1s. Crystals with silver cat's-whisker, 6d. Postage 1½d.—Post Radio, 2, Copenhagen Street, London, N.1.

SOUTHERN RADIO'S Wireless Bargains—all guaranteed and sent post paid.

TELSEN speaker units, 2/6; Telsen (1937) iron-cored coils, W349, midget size, 3/6; W478 (twin ganged), 9/-; W477 (triple ganged), 14/6; W476 (triple ganged superhet), 14/6; I.F. transformer coils, W482, 4/-; Telsen dual range coils, 2/9, with aerial series condenser incorporated, W76, 3/9; Telsen A.C./D.C. multimeters, 5-range (tests anything radio or electrical), 8/6.

HEADPHONES, 4,000 ohms. 3/-; Acc (P.O.) microphones, ready for use with any receiver, 4/6.

GARRARD Record Changers, A.C. 200-250 volts, changes eight 10-inch or 12-inch records, £6; Garrard A.C. motors with pick-up, 42/-.

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VAUXHALL. Polar Midget condensers, 2-gang, 6s. 8d.; 3-gang, 8s. 9d.; 4-gang, 13s. 6d. Polar full vision horizontal drives, 5s.

VAUXHALL. Hivac valves, entire range, full discounts. Polar station-named scales for horizontal drives, 1s.

VAUXHALL. T.C.C. electrolytic condensers, 8 mfd. and 4 mfd. 500 volt, 2s. 6d.; 50 mfd. 50 volt, 1s. 6d.

VAUXHALL. Iron-cored coils, 3-gang, on base, with circuit, 17s. J.B. drives with station-named scale, 5s. 6d.

VAUXHALL. Magnavox and Rola P.M. speakers, 7in. cone, 16s. 6d.; 10in. cone, 22s. Energised models, 2,500 field coils. 7in., 12s. 6d.; 10in., 17s. 6d.

VAUXHALL UTILITIES, 163a, Strand, W.C.2. Temple Bar 9338. Send postcard for free list. Post paid, 2s. 6d. and over, or C.O.D.

CORONA Four. First Specified kit, £4 7s. 6d. Complete, "Fifty-Fifty" Kit Guaranteed Components £3 7s. 6d. Cash, C.O.D. Easieway. Exchanges, etc. Lists and Quotations Free.—P.R. Co., Terminus Road, Brighton.

BANKRUPT Bargains. List free. All brand new goods. Decca 1937 6v. A.C. mains superhets, £5/10/-. Decca 1937 18gn. 6v. superhet radiogram, 11 gns. Decca 3 pentode battery sets, 77/6. Decca battery 5v. superhets, 98/6. All in sealed cartons. Altham 3v. all-wave with M.C. and valves, 70/-. Halycon S.W. converters, A.C., with valve, 20/-. Plessey 5v. A.C./D.C. superhet chassis with Mullards and moving coil, 90/-; battery 4v. ditto, 80/-. Burgoyne 5v. superhet radiogram, A.C. table model, £8/10/-. 1938 Ferguson and Truphonic sets in stock. Large stock valves, speakers, components at keenest prices.—Butlin, 6, Stanford Avenue, Brighton, Sx.

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NEW 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT. 13 to 86 metres without coil changing. Complete Kit and Circuit, 12/6. **VALVE GIVEN FREE!**

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SUPERHET CONVERTER KIT, 13/6. De Luxe Model, 18/6. S.W. SUPERHET CONVERTER KIT, for A.C. Mains Receivers, 20/-. A.C. Valve given **FREE!**

NEW 2-VALVE S.W. KIT, 13 to 86 Metres without coil changing. Complete Kit and Circuit, 19/6. **VALVES GIVEN FREE!**

DE LUXE MODEL, 14 to 150 Metres, complete Kit and Circuit, 4 Coils and all parts, 25/-. **VALVES GIVEN FREE. 3-VALVE S.W. KIT,** S.G. Det. and Pen., 42/-. **VALVES GIVEN FREE!**

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SHORT-WAVE COILS, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of 3 S.W. Coils, 14-150 metres, 4/- set with circuit. Premier 3-band S.W. Coil, 11-25, 19-43, 38-86 metres. Simplifies S.W. receiver construction, suitable any type circuit, 2/6.

COIL FORMERS, 4- or 6-pin low-loss, 1/- each.

Famous **EUROPA MAINS VALVES,** 4 v. A.C. and 20 v. .18 Universal. All standard types, 4/6. I.H. Pentodes and F.W. Rectifiers, 5/6.

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7-WATT A.C./D.C. AMPLIFIER, 3-stage high-gain, push-pull output. Complete kit of parts with 5 specially matched valves, £4 4s. Completely Wired and Tested, £5/5/0.

COSMOCORD PICK-UPS, with tonearm and volume control, 10/6 each. **PICK-UP HEADS,** only, 4/6 each.

PREMIER MAINS TRANSFORMERS, wired-end type with screened primaries, tapped 200-250 v. Centre-tapped Filaments. Guaranteed one year. **H.T. 8 & 9 or H.T. 10** with 4 v. 4 a. C.T. and 4 v. 1 a. C.T., 8/6. **250-250 v., 60 m.a.,** 4 v. 1 a., 4 v. 2 a., and 4 v. 4 a. all C.T., 8/6. **350-350 v. 120 m.a.,** 4 v. 1 a., 4 v. 2 a., and 4 v. 4 a., all C.T., 11/-. Any of these transformers with engraved panel and N.P. terminals, 1/6 extra. **500-500 v., 150 m.a.,** 4 v. 2-3 a., 4 v 2-3 a., 4 v. 2-3 a., 4 v. 3-4 a., all C.T., 17/6.

SPECIAL OFFER PHILIPS MAINS TRANSFORMERS, 450-450 v. at 150 m.a., or 500-500 v. 100 m.a., 4 v. 4 a., C.T., 4 v. 4 a. and 4 v. 3 a. Screened Primary. Tapped input 100-250 v., 12/6. **AUTO TRANSFORMERS,** step up or down, 60 watts, 7/6; 100 watts, 10/-.

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RECEIVERS, COMPONENTS AND ACCESSORIES

Surplus, Clearance or Secondhand, etc.

CAMM'S Corona Four. Ford guaranteed Kit £3 5s. complete. Specified valves, £1 6s. 6d. Hosts of other Kit and Component Bargains. Pick-ups, 4s. 3v. chassis 1s. Lists free.—Ford Radio, 10, Queens Place, Hove.

ALL COMPONENTS for erecting 3-Valve Receiver, Bargain price, 5s. 9d., post free. Quotations invited for Radio Spares. Universal, 221, City Road, London, E.C.1.

ALL lines previously advertised still available.—Radio Clearance, 63, High Holborn, W.C.1. Telephone: Hol. 4631.

BATTERY CHARGING PLANT

12-VOLT 2 amps., 30/-, 6v., 25/-; 2 volt ½a., 8/6; 1 amp., 12/6; 2a., 18/6. Details, Brighton Radio Service, 34, Middle Street, Brighton.

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MAKE YOUR HOBBY your career or increase its interest tenfold. Britain's Best College, approved by the Inst. Rad. Eng. and leading Radio firms, provides complete training in Radio Engineering by post or day classes. Full details from: "P.R.W.," LONDON RADIO COLLEGE, Grove Park Rd., London, W.4. (Chiswick 3244).

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ALCO ELIMINATORS AND CHARGERS.—4 H.T. taps, 120v/150v. 20/30 m.a., 18/-. With ¼ amp. charger, 25/-. Charger alone, 7/6. ¼ amp., 11/-. Year's guarantee. Details free. P. & D. Radio, 1, Goodinge Road, N.7.

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When writing to Advertisers please mention "Practical and Amateur Wireless"

ADVERTISEMENT INDEX

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12 from

ANTI-INTERFERENCE AERIALS—See page 175

Practical and Amateur Wireless

3D EVERY WEDNESDAY

Edited by F. J. CAMM

a GEORGE NEWNES Publication

Vol. 11. No. 267. October 30th, 1937.

AND PRACTICAL TELEVISION

Building a 12 WATT AMPLIFIER

Automatic Tuning Systems

See Page 177

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. XI. No. 267. October 30th, 1937.

ROUND *the* WORLD *of* WIRELESS

Public Address Amplifiers

MANY listeners are now using their existing broadcast receivers for small public address work. We do not mean by this that they address public meetings through the medium of their receivers and a microphone, but the term "public address" has now become so common that any broadcast to a crowd of more than about 20 people is referred to as public address work. Thus, in the smallest case you could take the gathering of people which assembles at a birthday or wedding celebration, where dancing is to be indulged in. A really substantial volume of sound is required to be audible above the general shuffling of feet and hum of conversation, and in this field alone there is good scope for experiment in the design of suitable apparatus. At least 10 watts is needed for a very small hall, and the ordinary broadcast receiver will not deliver sufficient volume for good dancing under these conditions. Thus, a special amplifier has to be built, and a good all-round unit for the ordinary listener will have an output between 10 and 15 watts. Twelve watts is a happy medium and an amplifier giving this output will be found of the utmost value to many experimenters. On page 186 we give details for the construction of a unit of this type, employing a push-pull output stage, and it may be used to feed two or more loudspeakers, and the mixer input arrangement will enable it to be used for the reproduction of gramophone records or for announcements through a microphone.

B.B.C. Stagshaw Station

REPORTS are already coming in regarding reception from the new Stagshaw station, and results seem to be very varied. In some parts improvements are reported, and in others the usual difficulty of eliminating the station for the reception of another on a wavelength close to it has been introduced. We shall be glad to hear from other listeners concerning the results which are obtained.

Radiated Power

A LONG time ago we mentioned the case of an engineer in America who illuminated his house and floodlit the front by means of lamps fed with current picked up from the KDKA aerial system. In Germany residents in the vicinity of the Hamburg station have also been adopting this idea and proceedings have been taken against them by the postal authorities for "stealing electric power." It would appear that there may still be a hope that one day we shall be able to drive our cars by means of energy radiated by a central station.

Commentary Popularity

IN a ballot which was organised at the recent Manchester Radio exhibition, listeners had to vote for the order of popularity of running commentaries on public events. The final order was: 1. Cup Final; 2. The Derby; 3. Grand National; 4. A Boxing Title match; 5. Test Match; 6. Wimbledon; 7. Boat Race; 8. Open Golf Championship. The Cup Final secured twice as many votes as any other event, and the Derby and Grand National ran very close for second place.

Flotsam and Jetsam Return

THESE two popular radio characters have signed a contract to make two appearances in forthcoming variety programmes after an absence of more than twelve months. The first will be on October 30th (Regional) and the second on November 27th (National). Jetsam (Malcolm McEachern) has been broadcasting since 1921, but he did not team up with Flotsam (B. C. Hilliam) until 1926. They hope to revive their News Bulletins.

Snooker Commentary

THIS season the B.B.C. outside broadcast department plan to visit various professional billiards matches, and the first will be on October 28th. On this occasion the microphone will be taken to Thurston's for the Davis *versus* Inman Snooker Match. Willie Smith, the famous professional, will give the commentary, assisted by Charlie Chambers, the now famous marker of Thurston's Hall. During the season matches between Lindrum and Newman and Davis and Lindrum will be heard.

Boomerang No. 2

IN the second of the Boomerang series of broadcasts from the Midland station, to be given on October 31st, a motorist will give his opinion about policemen and a policeman will say what he thinks about motorists. This programme will be recorded for subsequent repetition in the National programme in the afternoon of November 2nd.

Another Champion Band

THE winning band in the Military Band Contest at Belle Vue, Manchester, on October 11th, will give a forty-minute concert for northern listeners during the evening of November 1st.

Oratorio from Derby

IN the Midland programme on November 6th, Derby Choral Union, now beginning its seventy-second season, will be heard in Haydn's "Creation," which it is giving at the Drill Hall, Derby, with the City of Birmingham Orchestra. The Conductor of the Choral Union is Harold Gray, who also conducts Birmingham Festival Choral Society, Wolverhampton Musical Society and Sutton Coldfield Choral Society. The soloists for this performance will be Nora Gruhn (soprano), Webster Booth (tenor) and Norman Walker (bass).

ON OTHER PAGES

ROUND the WORLD of WIRELESS (Continued)

New B.B.C. Building Site

WE are informed that the B.B.C. has acquired a two years' option to build on a 6,000 square yard site in Birmingham, fronting Islington Row and Frederick Road. This site is suitable for a new Midland Regional headquarters, but no immediate building plans are in contemplation.

INTERESTING and TOPICAL NEWS and NOTES

Orchestral Music

ON November 3rd the third of the present season of B.B.C. Symphony Concerts in the Queen's Hall will be conducted by Arturo Toscanini. The programme will consist of two Beethoven Symphonies—No. 1, and No. 9 (The Choral). The soloists in the choral section will be Isobel Baillie, Mary Jarred, Parry Jones and Harold Williams, supported by the B.B.C. Choral Society. This will be Toscanini's last appearance in this country before his departure for America.

A fair listener with her Ekco "Pick-me-up" portable model P148. Only 17lbs. in weight the cabinet is finished in black rexine with coloured moulded inset. The price is £7 19s. 6d., including batteries.

Radio Sets' 50,000-miles Journey

ACCORDING to a recent report Philco radio chassis travelled more than 50,000 miles last year even before they left the factory at Perivale. That mileage was made on the mile-long moving belts and conveyors used in the factory for assembly and test of all Philco's twenty-nine models. More than 200,000 Philco home and car radio sets travelled over those conveyors last year. Counting feeder lines and the main assembly belt, the average set made close to a quarter of a mile journey during the process of manufacture.

Leslie Bridgewater Quintet

AN interesting broadcast will be given in the Regional programme on November 11th, when the Leslie Bridgewater Quintet will give the first of the series of four recitals of music composed by famous violinists. The composers represented on this occasion will be seventeenth century violinists such as David Mell (1604-1662), Jacopa Walther, Nicola Matteis and Thomas Baltzar.

Variety from Morecambe

ONE of Morecambe's many places of entertainment will provide a broadcast for listeners to the Northern and main Regional programmes on November 5th, when in the "Northern Music-Hall" series variety excerpts will be broadcast from the Winter Gardens at this well-known Lancashire resort.

SOLVE THIS!

PROBLEM No. 267.

Burston's set became very noisy, but when the primary winding of the H.F. transformer, coupling the H.F. valve to the detector, was short-circuited the noise ceased. Where was the fault? Three books will be awarded for the first three correct solutions opened. Address your solutions to the Editor, PRACTICAL AND AMATEUR WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 267 in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, November 1st, 1937.

Solution to Problem No. 266.

The dial lamp, connected in series with the valve heaters, had burnt out.

The following three readers successfully solved Problem No. 265 and books are accordingly being forwarded to them: J. Robertson, Aukengill, Wick, Caithness, Scotland; J. Garlick, 84, Kingswood Chase, Leigh-on-Sea, Essex; R. Barlow, 13, Kenilworth Ave., Bury Old Rd., Prestwich, Manchester.

Concert from Leeds University

A RECITAL of chamber music by the Pougnet-Morrison-Pini Pianoforte Trio will be broadcast to Regional listeners from Leeds University on October 28th. This will be one of the Leeds University midday concerts, well-known and much appreciated by music-loving listeners in the north.

Midland Brass Bands

THE third of the bands, whose story will be told in the series of Midland brass bands, will be Wigston Temperance from Leicester. All members of this band are working men, and two of the original members have played since the band was founded in 1902. It has been in the championship section at Crystal Palace after eight successive wins in eight years. Conductor Charles Moore, who has been the conductor throughout, will conduct the band in a popular programme on November 2nd.

Piano-accordionist

TOMMY O'HARA, the piano-accordionist who has been on the halls, will return to the Midland studio to give a recital on October 29th. He was born in Canada but came to Birmingham at the age of one. He began playing the piano-accordion at thirteen, and has broadcast many times in the last eight years.

Ramona, the famous American star of stage, screen and radio, who has just commenced a season at Ciro's with Jack Harris and his Band.

Sunday Orchestral Concert

IT has been decided to broadcast this winter some of the Sunday Orchestral Concerts by the City of Birmingham Orchestra in Birmingham Town Hall, and the first chosen will be broadcast on October 31st. Anita Oberlander (soprano) will sing with the orchestra "Softly Sighs" from Weber's "Der Freischütz." The Symphony will be Beethoven's No. 7.

An Anti-Interference Aerial System

Methods of Arranging a Doublet All-wave Aerial which is Efficient and Non-responsive to the Milder Forms of "Local" Electrical Interference

By FRANK PRESTON

IT is now generally realised that some form of anti-interference aerial arrangement is desirable for use with any type of receiver. Because of this there are now various complete aerial systems on the market. Unfortunately for many readers,

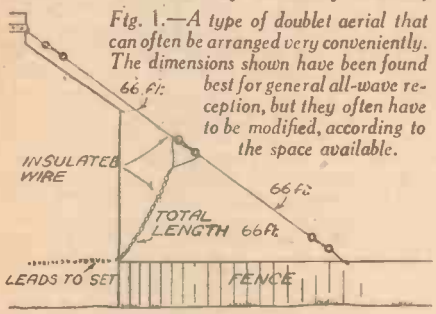

Fig. 1.—A type of doublet aerial that can often be arranged very conveniently. The dimensions shown have been found best for general all-wave reception, but they often have to be modified, according to the space available.

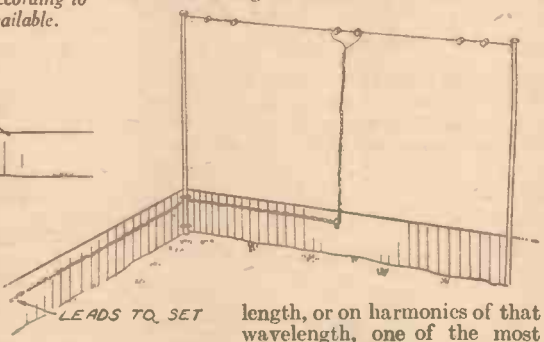

Fig. 2.—How a doublet can sometimes be erected between two masts at the end of the garden so that it is well away from the source of interference. In this case the aerials' span can rarely be more than 33ft. each, the total length of the lead-in being 66ft.

several of these are by no means inexpensive; in any case, the average constructor would prefer to make his own. The question thus arises as to just what types of aerial can be made at home.

Undoubtedly the simplest is that known as the doublet. Sometimes it is described as a dipole, but often incorrectly, since a dipole should, theoretically, be designed for use on one wavelength—or at least on one waveband—only. And an aerial that is "tuned" to a fixed wavelength is of little use to the average amateur who is interested in the reception of a large number of stations on all wavebands, although perfectly suitable for the amateur transmitter whose work is confined to a very narrow band of frequencies.

Dimensions

A dipole is arranged in the form of two inverted-L aerials, or of two end-to-end vertical aerials, whose two down leads are twisted together or transposed in some other manner. For most efficient reception, each horizontal arm of the dipole should be one quarter wavelength long. Thus, if the aerial were for reception on 20 metres, each arm should be 5 metres—approximately 16ft.—in length. For the short-wave bands such dimensions are perfectly satisfactory and convenient, but consider the position when reception on, say, 1,500 metres is required! Theoretically, a dipole for that wavelength should consist of two arms, each about 1,220ft. long. That means that the total length of the aerial proper should be nearly 2,500ft., which is obviously impracticable.

That is not all, for the twisted down lead should, again theoretically, be one half-wavelength long, or twice as long as each of the horizontal spans. That also is often impracticable, even when the aerial is designed for short-wave use. It is obvious, therefore, that a compromise must be effected if the dipole or doublet is to be satisfactory and practicable for all-wave use.

Non-radiating Down lead

Before going into practical details of construction, it will be as well to gain an idea of the main principles underlying the doublet arrangement. Apart from its being "tuned" to the wavelength to be received, and thus being most effective at one wavelength, or on harmonics of that wavelength, one of the most important features is that the downlead is "dead." In other words, the two leads which are twisted together or crossed over each other do not act as "pick-up" devices, as does the down lead of a normal type of L or T aerial. It is due to this that the kind of aerial under consideration is anti-interference in character. Since the two down leads are balanced, the pick-up of one is counteracted, cancelled out, or neutralised by the pick-up of the other. And as the down lead is generally in the region of electrical interference generated inside the house (by electrical conductors, switches, contacts and the like) it is this which generally "collects" the interference with the usual aerial arrangement.

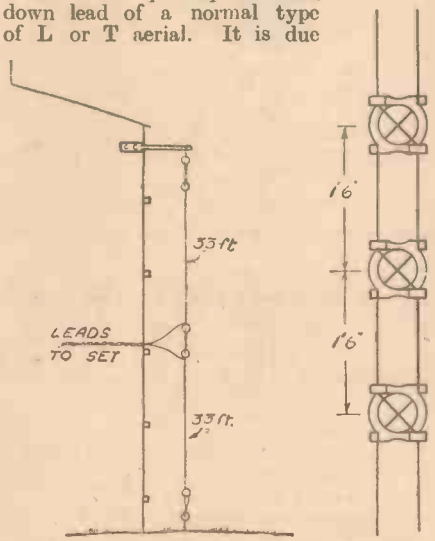

Fig. 3 (left).—Flat-dwellers or those living in a room above ground level in a high building will find that this arrangement of dipole can often be used successfully. It is not ideal as an anti-interference aerial, but is satisfactory for all-wave reception, and sensibly non-directional.

Fig. 4 (right).—When using an outside doublet it is often convenient to use bare wire along with transposer blocks as shown here for the down lead. Twisted wire can be used between the window and the set.

By placing the aerial proper a fair distance from the source of interference (the house) it picks up little or no interference in normal circumstances, and also gives maximum response to the wanted signals. For this reason, a long down lead from a doublet is generally to be preferred, the aerial being placed across the end of the garden, or as high as possible above the house.

It is worth bearing in mind that a horizontal doublet has fairly marked directional properties, being most sensitive to signals coming from a direction at right-angles to the line of the aerial. Thus, the aerial can generally be arranged so that it is most responsive to certain particularly-desired transmissions, and less responsive to others which are often responsible for interference. When it is preferred that the aerial shall be equally receptive from all directions, the vertical arrangement is to be preferred, since this is sensibly non-directional.

Practical Considerations

How, then, are we to obtain the advantages of the doublet or dipole, without the disadvantages of excessive lengths of aerial and down lead? The simplest method, for all-wave, or even medium- and long-wave reception, is to use an aerial length which approximates to those of the harmonics or sub-harmonics of the wavelengths most required. In practice, I have found that a doublet aerial of length corresponding with a wavelength of about 80 metres suits the purpose very well, and is convenient for general all-wave use. This means that the horizontal spans should each be approximately 66ft. long; if the down lead can be made of the same length, so much the better; if not, it can be of a length not bearing any definite relation to the size of the aerial proper. However, as the down lead need not be straight, the full 66ft. can often be used without difficulty, and run around the picture moulding or skirting board from the window to the set in another corner of the room.

Probably the simplest method of construction consists of using two lengths of insulated wire, attached to insulators, as shown in Fig. 1, the down lead portions being twisted together. By following this idea, there are two continuous lengths of wire right from the furthermost insulators to the set. In consequence, there need be no soldered connections (which often corrode) and nothing to give trouble. It is, of course, wise to choose wire which is covered with insulation that does not perish on exposure to the atmosphere. There are several proprietary and inexpensive brands of aerial wire that comply with this requirement.

By following this course, the aerial can be stretched between two posts at the end of the garden, or between the house and a mast. The down lead can be brought

(Continued overleaf)

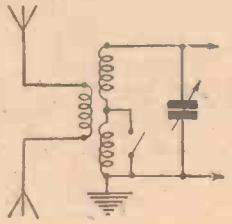

Fig. 5.—The two leads from the dipole or doublet should be joined one to each end of a separate winding on the aerial coil, as shown here.

AN ANTI-INTERFERENCE AERIAL SYSTEM

(Continued from previous page)

vertically from the aerial to the fence, to which it might be attached with ordinary staples, as shown in Fig. 2. Due to the balanced lead-in, losses due to the closeness of the twisted lead to the earthed fence are negligible, and the complete system is particularly neat and unobtrusive.

A Vertical Doublet

Where an outside position is inconvenient the aerial can be mounted between two corners of the roof inside the house, and the down-lead brought either down the wall on the inside or, better still, dropped through a hole in the boarded projection of the eaves and kept fairly close to the outside wall. Another idea that can sometimes be adopted when the receiver is in a room above ground level is to attach the aerial to the eaves and to an insulator connected to a spike fixed into the ground, the lead-in being taken from the centre straight into the room, as shown in Fig. 3. Generally, however, it is necessary to use a shorter aerial than that referred to above —say two 33ft. spans.

When the aerial can be mounted in a more exposed position, across the garden for example, bare wire can be used throughout, the two down leads being carried in so-called transposition blocks, as shown in Fig. 4. These blocks should be arranged at approximately 1ft. 6ins. intervals to ensure that the two leads are sufficiently close and transposed to neutralise each other. The leads to the set itself can be by means of ordinary twin flex, taken from a pair of ebonite lead-in tubes of the usual type passed through the window frame.

One difficulty which sometimes arises in following this system is that the lead-in might be very short. In practice it seems that efficiency is lost if the lead-in is less than the length of one of the aerial arms, so it is worth while to contrive that a fair length is obtained. The desired result could be obtained by having a longish lead from the window to the set, but if this is not convenient, it is better to use the insulated and twisted lead-in, taking this along a more circuitous path.

In the foregoing it has been assumed in all except one instance that the aerial proper is placed horizontally or nearly so. Actually, this expression has been employed for convenience and ease of explanation only,

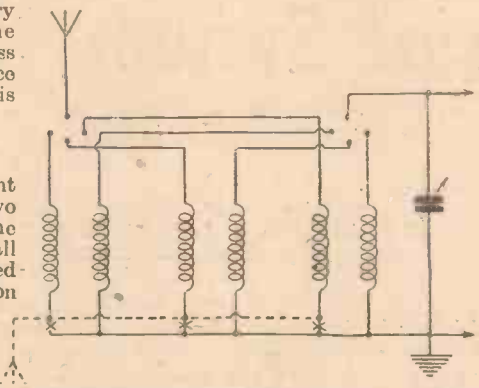

Fig. 6.—In some all-wave coils having separate aerial windings one end of each of these is joined to a common earth terminal. In that case a doublet can be used by breaking the leads marked X and connecting them together, as indicated by the broken line, and to earth.

for it might be at any angle that happens to be convenient, although it is generally best to have the aerial in either a reasonably horizontal, or a vertical position.

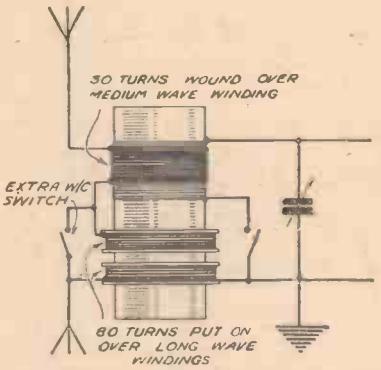

Fig. 7.—How a normal two-range coil, without separate aerial winding, can be modified for use with a doublet.

Receiver Connections

In order to use a doublet or dipole, the aerial coil of the receiver should have a separate aerial winding, as shown in Fig. 5. This is so that a "symmetrical" tuned aerial circuit can be provided. Unfortunately, many receivers do not incorporate a coil of this type, so some provision must be made. If six-pin plug-in coils are used it is an easy matter to modify the connections at present used to provide the aerial winding. Also, when using an all-wave coil with connections similar to those indicated in Fig. 5, it is generally quite an easy matter to break the lower connection from the aerial coupling windings from the earth terminals, and to bring out a lead to an extra terminal.

In other cases, it might be necessary to modify the coil by adding an extra aerial winding. With air-core coils this can be done by winding about 30 turns of wire over the medium-wave section and 80 turns over the long-wave section, and fitting an extra wave-change switch as shown in Fig. 6. Alternatively, if ganged switches are employed an extra section can be added to the assembly to provide the extra contacts required.

Most all-wave coils have separate aerial windings, and therefore the difficulty just mentioned does not arise. When such windings are not provided, however, a similar procedure can generally be followed by winding about eight turns over the short-wave section, and using a three-point switch.

It is sometimes found that the doublet is not as satisfactory as the more-usual inverted-L on long waves. If that is the case, it is an easy matter to join together the two doublet down leads and to take these to the normal aerial terminal, using the earth connection in the usual manner. The doublet then becomes, in effect, a standard T-type aerial. When these connections are used, the anti-interference properties of the doublet are lost, and the aerial is no more effective than one of standard type; in fact it will be less satisfactory if the down lead is long and attached to a wall, because there will be a certain amount of capacity loss. Nevertheless, such loss is not great at the lower frequencies, so reception will not generally be affected to any serious extent.

Important Broadcasts of the Week

***NATIONAL* (261.1 m.)**

Wednesday, October 27th.—The Transmutation of Ling, a play by Ernest Bramah.

Thursday, October 28th.—Snooker: a commentary during play in the Handicap Competition, from Thurston's Hall.

Friday, October 29th.—Concert Party programme.

Saturday, October 30th.—Symphony Concert, from Queen's Hall, London.

***REGIONAL* (342.1 m.)**

Wednesday, October 27th.—A commentary on the Cesarewitch, from Newmarket.

Thursday, October 28th.—Royal Philharmonic Society's Concert from Queen's Hall, London.

Friday, October 29th.—Spending and Saving, a discussion in cockpit form.

Saturday, October 30th.—Palace of Varieties.

***MIDLAND* (296.2 m.)**

Wednesday, October 27th.—Follow On, a revue in miniature.

Thursday, October 28th.—A Symphony Concert, from the Town Hall, Birmingham.

Friday, October 29th.—How to Get Your Money's Worth—3, a discussion.

Saturday, October 30th.—Choral programme.

***NORTHERN* (449.1 m.)**

Wednesday, October 27th.—Between Houses, variety programme.

Thursday, October 28th.—Fell Top, a radio play from the novel by Winifred E. Watson.

Friday, October 29th.—Spending and Saving, a discussion in cockpit form.

Saturday, October 30th.—A running commentary on the second half of the Rugby League match York v. Swinton, from York Rugby Ground.

***WEST OF ENGLAND* (285.7 m.)**

Wednesday, October 27th.—Music of Other Countries—1, Spain: Choral and Instrumental programme.

Thursday, October 28th.—Slushington-in-the-Moor: A Grand Village Concert.

Friday, October 29th.—Yellow Sands, a Devonshire comedy by Eden and Adelaide Phillpotts.

Saturday, October 30th.—Variety in Miniature.

***WELSH* (373.1 m.)**

Wednesday, October 27th.—Variety from the New Theatre, Cardiff.

Thursday, October 28th.—Choral programme, from Bethlehem Church Hall, Rhos, Wrexham.

Friday, October 29th.—Choral programme, from Penuel Chapel, Cwmavon.

Saturday, October 30th.—A Variety programme.

***SCOTTISH* (391.1 m.)**

Wednesday, October 27th.—Stage Parade: Memories of the Glasgow Theatre, 1928-1930, devised by Jack House.

Thursday, October 28th.—A selection of waltz melodies played on two pianos.

Friday, October 29th.—Variety from the New Metropole Theatre, Glasgow.

Saturday, October 30th.—Eerie Evening: programme based on ancient legends of the North-East of Scotland.

AUTOMATIC TUNING SYSTEMS

How the Modern Push-button Tuning Devices Operate, and How to Make and Incorporate Them in Existing Receivers

By W. J. DELANEY

IN 1933 we gave details for incorporating an automatic tuning device in an existing receiver so that either the National or the Regional station could be obtained without the necessity of operating the tuning condenser. The arrangement consisted of the incorporation of two pre-set condensers wired across the tuning circuit and each tuned for one of these stations. A simple single-pole change-over switch enabled the desired condenser to be included and the ordinary variable condenser was thus dispensed with. For the benefit of new readers the circuit is reproduced in Fig. 1. It will be obvious from this, that by using a three-way switch a further condenser may be included, and this may be another pre-set for the selection of another station, or a variable for normal tuning purposes. This is the basis of the modern tuning devices which are now being incorporated in up-to-date receivers, and which provide push-button tuning for a dozen or so stations. It is obvious that the arrangement depicted in Fig. 1 will only be applicable to the very simplest type of set—such as a crystal set or a one-valver without reaction, as a single tuner is employed. By ganging the change-over switch with another one, however, a reaction condenser could be pre-set for each station and the device could then be used in an ordinary receiver employing a detector with reaction.

Superhet Circuits

In the superhet receiver it is necessary to tune not only the grid circuit of the frequency-changer valve (and any pre-H.F. stages which are used) but also the oscillator circuit, and there has to exist in this a frequency difference dependent upon the intermediate frequency employed in the

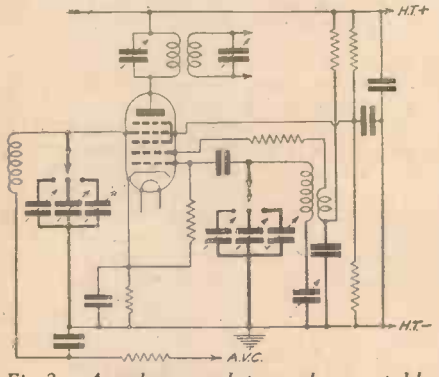

Fig. 2.—A modern superhet may be operated by selector switches by a similar arrangement to that shown here.

receiver. It will, therefore, be rather difficult to adjust pre-set condensers for all of these circuits unless a suitable test apparatus is available with which to adjust correctly the oscillator circuit to obtain the desired intermediate frequency, and in this respect the home constructor may find it difficult to build an automatic receiver. Furthermore, it will be obvious that a number of switches or push-buttons will have to be devised to operate so many circuits and interaction will have to be avoided. This, then, is in outline the main arrangement which has to be incorporated, and the following are the principal constructional details as used in certain commercial receivers and which may be incorporated by the home constructor.

Firstly, the change-over switch must be converted into a switch which operates

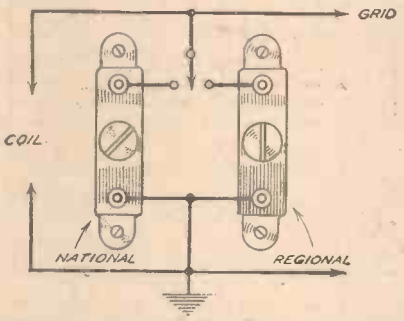

Fig. 1.—The basis of automatic tuners—pre-set condensers, each tuned to a different station and brought into circuit by a switch.

by the pressure of a button, and each button must be linked up with the remaining controls, so that when changing stations the button which is already depressed will be raised for subsequent operations. One very simple way in which this may be done is shown in Fig. 3. Each button is fitted to the top of a flat strip of brass or other metal on the side of which is a small cam, and above this a shallow saw-cut. A flat strip of metal is pressed against the edge of each of these rods or bars by means of a weak spring. When the buttons are all raised, the pressure bar will rest just below the cam or projection. When a button is pressed down, the contact at the bottom of the rod will operate the requisite condenser, and the pressure rod or locking bar will drop into the saw-cut keeping the button depressed and the condenser in circuit. As soon as another knob is depressed the raised portion will push the locking bar out from the slot in the depressed bar and thus it will be released, the button being raised by the small spring at the end. The second button will enable the appropriate rod to be locked in a similar manner. At the bottom of the push rod or bar a strip of metal may be affixed to operate the contacts for each condenser, and in this respect each constructor will no doubt have his own preference for making the necessary contacts. One very important point is that each circuit should be kept isolated. That is, the fixed (or pre-set) condensers should be arranged in sets, each stage being screened in a separate compartment or a small metal box, and leads to such parts of a circuit as the oscillator of a superhet should be screened to avoid interaction.

Automatic Frequency Control

To avoid difficulties due to an inaccurate adjustment of the condensers and other circuit losses, the modern receiver incorporates what is known as automatic frequency control. This brings the oscillator circuit into exact resonance to provide the correct intermediate frequency, and this is accomplished in several different ways. Unfortunately, it is rather difficult for the home constructor to make up a device of this nature, but for those who wish to experiemnt it may be stated that the usual arrangement is to provide a double-diode to be fed with the signal from the I.F. stage. The input is to the cathode circuit, and the two diodes are connected to two tuned circuits, one slightly lower than the I.F. and the other slightly above. The resultant current, due to an "off-tune" signal, will cause a flow of current which is fed back to the oscillator circuit through the tuned circuits and corrects it in the required direction.

Other Tuners

A modification of the push-button tuner just described is now being adopted to avoid the use of a number of pre-set condensers and to avoid the need of an A.F. control circuit. This is effected by causing the push-buttons to operate a motor which drives the ordinary ganged tuning condenser. The spindle of this is lengthened and projects at the rear, to be there linked to the shaft of a motor of the reversible type. The coupling is generally of the "slip" type so that a switch may be operated at the same time, or the motor is of the type having a forward armature movement (thrust) when switched on, which will also carry out this feature. At the other end of the motor spindle a number of metal cams are assembled, and on each of these is an insulated section. The current to the motor is fed to brushes bearing against the edge of

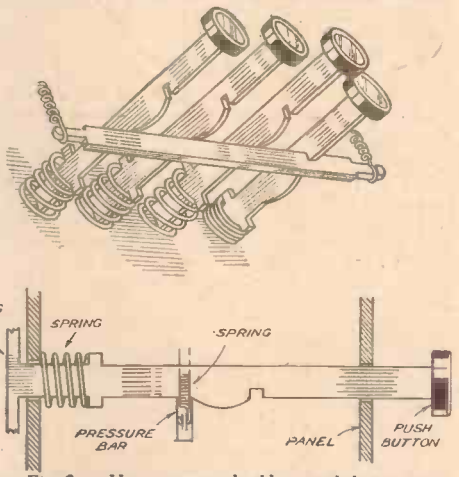

Fig. 3.—How you can build a push-button tuner—with a detailed illustration of the separate push rods.

the discs and thus, when an insulated section comes against the brush of the appropriate disc, the current will be interrupted and the motor will stop. In one system all of the discs are locked by the buttons in the "out" position. Depressing a button switches on the current and the motor revolves, taking with it the disc released by the depressed button. This

(Continued on next page)

AUTOMATIC TUNING SYSTEMS

(Continued from previous page)

turns the condenser and so tunes to the various stations. When the insulated section arrives at the brush the motor stops and the condenser is tuned to a predetermined station. It will be seen by this arrangement that each disc has to be set when the receiver is first trimmed up, and, furthermore, that some form of automatic reversing mechanism must be employed as it may be desired to tune a station at one end of the dial when the last station to be selected was at the other end. What happens is that when a button is depressed the motor commences to turn in the direction in which it was last going, and when it gets to the end of its travel (determined by the 180 degrees movement of the condenser) a contact is operated and the motor is reversed. It thus continues to move until the desired contact is met. Coupled with the disc is a silencing switch for the circuit so that no signal is heard from the loudspeaker until the condenser comes to rest. This arrangement—which is incidentally similar to that used in the American R.C.A. receivers—is shown diagrammatically in Fig. 4. An alternative arrangement incorporates a relay which is operated when the contact opens or closes for each station, and this relay operates the A.V.C. and "silent" tuning contacts which are assembled on the tuning unit. The motor in these devices is of the low-voltage type, operated from a small winding on the ordinary mains transformer, and a separate switch is usually included in this winding so that the motor may be switched out of circuit when ordinary or manual tuning is to be used. It will be seen that this device will be very rapid in action, as the ordinary motor which is used will turn at quite a fast rate, and in practice the action of station selection becomes almost instantaneous. The buttons are interlocked as in the first example quoted, and thus it is only necessary to depress the required button when any other button which is already down will be returned to its "off" position. At the moment there appears to be only one receiver of this type on the English market, although no doubt the device will quickly become popular as soon as it is introduced, on account of the fact that it avoids the necessity of tuning, is much more speedy, and does not in any way affect the ordinary tuning system which may still be used.

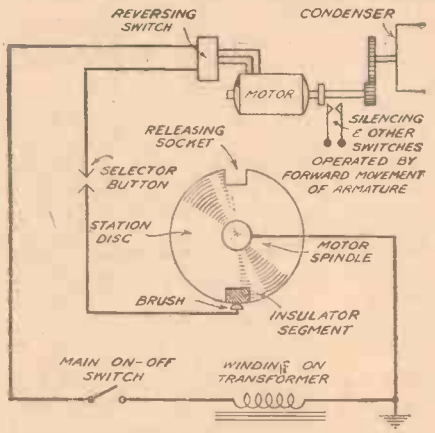

Fig. 4.—One of the American commercial motor-driven pre-selectors is operated as shown here. The disc is repeated for each station required.

Dial Tuning

A modification of this form of tuning is seen in the dials similar to automatic telephone systems, except that the rotation of the dial operates the motor in a similar manner to the pressure of the buttons. Further details of this arrangement will be given at a later date.

THE BRITISH LONG-DISTANCE LISTENERS' CLUB

Sun and Fading

A MEMBER has recently raised a query concerning the effects of the sun on the signal strength which he receives and also questions the effects of absorption by the various layers of ionised air. It appears that there is still some doubt as to the exact nature of the various layers of atmosphere surrounding the earth, and therefore a certain amount of present-day knowledge amounts to guess-work. It has been proved, however, that there are two separate layers, one known as the Heaviside layer situated between the earth and another known as the Appleton layer. These are shown in the accompanying illustration. When a signal is radiated from an aerial it shoots off from the aerial and is then reflected or deflected by the Heaviside layer. A certain portion of the signal does, however, follow the curvature of the earth. In the diagram the first part of the signal referred to is shown deflected at the point A and will be heard at the point marked B. In certain other cases, however, the signal will apparently penetrate the Heaviside layer, and will be deflected from the upper or Appleton layer as shown at point P. This signal will not arrive at the earth until it reaches the point R, and thus between T and R this signal will not be heard. This is known as the skip-distance effect and accounts for the fact that it is not possible to hear certain short-wave stations although they are very close to the receiver. The actual behaviour of the signal wave varies according to the wavelength, and the effects just mentioned are most strong on the short waves. During daylight, when the sun is shining these layers of air move, and in addition the ionisation of the layer is modified. This gives rise not only to a modification in the angle of reflection as shown in the diagram but also controls the degree of reflection or absorption of the signal and this accounts for many of the peculiar effects of fading which are experienced when listening to a distant station.

Microphone Transformer

A number of low-priced microphones of the telephone mouthpiece type are now on the market, and several readers have experienced difficulty when trying to use these, on account of the fact that the particular component that they have obtained has no transformer included with it. It is essential when using a microphone to ensure that it matches the input circuit, just as when connecting a loudspeaker to the output circuit. The ordinary type of carbon microphone will need a transformer of about 100 to 1 ratio in order to match the grid-filament impedance of an ordinary type of valve. Transformers of this type may be purchased from many dealers or you can make up a suitable type from the following details: Obtain a 2in. length of ½in. diameter paxolin tubing, or ebonite tubing if this is more readily available. To each end affix (by means of cement or Chatterton's compound) two discs 1½in. in diameter. Over the tube wind 100 turns of 24-gauge D.C.C. wire, anchoring the ends by threading through holes drilled or pierced in the end cheeks of the bobbin. Cover this layer of wire with a layer of Empire cloth or two or three layers of thin brown paper and stick the ends in place. Now on top of this 10,000 turns of wire must be wound in order to provide the necessary step-up of 100 to 1, and a fine gauge of wire will have to be used to accommodate such a large quantity of material. Thirty-eight gauge enamelled wire will be suitable and in order to keep it neat it should be placed more or less smoothly in each layer, and after every 2,000 turns a layer of thin paper should be overlaid. The primary winding, joined to the microphone, is the first layer (100 turns), and the secondary winding, joined between grid and filament or grid bias, is the larger or outer winding. Remember, also, that the microphone must receive a polarising voltage, and for this 4.5 volts are generally most suitable. This voltage should be applied by connecting a small flash-lamp battery between one side of the mike and one side of the primary.

A.E.L. Certificate

An important point has arisen in connection with the A.E.L. certificate which was recently mentioned in these columns. This award is given when you have received verification cards from five *continents*. A number of members have sent in veris in which two and even three are in respect of European countries. It is, therefore, important to remember that cards from such countries as Spain, Germany, Italy, etc., are all in respect of one continent only—Europe. Similarly, South America and North America represent only one continent, and, therefore, members should make quite certain, before sending in their cards, that five separate and distinct continents are represented.

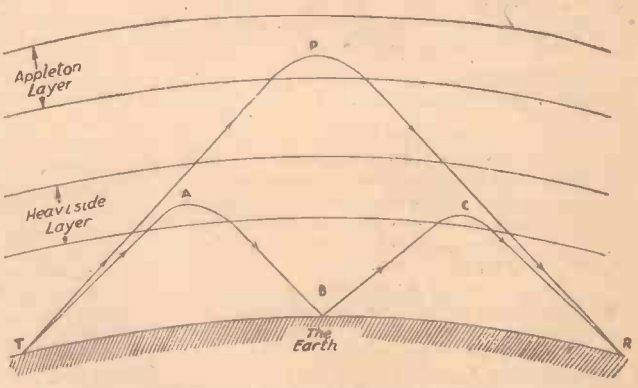

Diagram illustrating the effects of the Appleton and Heaviside layers on a wireless signal.

Practical Television

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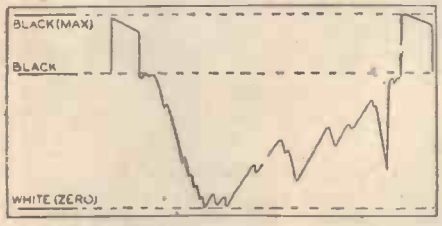
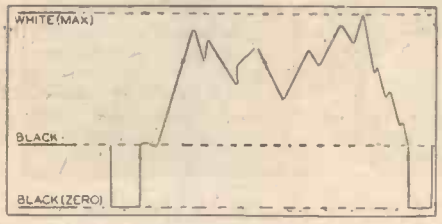
Television Synchronising Pulses

READERS will be aware that the television synchronising pulse standard in this country is situated between the black level and zero carrier. It occupies approximately 30 per cent. of the maximum output of the transmitter; the pulse is therefore made up of a movement between 0 kW output and 5 kW output, and the picture intelligence is built up between 5 kW and a maximum of 17 kW output. In America the reverse procedure is adopted. The operation of the synchronising pulse instead of being no output is maximum



Television waveform showing a complete line; American system.



Television waveform of the British system.

output; that is to say, picture intelligence is accommodated between 0 and 70 per cent. output, and the synchronising pulse between 70 and 100 per cent. output. In America, therefore, white is zero carrier, so that if a picture finishes with white and the next picture starts with white for the duration of the synchronising pulse, the output will leap from 0 to maximum and back again. The accompanying diagrams show clearly the English and American arrangements. There is much to be said for both principles, but it is a great pity that in one fell swoop interchangeability between American and English television is rendered impossible.

Straight versus Superhet

In the case of the straight set there are several difficulties to be faced. The ultra-high carrier frequency of the present television signal means that amplifiers of a very special design are essential to take care of the limiting effects brought about by the stray capacities in the circuit. Again, at these video frequencies the valves tend to behave as if relatively low resistances are shunted across the electrode capacities. This is due to the energy absorption from the source of potential in the grid-cathode circuit introduced by those free electrons whose time of flight is of the same order as the time period of the high-frequency oscillation. In the case of the superhet the amplifiers operate at the intermediate frequency and while somewhat similar in design to T.R.F. amplifiers they are certainly free from some of the troubles peculiar to that circuit. An examination of the receiver data, however, shows that there is no hard and fast rule for the value of the intermediate frequency chosen. If of a high order, many of the advantages of the superhet principle vanish, while with low intermediate frequencies care has to be exercised to ensure that there is no risk of picking up comparable carrier or interfering frequencies, since this will ruin the picture by superimposing patterns over the scanning field. To allow for some degree of frequency attenuation correcting devices are quite frequently included in the set, but if the measure of compensation brought about in this way becomes too pronounced the picture will exhibit hard, double images, which to the viewer give the appearance of a stereoscopic effect. Too much correction also introduces high-frequency mush which appears on the screen as a fine dot pattern easily visible to the eye when viewing is undertaken at too close a range. Continual testing and experiment will supply satisfactory solutions to all these acute problems, so in the meantime both types of set will be used by the manufacturers.

Increased Fees

THE possible future fusion of certain sections of the B.B.C. programme so that both the ordinary listener and the television viewer will be catered for by the show, is causing a measure of apprehension amongst some of the artists. They feel that double fees will become due to them because their show will have to be of the same nature as a stage item—with all the lines properly memorised, suitable clothing worn and special make-up used. This matter is already being taken up with the B.B.C., and provides yet another reason for justifying the Corporation's attitude in demanding more money from the Treasury than is at present allocated.

Important Television Problems

THE intricacies associated with modern cathode-ray tube technique, insofar as they are applied to the modern demands of television, are likely to be increased with the demand for larger pictures suitable for public hall exhibition purposes. Ordinary lens magnification of present-day pictures is not an economical solution, and it is for this reason that attention is being turned to projection cathode-ray tubes. The available screen area over which the light spot traces out its modulated scan is greatly reduced when compared with normal type tubes. As a result of this the focusing devices, whether electro-magnetic or electrostatic in type, have to be adjusted with a higher degree of accuracy. Again, it is essential to see that no trace of de-focusing occurs during any period of time that the electron beam (that is, the visible spot) is modulated by the varying television signal. The spot diameter should remain unaltered, and only the degree of brightness change in exact accordance with the fluctuating intensity of the received signal. Added to this, if the screen material should happen to be coarse grained, a limit to picture clarity will be set irrespective of the smallness of the spot itself. These are only two of the reasons why a good deal of research is being carried out by cathode-ray tube manufacturers to ensure that the tube's performance will be satisfactory in every respect, coupled with the minimum of adjustments which have to be undertaken by the individual operating the special receiver. Yet another factor of great importance is the degree of brightness shown by the pictures on the screen remote from the projection-tube. Unless this is adequate for everyone to see the images clearly, then the results will leave much to be desired, and to achieve this high anode voltages will be necessary. A wide angle of vision is also essential, and this necessitates research being carried out into the question of new screens, for screens which give sufficient picture brightness are unfortunately of such a character that the angle of view is rather restricted without diminution of brilliance.

One of the Ultra television receivers using the reflected-image system.

Televiews

Using Telephone Cable

IN the days of low-definition television, ordinary Post Office telephone cable was used quite frequently for the conveyance of television signals between remote points. The first important occasion was for Baird's transmission between London and Glasgow, and prominent Scottish citizens were able to see and hear people in London through the medium of an early disc-model receiver. When television developments began to embrace pictures of high definition, however, it was found that standard telephone lines introduced such a large degree of phase and amplitude distortion to the high frequencies of the generated signal that it was almost impossible to recognise the reconstituted picture. Bearing in mind that the telephone cables throughout this country are designed to handle aural frequencies up to a maximum of 15,000 cycles with the best lines, this was only to be expected, and for long distance television work specially designed co-axial cables are now employed. It has now been revealed, however, that the Germans have succeeded in transmitting high-definition television pictures up to distances of two miles by employing ordinary public telephone wires.

The technical details of the tests have not yet been revealed, but it is thought that some form of carrier telephony method has been used coupled with specially designed terminal equipment, which has enabled the video frequencies to retain their correct phase and amplitude relationships without serious attenuation. Even if the distances are limited ultimately to a few miles, a development of this nature opens up an enormous field of exploitation for the television service. Instead of being limited to transmission from points only reached by the co-axial cable round London, any place with a telephone line which can be tapped into the cable will come within the range of the camera. No doubt the British Post Office will be able to co-operate with the B.B.C. in this matter, and so provide viewers with an outside television broadcast service of wider scope than hitherto contemplated. The reduced costs involved will also make possible the extension of any television telephone service which may be planned, for up to the present the expense of laying special cable has been a big stumbling block to any big development of this kind. Another line of progress is the relay distribution of television programmes which has hitherto been handicapped for identical cable cost reasons. Just as listeners can have a loudspeaker only for listening to programmes featured on a relay system of distribution, so at some future date it is quite likely a simple picture reproducer will be hired for connecting to a distribution network feeding televison signals into the home.

Checking Inaccuracies

NO doubt many readers who used thirty-line television receivers will remember the high frequency and low frequency test cards used by the B.B.C. so that experimenters could check the efficiency of their amplifier equipment. The first-named consisted of a number of narrow black and white triangles tapering to a point, and the degree of blurring towards the apex of this simple diagram was a measure of the high-frequency distortion occurring. The L.F. test was two black and two white rectangles, and for good pictures it was essential to arrange the receiving circuit so that the lines of demarcation between black and white edges was sharp and clear cut, with no grey shading passing from the black rectangle to the white. Although the frequency range involved in the picture signal was ridiculously low when compared with the modern standard which we reckon in megacycles, the amplifier knowledge then available made the task of adjusting the receiver and amplifier a difficult one for the average experimenter.

No doubt remembering the extreme usefulness of these early test devices, the B.B.C. have recently introduced a television tuning signal picture which serves a similar purpose. It consists of an ingenious grouping of circles, cubes, triangles, black-and-white lines, etc., which reveal straightway many of the defects present in some sets. Any trace of non-linearity either in the line scan or frame scan is portrayed quite clearly, for the geometric figures at once acquire queer shapes which differ considerably from the original design. If the format ratio of 5 to 4 is not correct, due to a wrong adjustment of the time-base generator knobs controlling picture height and width, then this may be rectified very simply. Some vision chassis are designed to embrace the full range of modulation frequencies embodied in the present B.B.C. picture, but others attenuate before the maximum is reached. This fact is revealed by the loss of the higher frequencies showing a diminution in the picture detail, and the tuning signal design now employed gives a splendid check on these deficiencies. It is most useful to manufacturers inasmuch as it enables them to very readily test out their sets for defects prior to sale, while the purchaser is to some extent safeguarded, for he can see at a glance whether the set he is using fulfils the rigid requirements of modern high-definition working.

A cathode-ray tube receiving finishing touches in the G.E.C. research laboratories.

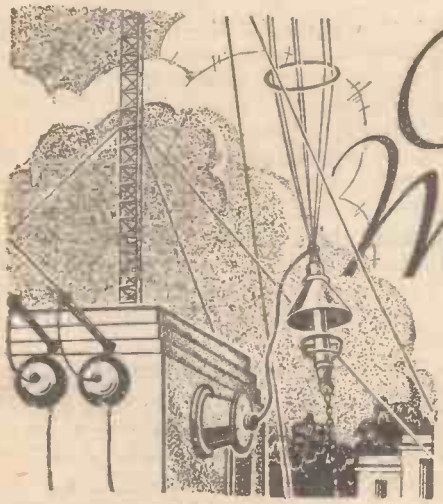
"JOURNEY'S END"

"Journey's End," the famous war play by R. C. Sherriff, is to be televised on Armistice Day, November 11th. The performance will last an hour and will occupy the whole of the evening transmission period.

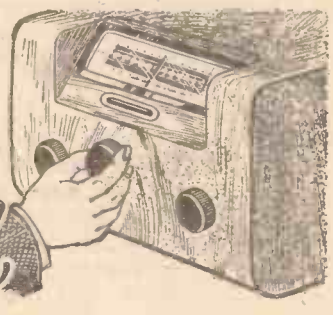
The production of "Journey's End," which will be handled by George More O'Ferrall, will test the resources of the television studio, as every effort will be made to reproduce the atmosphere of the trenches so vividly portrayed in the play. It is hoped to include film sequences in addition to sound and other "effects."

A Mirror Problem

INDIRECT viewing of television pictures is employed in quite a number of present-day television receivers, one of the main reasons being the more compact set assembly that is possible if large-size cathode-ray tubes are used. In general, the tube is positioned vertically with the directions of scan suitably reversed so that the vertical picture observed in the mirror inclined at an angle of 45 degrees to the horizontal tube screen shows the picture the correct way round. Unless the mirror used for this purpose is of good quality, however, it will tend to distort the picture seen. Furthermore, the glass should not be thick, otherwise multiple reflections will occur which look like a series of ghost images and have the effect of marring the sharpness of the lines and picture generally. Special mirrors with surface silvering have been developed for this work and these give the nearest approach to perfect reflection that is possible. Unfortunately, the cost of this section of the equipment is high, which adds to the price of the complete receiver. The improvement is so marked, however, that the extra expense involved is well worth while.



On Your Wavelength



By Thermion

Our Growing Vocabulary

THAT list of terms used in connection with P.A. work published in last week's issue reminded me that the radio trade has developed a vocabulary and a nomenclature all its own. The first real attempt to collect together and define all of the terms used in connection with wireless, wireless construction, television and electricity, is the "Wireless Constructor's Encyclopædia" by your Editor. This volume has broken all the records for the sale of technical books, for hundreds of thousands of them have been sold, and it is true to say that there is not a country in the world where copies of it do not exist. It is the handiest book published in connection with radio and the radio trade. Every term, however remote, is recorded in its pages. There are hundreds of useful diagrams, appropriate sections are enlarged to include constructional details; there are dozens of useful tables; sections on french polishing, cabinet-making, soldering; it is not a book which you merely refer to—you can open it at any page and find something of great interest. Not only that, for the contents are appropriately cross-referenced so that you are guided throughout the pages. The book, so to speak, is its own map of the technical country it explores. If you want to know the frequency of a musical note, or the size of a B.A. tap or drill, or the diameter of a wood screw, or the definition of an Aeo light, or how to charge accumulators, or wish to refer to fundamental circuits, or plan a short-wave aerial, or trace a fault, it's in the "Wireless Constructor's Encyclopædia." The work of keeping it up-to-date and noting new terms as they occur or as they are coined, is a colossal task, and when a new edition goes to press the work of emendation, expansion and addition to bring the book up-to-date is a task which is costly and tedious. There is no other similar book of its type in the world. I still find that I have to refer to it, and it is one of the books which I will not lend. Its price should be nearer £5 5s. than 5s., bearing in mind the vast amount of knowledge and experience which is compressed into its 500 pages. If you have not a copy you should certainly obtain one of this classic volume, which has become a standard work throughout the world.

"Wireless Coils, Chokes and Transformers"

ANOTHER book produced by your Editor is the above and it certainly fills a gap in wireless literature. Formerly there was no book which told you how to make coils, chokes and transformers. It costs only 2s. 6d., but the experimenter will find that it contains pounds worth of information, and it will also save him pounds.

The Season Starts

ALTHOUGH the wireless show is held before the season really commences, it is not held too early, for if held later it would clash and vie with other and almost equally important exhibitions such as the Cycle and Motor-cycle Show, and Motor Show and the Shipbuilding and the Marine Exhibitions. The constructor season usually commences about the beginning of October, and we have a barometer in the form of the technical inquiries we receive. They sag a bit in the summer and reach their peak point in January. From October until January our Query Service—always prompt and reliable—is kept hard at it. Note that no charge is made for it. Another useful index is the amount of correspondence which I receive, for my daily post in the autumn and winter brings me letters from all over the world. From the volume of correspondence received it is obvious that interest in home construction is by no means dying, and I understand that the sale of our blueprints (we issue one for practically every possible style of receiver) are this season breaking all records. I think that the clubs are doing yeomen service in upholding the tradition and preaching the gospel of the finest scientific hobby in the world. Have you noted how the club movement is growing? Elsewhere in this issue appears an up-to-date directory of all of the clubs. If there is one in your district, why not join it?

Origin of "Stentorian"

A READER asks me why this term has been applied to a certain make of speaker. No doubt the W.B. Company will correct me if I am wrong, but I presume that it is named after Stentor, the hero in Greek legend of the Trojan War who had the voice of fifty men! He was thus the *original* loudspeaker—the *first* loudspeaker. I think the trade name therefore rather cute.

Hire Purchase Value

I WAS interested to read the results of a crop of cases recently brought before a London judge, in which a well-known wireless firm was suing a number of customers who had defaulted in their payments for receivers purchased on a hire purchase arrangement. The judge held that the value was at its present market value and not the outstanding instalments, and he issued judgments accordingly. On this basis, therefore, it would seem to pay the listener to purchase a set, pay two or three instalments, default, have the case taken to court, and pay the balance according to market value. I cannot believe that these judgments will be allowed to stand.

Towards Eight and a Half Millions

THE September licence figures show a further increase in the number of paid licences, the increase being 51,427. A total of 570,888 paid licences were issued, and 519,461 expired. The total number of licences in force at the end of September was 8,347,800, not far short of 8½ millions. The peak point has not yet been reached, and it is my opinion that it will not be reached until the 12,000,000 mark is passed.

An Ingenious Time Switch

I SEE that Milnes are now supplying an automatic time switch known as the Chronostop at 37s. 6d. Its purpose is to switch on or off electrical apparatus at any predetermined time. The switch is provided with a standard 5 amp. plug and socket, and it has a two-position device for setting to switch either off or on. A small knob is set to the number of hours ahead at which it is intended that the switch shall operate. The hours appear in a small window and the minutes on a dial attached to the knob.

Club Socials

I HOPE club secretaries will take a friendly hint that their winter curriculum should not exclude club dances, concerts, annual dinners, and other social functions. The ladies like to be present sometimes, and even the members do not wish always to listen to technical dissertations. The successful club endeavours to blend the social and the technical interests.

"Drugged to Bad Quality"

ACCORDING to Sir Noel Ashbridge, Chief Engineer to the B.B.C.: "In most households, the wireless set gets considerably less attention than the kitchen stove, although it is a far more delicate piece of apparatus. Some people seem to be content if the reading of the news bulletins is just intelligible and no more. What is perhaps more common is to find that the people who seldom hear any set but their own get hardened to indifferent quality of reproduction. I have often heard sets giving a travesty of the original, but when it has been pointed out that better results can be obtained quite easily the owner of the set disagrees. Sometimes people even prefer bad reproduction to good, because they have become so accustomed to it. In the B.B.C. we call this getting 'Drugged to Bad Quality.'"

Sir Noel went on to urge people to buy new sets. If they are also after quality I would also urge them to build them. Which reminds me that some two years ago I was invited by a member of a certain radio firm to visit his home to listen to a wireless set he had built. I had deferred this visit for some time, for the individual was a bit of a bore. He had prated so much about this set and its wonderful quality that at last I caved in and visited him. Believe me, I have never heard from any set such appalling noises, nor lack of quality in the whole of my experience of radio. He was quite wounded when I suggested that the set ought to be burnt. He thought that the reproduction could not be beaten. Who are we, therefore, to judge what is quality? Someone has got to decide on a unit of quality before we can criticise it, although in the case I have quoted it would have been agreed by everybody except this particular individual that the set was devoid of it. If a member of a radio firm is unable to discern quality, what hope has the listener?

Notes from the Test Bench

Corona 4; 'Phone Reception

THE Corona 4 described in the last three issues is intended for speaker reception, but constructors who wish to use headphones can do so without altering the wiring in any way. The phone leads may be connected either across resistance R4 in the anode circuit of V2, or between the H.T. terminal of the L.F. transformer and the lead at present connected to this terminal. When connected in the anode circuit of V2 sensitivity will be rather low as only two valves will be used, but when the second suggested method of connection is employed the first three valves will be in operation and excellent 'phone reception will be obtainable. For some stations two valves will be found adequate, and as lowering the number of valves means a reduction of background noise many listeners will probably prefer this method of connection. The 'phone leads could, of course, be connected to the speaker sockets, but it is doubtful whether the fourth valve will prove advantageous for phone reception. If connection is made to the speaker sockets it will be advisable to increase the bias on the output valve to approximately — 10½ volts in order to reduce the direct current passing through the headphone windings, which, if it rises to too high a value might result in damage.

Adding Pick-up

IT is also a very easy matter to add pick-up sockets to this receiver. As in the case of the headphones the actual method of connection is again governed to a great extent by the required volume. If the maximum amplification obtainable is desired the pick-up sockets should be connected to the grid socket of V2 and the —1½-volt socket of the G.B. battery respectively, but for normal requirements adequate volume will be obtained by connecting these sockets to the ends of V3 grid leak, R6. When connected in this manner the third and fourth valves will be in use on gram., whereas with the first-mentioned method of connection V2 will also be in use. Constructors who wish to use a radio-gram switch should obtain one of the three-point change-over type. The lead at present connected to the grid of V3 should be disconnected from this point and connected to one of the end terminals of the switch. The centre terminal of the switch should be joined to the grid of V3, and the other end terminal to one of the pick-up sockets with the other pick-up socket connected by means of a flexible lead to the —3 volt socket of the G.B. battery.

Modern Girls and Old-world Songs

IT now seems that the modern girl prefers old-world songs to modern dance music. This was one fact revealed in an investigation carried out by the General Electric Company to find out how girls employed in one of its factories in making valves for radio receivers reacted to music played during working hours. Without exception, the girls said that music enabled them to work better and, at the same time, pass the time quicker.

Although the average age of the girls is only 22, pre-war music-hall favourites were easily the most popular. Among those which received the highest number of votes were "Daisy, Daisy" ("A Bicycle Made for Two"), "Two Lovely Black Eyes" and "The Man Who Broke the Bank at Monte Carlo." Waltzes were more popular than fox-trots and although classical music came at the bottom of the list, a quarter of the girls said they preferred it to any other kind.

"We experimented with music during working hours for a month in one department," said an official of the General Electric Company, "and we asked the girls to answer a questionnaire to find out whether we were justified in carrying on with the idea. We first decided to try the experiment as the result of a suggestion in a report published by the Medical Research Council, which advocated music in factories as a means of reducing boredom in repetitive work. The number of girls taking part in the experiment was 132. It is likely that the idea will be extended to other departments."

A PAGE OF PRACTICAL HINTS

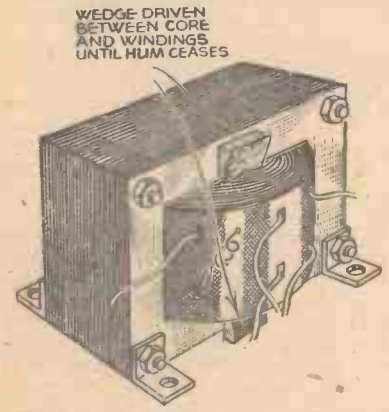
SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

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.

Eliminating Transformer Hum

MY present set is A.C. operated and the mains transformer that I am employing had a peculiar effect of humming or "buzzing" when there was a current flowing through the primary winding. I removed the transformer and thoroughly examined same, and made sure that the bolts holding the laminations together were tight; but the humming, which was quite audible when the set wasn't tuned, persisted on connecting it up again.



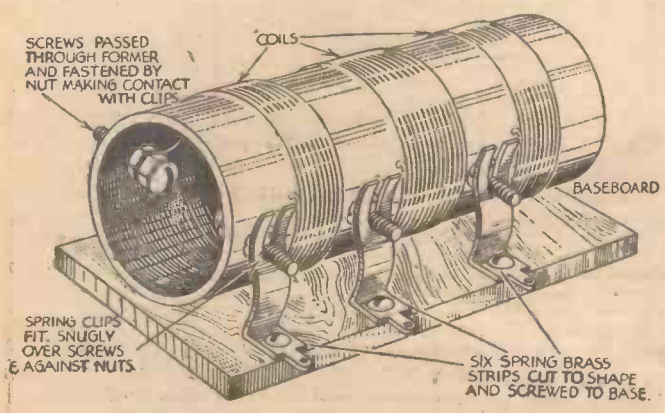
A method of eliminating transformer hum.

Upon experimenting, I found that I could stop the "noise" by shaping two small wedges of soft whitewood, and pushing them between the core and the windings, as shown in the sketch—one in the top and the other driven in from the underneath.—E. C. BUTT (Cranwell).

A Simple Coil Mount

I CONSTRUCTED this handy coil mount by cutting some spring supports to the shape shown in the sketch and bending these to form a good strong spring connection.

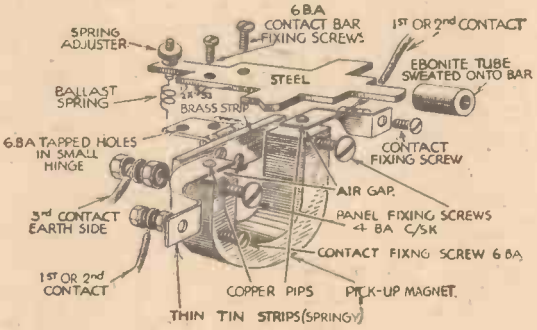
Screws were then passed through the coil former between each coil, protruding on each side, the coil ends are connected between two nuts inside the coil former which is pushed down into the slots in spring supports, thus making a good contact.—G. MOUNTFORD (Leeds).



A handy coil mount with spring contact supports.

A Novel 3-Point Magnetic Switch

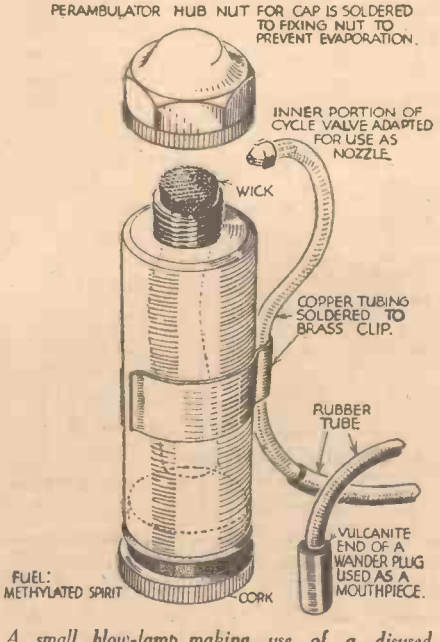
I HAVE recently employed the rather unique method of switching illustrated, and find that its efficiency warrants the little extra bulk due to the disused pick-up magnet. The assembly is clearly depicted in the accompanying drawing, from which it will be seen that the whole construction is mounted directly on to the rear of the front panel, two holes and a slot having previously been made. The normal position of the small steel contact arm is maintained by the pressure of the ballast spring, but this tension is not sufficient to influence the magnetic force of the magnet when the arm is in an operated position. On restoring to normal, the copper pips prevent the contacts remaining influenced by the magnet poles, and their respective spring tension restore these to their original position.—S. T. DALLON (Wolverhampton).



The assembly of parts for making a novel 3-point switch.

A Useful Blow-lamp

I HAVE often found that a small blow-lamp is of great use in radio set construction, and I constructed a neat little lamp from a broken-down electrolytic condenser of the metal-cased type. The end was cut off with a simple disc-cutter (or alternatively it could be sawn across with a hack-saw), and the contents turned out. The ebonite threaded plug was then drilled to accommodate a length of wick. This consisted in my case of some good cotton waste twisted into a rope. The case of the condenser was then packed with cotton wool and a cork from a liqueur bottle used to seal the end. A brass clip was soldered to a length of thin copper tubing and pressed over the case, with the tubing bent so that a jet of air could be directed on to the flame. To ensure a fine jet a piece of cycle valve was soldered to the top of the copper tube. At the other end of the tube a length of valve rubber (cycle variety) was attached and provided with a bakelite end of a wander plug to act as a mouthpiece. To close the wick and prevent evaporation the lock nut of the condenser was sweated on to a perambulator hub nut, and a thick cork washer placed over the body of the condenser will make a good, air-tight joint. Ordinary methylated spirit should be used in the lamp, and a hot and clean flame is then available for fine work.—J. NEWMAN (Brighton).



A small blow-lamp making use of a disused electrolytic condenser casing for the spirit reservoir.

Practical and Amateur Wireless Receivers—14

The Main Constructional Details of the Universal Hall-Mark Four are Given in This Article

SEVERAL requests have been received lately for a powerful mains receiver suitable for high-quality signals from the local stations with a fair number of distant stations at good quality. For this purpose at least one good H.F. stage must be employed, whilst to ensure good quality powerful loudspeaker signals a push-pull stage employing two pentodes is ideal. To cover the various mains supplies which may be used a Universal circuit will be found necessary, and thus the complete specification comes down to that used in our Universal Hall-Mark Four receiver, the circuit of which is reproduced below. A full list of components is also given this week, and for those readers who now wish to build a set of this type a full-size blueprint is available, number P.W.47, price 1s. Although a more or less standard arrangement, there are one or two points of interest in this circuit which require explanation. Firstly, a single tuned circuit is employed for the first stage and also for the detector stage, but this should provide adequate selectivity for all normal requirements. Where excessive interference is experienced, such as when the receiver is required for use close to a main B.B.C. station, a band-pass tuner could, of course, be employed in the aerial circuit, and this would entail the use of a three-gang condenser in place of the two-gang component now specified. The detector stage is quite normal, and it will be noted that a biasing resistor and condenser are included in the cathode circuit of the detector stage.

The Output Circuit

A pick-up may, therefore, be used, when required, by connecting it between the grid of this valve and the earth line (chassis).

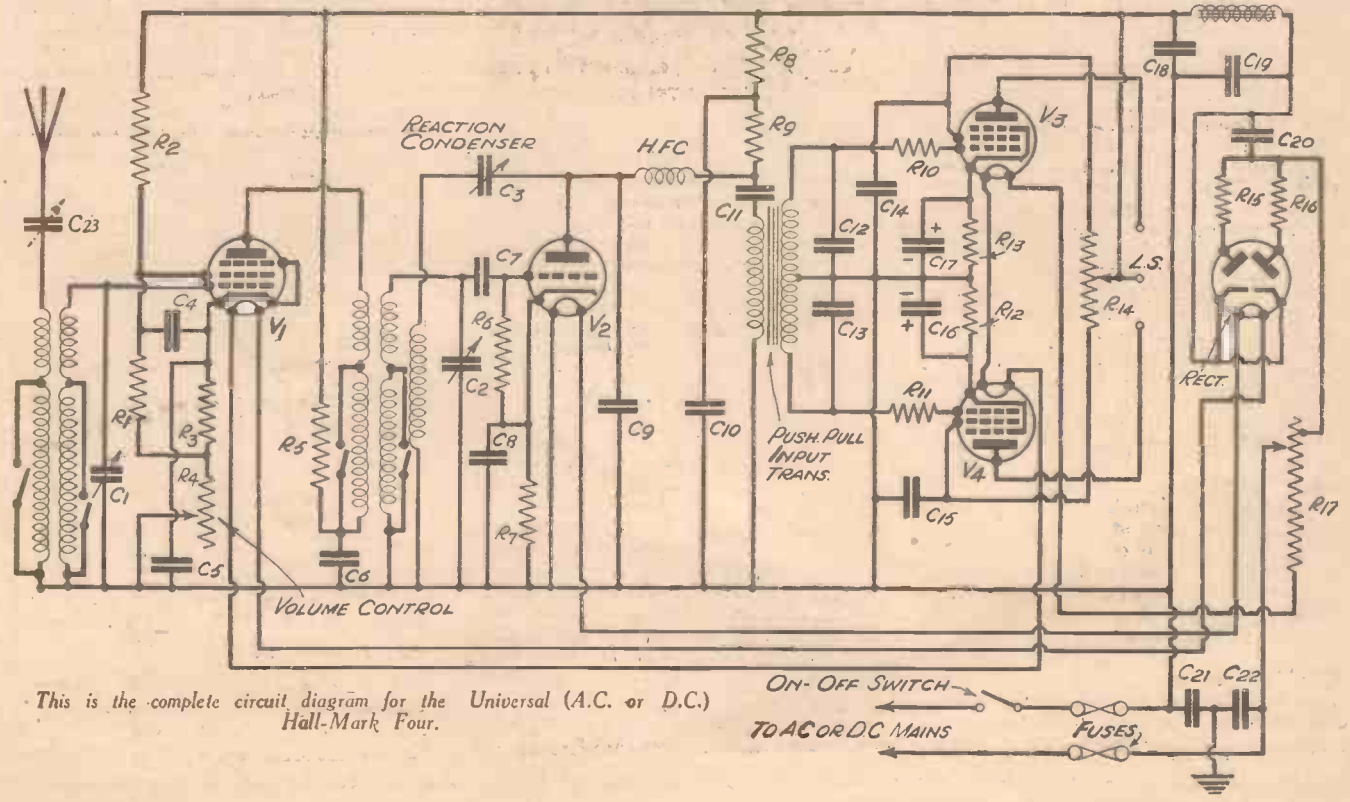
On the output side several devices have been included in the interests of stability and quality. Firstly, the transformer is parallel-fed to remove the current from the primary and to give an improved low-note response. Secondly, two fixed condensers are connected across the secondary (C12 and C13) and this assists in improving the quality and range of the lower musical frequencies. To ensure stability a resistance is included in series with each of the output grids, and a further device for this purpose consists of the inclusion of a potentiometer across the two valves. This potentiometer supplies the voltages to the two screening grids and it will be seen that the arm of the control is joined to H.T. positive. With the aid of this control it is possible to effect a balance between the two valves which will in many cases have the effect not only of improving stability but also of improving quality, especially where the two output valves are not well matched. If, however, when you build this receiver, you find that the adjustment of this control does not have any noticeable effect, it will simply indicate that the two output valves are fairly well matched, and it should then be adjusted to a mid-way position and there left. The remaining part of the circuit, supplying the H.T., is orthodox, a full-wave rectifying valve being connected on the half-wave principle and adequate smoothing devices being included to remove possibility of mains hum.

LIST OF COMPONENTS

One 2-gang set coils, types Q and T.—Wearite.
One 2-gang .0005 mfd. midget condenser with type V.P. drive with wavelength scale (C1, C2).—Polar.
One .00015 mfd. reaction condenser (C3).—Graham Farish.
Four .5 mfd. fixed tubular condensers (C6, C11, C14, C15).—T.M.C.
Two .1 mfd. fixed tubular condensers (C4, C5).—T.M.C.
Three .05 mfd. fixed tubular condensers (C20, C21, C22)—T.M.C.
One .0001 mfd. fixed tubular condenser (C7)—T.M.C.
Three .0002 mfd. fixed tubular condensers (C9, C12, C13)—T.M.C.
One 2 mfd. fixed condenser (C10)—T.M.C.
Three 25 mfd. electrolytic condensers (C8, C16, C17)—Dubilier.
Two 8 mfd. electrolytic condensers (C18, C19)—Dubilier.
One .0003 mfd. pre-set condenser (C23)—Formo.
Fourteen fixed resistances, 30,000 (R2), 25,000 (R1), 2,000 (R5), 500,000 (R6), 20,000 (R8), 30,000 (R3), 1,000 (R7), 250 (R12), 250 (R13), 50 (R15), 50 (R16), 10,000 (R10), 10,000 (R11), 200 (R3).—Graham Farish.
Two potentiometers 2,000 ohms type V.C.26 (R4) and 5,000 ohms, type V.C.29 (R14).—Bulgin.
One mains dropping resistance (R17)—B.T.S.
One snap H.F. choke—Graham Farish.
One L.F. choke H.T.11—Wright and Weaire.
One Input push-pull transformer type D.P.36—Varley.
Three potentiometer brackets—Peto-Scott.
One mains on/off switch, type S.80—Bulgin.
Five valveholders, 4, 7-pin, 1, 5-pin—Clix.
Two .5 amp mains fuses—Microfuse.
One mains lead and plug—Belling and Lee.
Five valves, types H.P.2118, R.2018, P.P.4118, P.P.4118, PV3018—Tungsram.
One loudspeaker, type F.R.7. P.M.24—Rola.
One Metaplex chassis—Peto-Scott (12 x 10 x 3½ins.).
A.E. strip and plugs—Belling Lee.
One Hall-Mark Four cabinet.

Other Models

For those listeners who require a similar receiver for battery operation a modified version of the receiver is available on Blueprint No. P.W.46. Similarly, for those listeners who are on A.C. mains and who prefer a model designed primarily for this type of supply, a special A.C. version is available on blueprint No. P.W.45.



This is the complete circuit diagram for the Universal (A.C. or D.C.) Hall-Mark Four.

The New B.B.C. Stagshaw Station

Some Details of the Station, Aerial and Equipment Now in Use in the North-east of England

ON October 19th last, the new transmitter at Stagshaw was opened by Her Grace the Duchess of Northumberland. This station is intended to serve the north-east section of England in a better and more efficient manner than the present N.E. transmitter. There were many important points to be considered in deciding upon the site for this transmitter, one of the most vital details being the number of people who are to be served by the transmitter. This led to a decision to place it near to Newcastle, since one half of the population of Northumberland and Durham lives in the neighbourhood of that city.

Other considerations were the convenience of the site as regards telephone line facilities, power supply and water supply. Finally, the site must be efficient for wireless transmission. This was ascertained by making tests with mobile transmitting and receiving equipment and several sites were tested before the final choice was made. The site chosen, which proved satisfactory in all these respects, is at Stagshaw, five miles north-east of Hexham and 16 miles west of Newcastle.

The Aerial

The most prominent external feature of the station is the mast-aerial which is already a familiar landmark. There are no actual aerial wires as the mast itself is the aerial from which radiation takes place. This type of aerial is usually described as "anti-fading," that is to say, it is designed to extend as far as possible the service area of the transmitter by radiating the maximum amount of energy in a horizontal direction (the "ground wave") and reducing as far as possible the radiation in other directions (the "sky wave"). Now the range at which serious variations in the strength of reception occur after nightfall depends upon the interaction of these two waves. If, therefore, the "sky wave" is made as weak as possible and the "ground wave" as strong as possible, the maximum non-fading range will be obtained.

It should be explained that the use of this anti-fading aerial does not mean that there will be no variations in the strength of reception from the new transmitter. However, the range at which serious fading is likely to occur will be greater than it would be if one of the older types of aerial were used.

The high-frequency energy from the transmitter is fed by means of a concentric tubular feeder-line system to an aerial transformer house situated at the base of the mast and thence to the mast-aerial itself. The height of the mast is 485ft. It is of the parallel lattice-steel type and is held in position by three sets of three insulated stay wires.

The Building

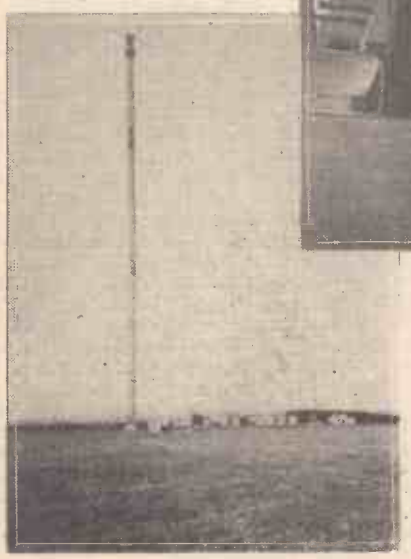
The plan of the building is similar to that of the Lisnagarvey and Burghead stations, although the lay-out of the plant is somewhat different. The building is of modern design and is brick-built. It has a single storey except for the office block at the front which has two storeys.

The Transmitter

The transmitter itself is different from any previously used by the B.B.C. in the home service. The difference lies in the use of what is known as high-power Class B modulation which permits a considerable saving in power to be obtained. The power which the transmitter delivers to the aerial is 60 kilowatts and the wavelength is 267.4 metres (1,122 kc/s), the same as that of the old Newcastle transmitter. The wavelength of the transmitter is controlled within very fine limits by a constant-frequency drive unit.

Power Supply

This is taken from the mains of the North-East Electric Supply Company through a sub-station on the site. The various supplies for the transmitter, including the 14,000-volt high-tension supply for the valve anodes, the low-tension supplies for heating the filaments and the auxiliary high-tension and grid-bias voltages, are all obtained from motor-generator sets, stand-by equipment being provided in each case. An emergency power supply is available in case of mains failure from a Diesel-driven alternator set installed in the power house, while a storage battery provides emergency lighting and power to operate auxiliary plant.



On the left is the vertical mast-aerial, and above is seen the transmitter control desk.

Water Supply

The whole of the water supply for the station is taken from local springs.

General

The front part of the building contains the offices, staff mess-room, valve store, a quality checking room and the control room. The control room is connected by high-quality telephone land lines to the Newcastle studio centre and thence to the simultaneous broadcasting network. In the control room the programme is passed through amplifiers which increase its strength to that necessary for the input to the transmitter. There is a programme control position at which the necessary control and switching operations are carried out. There is also a studio for emergency use and for testing, as at other B.B.C. transmitting stations. The apparatus associated with the constant-frequency drive unit is installed in the centre of the upper storey of the office block, facing the transmitter hall.

Reception

The position of the transmitter will enable it to provide a satisfactory service throughout an area extending roughly from the north of Yorkshire to the Scottish border. It will not, however, be able to provide an equal service at a similar distance to the west, owing to the much more severe attenuation caused by the mountainous districts of Cumberland and Westmorland. In Newcastle and district, listeners will notice a great improvement in the quality of reception. Some listeners living near the new station may find it difficult to cut out its transmissions in order to receive from distant stations, particularly with unselective receivers. With reasonably modern receivers, however, no serious difficulty is likely to be experienced. Listeners requiring advice concerning reception are invited to send a postcard to the British Broadcasting Corporation, Broadcasting House, 54, New Bridge Street, Newcastle-upon-Tyne, or to Broadcasting House, London, W.1, asking for a copy of a pamphlet entitled "The Stagshaw Transmitting Station," which will be sent post free. Applications should be marked "Stagshaw" in the top left-hand corner.

BUILDIN

12-WATT A

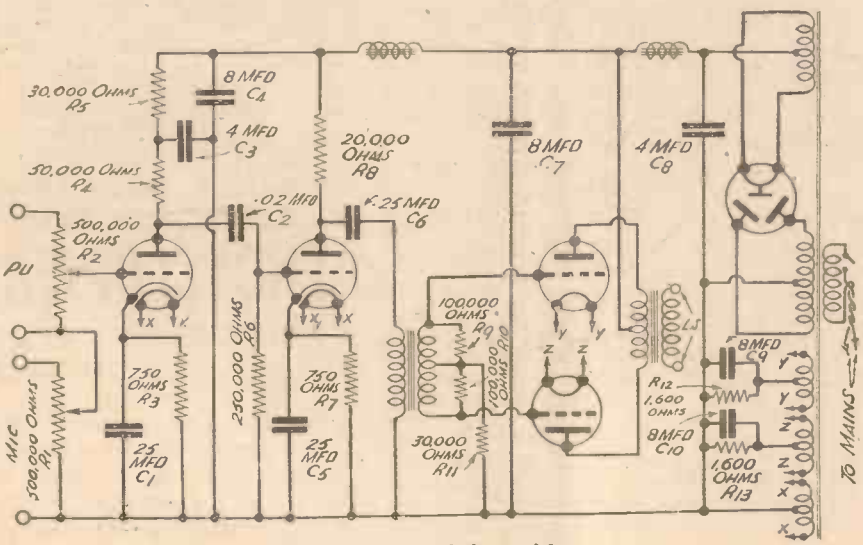
Circuit and Constructional Deta Amplifier Capable of Providing of 12 Watts, and Suitable for U Microphone, Pick-up, or Radio

A rear view showing the valve layout.

THIS design is being published in response to numerous requests for a really powerful amplifier, capable of providing sufficient output to fill the average-sized hall. Perhaps the actual undistorted wattage figure does not convey much to many of our readers, and it is probable that the output available can be better gauged when compared with that obtainable from cinema talkie equipment—the maximum obtainable in many cinemas does not exceed 20 watts. Constructors must not, of course, confuse undistorted output wattage with wattage dissipation. The wattage dissipation is sometimes given in connection with amplifiers and output valves, but it is emphasised that this wattage bears no direct relationship to the undistorted output wattage. The dissipation under normal working conditions is invariably higher than the undistorted output—in this 12-watt amplifier the dissipation of the output valves is approximately 40 watts. When buying or constructing an amplifier it should, therefore, be carefully ascertained to which of the two wattages the designer or manufacturer is referring.

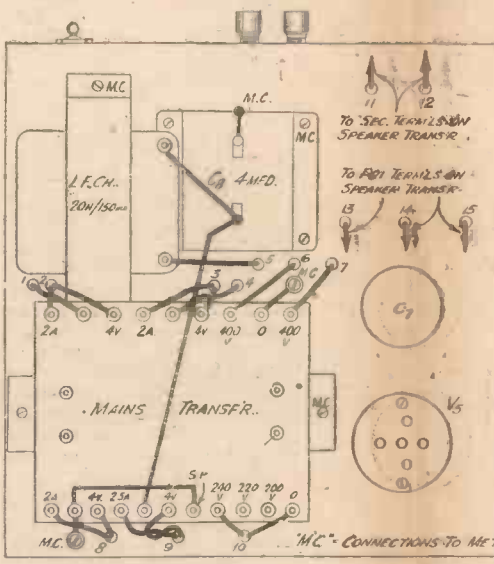
Circuit Arrangement

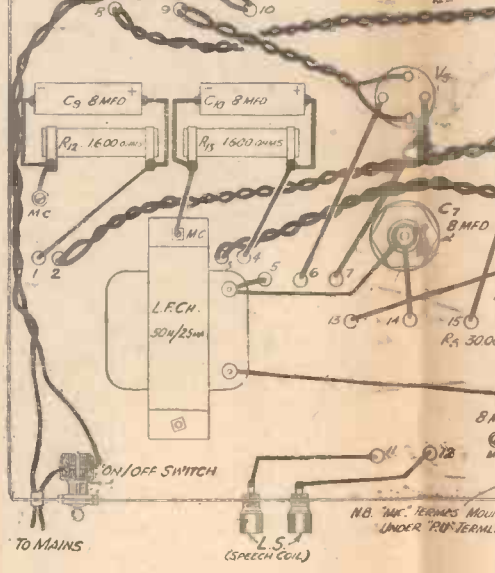
Some readers, having heard so much about the various types of resistance-coupled amplifier recently, will be rather surprised that transformer coupling precedes the output valves in this design. We make no excuse for incorporating a transformer, however, as we are definitely of the opinion that the home constructor will obtain better results from a well-designed transformer-coupled push-pull amplifier than from one using resistance coupling. A study of the diagram will indicate that the design is perfectly straightforward, and it is not claimed that any revolutionary development has been incorporated. The fact is that L.F. amplifier design has not changed a great deal in the past five years, and the secret of success in amplifier designing lies in the correct choice of components and valves. Although the circuit arrangement of a powerful amplifier of this type may look very simple, it is certainly true to say that more careful calculations are necessary than when designing a more complicated-looking radio unit. Accurate calculation of the required resistance network for the first two valves is essential owing to the fact that the smoothed voltage available is approximately twice that required by the valve anodes. Again, owing to the high voltage drop across some of these resistances, their wattage ratings must be carefully chosen.



Theoretical circuit of the amplifier.

WIRING DIA

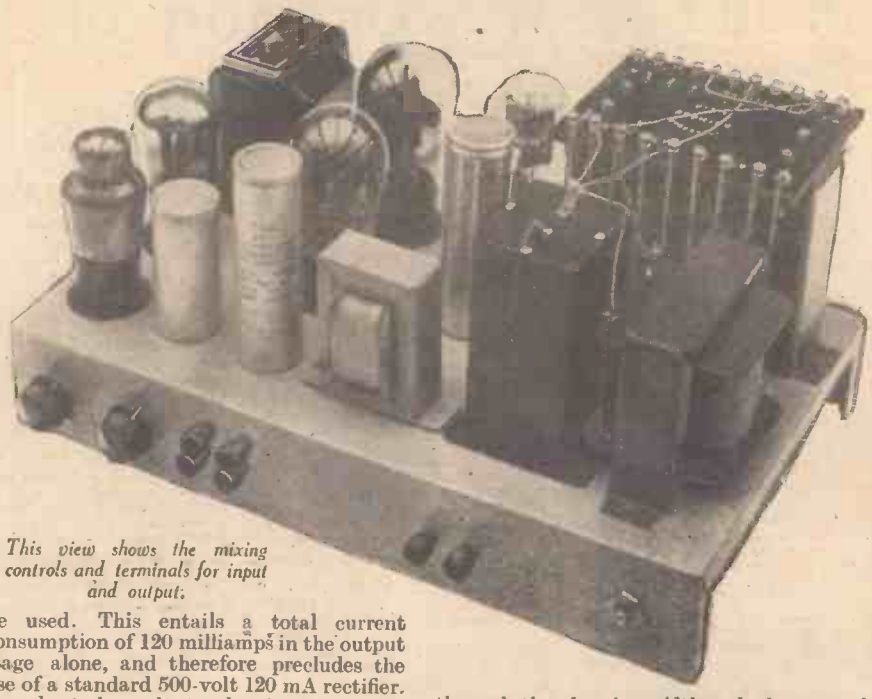




G A MPLIFIER

ils of an A.C. Operated g an Undistorted Output se in Conjunction with a Unit.

By IDRIS EVANS



This view shows the mixing controls and terminals for input and output.

Output Stage

An undistorted output of 15 watts could be obtained from two PX25A valves connected in push-pull, but in order to obtain this output the maximum permissible anode voltage of 400 volts must be used. This entails a total current consumption of 120 milliamps in the output stage alone, and therefore precludes the use of a standard 500-volt 120 mA rectifier. In order to keep the total current consumption of the four valves below the rating of the standard type of rectifier (120 mA) it was decided to use a transformer having a secondary output of 400-0-400 volts. The rectifier output voltage is then approximately 415 volts at 120 mA. A drop of approximately 30 volts occurs across the smoothing choke and output transformer primary, leaving approximately 385 volts across the anodes of the output valves and H.T.—. A drop of approximately 80 volts occurs across each of the bias resistances of the output valves, however, and therefore the actual anode voltage on the output valves will be approximately 305 volts. At this voltage their consumption is about 50 mA each, which allows for 20 mA to be taken by the first two valves without overloading the rectifier. By careful choice of anode resistances the total consumption of these valves has been kept at a slightly lower value than 20 mA.

Construction

No constructional difficulties should be encountered provided that the specified chassis is used—this is supplied ready-drilled by Peto-Scott, Ltd. It will be found that this chassis is enamelled, and therefore great care should be taken to remove the enamel at all points marked M.C. (metal chassis). All these points must be in good contact with each other through the chassis. Although the enamel forms an insulation covering for the chassis, however, it must not be relied upon as a reliable insulation for the bare ends of resistances, wires, and terminals. The resistances and wiring must be kept clear of the under-chassis surface, and the terminals marked Mic, P.U., and L.S. must be effectively insulated from the chassis.

Electrolytics

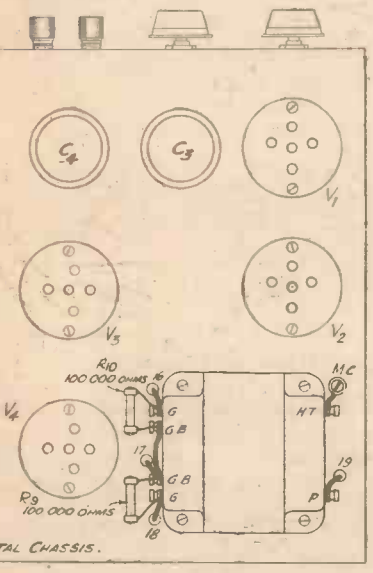
Another point which must be carefully noted is the method of wiring the small electrolytic condensers C1, C5, C9 and C10. They must be connected the correct way round, as shown on the wiring diagram—the negative (—) end is joined to M.C. in each case. With the electrolytics C3, C4, and C7 the casing is negative and is automatically connected to M.C. when the condenser is mounted, provided that the enamel is cleaned off underneath the fixing nut.

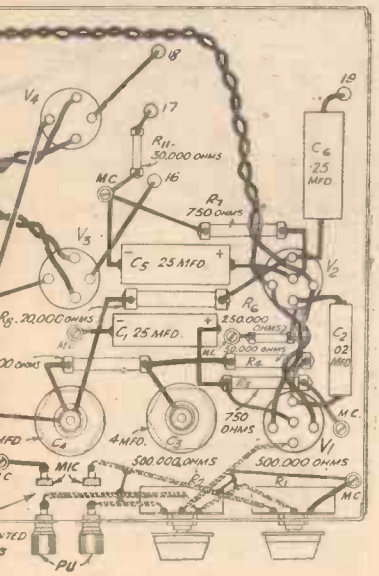
Output Transformer

The speaker used in conjunction with this amplifier should be capable of handling 12 watts and should have an output transformer suitable for matching two PX25A valves connected in push-pull (4,500 ohms each). It will be advisable to mount the speaker output transformer on the amplifier

(Continued on page 189)

AGRAM





LIST OF COMPONENTS

One push-pull input transformer—type DP6. Varley.
Two Lab. Vol. Controls—500,000 ohms. Radio Resistor.
Eleven fixed resistances: 30,000 ohms (R11); two 100,000 ohms (R9, R10); 250,000 ohms (R6); Type F½. Two 750 ohms (R3, R7); 30,000 ohms (R5); 50,000 ohms (R4); Type F1. 20,000 ohms (R8); Type F3. Two 1,600 ohms (R12, R13) type Spirohm. Dubilier.
Ten fixed condensers: 4 mfd. (C8) type 95. Two 8 mfd. (C4, C7) type 805. 4 mfd. (C3) type 812. Two 8 mfd. (C9, C10) type FT150V. two 25 mfd. (C1, C5) type FT25V. .25 mfd. (C6) type 250. .02 mfd. (C2) type 300. T.C.C.
Two L.F. chokes: 50H/25 mA; 20H/150 mA Premier.
One mains transformer: 400-0-400v/120 mA; 4v/2.5a; 4v/2a; 4v/2a; 4v/2a. Premier.
Five valve-holders: two 5-pin; three 4-pin; Type V1 without terminals. Clix.
Six insulated terminals. Belling and Lee.
One on-off switch—No. S80. Bulgin.
One fuse plug—No. P.27. Bulgin.
18in. metal screened lead. Ward and Goldstone.
Connecting wire and screws. Peto-Scott.
Five valves: MH4 (non-met); ML4 (non-met); Two PX25A; MU14. Osram.
Metal chassis. Peto-Scott.
One 12-watt speaker with separate push-pull. W.B.
Output transformer to match two PX25A.

"P. and A. W." Directory of Radio Clubs and Societies

Our Revised Directory of Radio Clubs. We Shall be Pleased to Receive Details of Any Other Clubs Not Included

A

Anglo-American Radio and Television S.W. Club (Uxbridge).
11, Hawthorn Drive, Willowbank, Uxbridge.

B

Battersea and District Radio Society.
Hon Sec., S. F. Harris, 93, Salcott Road, Battersea, S.W.11.
Bec Radio Society.
9, West Way, Grand Drive, Raynes Park.
Bideford and District Short-wave Society.
Hon. Sec., E. K. Jeusen, 5, Furzebeam Terrace, Bideford.
Blackpool and Fylde Radio Society.
Sec., H. Fenton, 25, Abbey Road, Blackpool.
Blackpool Short-wave Club.
E. Sutcliffe, The Welbeck Hotel, North Promenade, Blackpool.
Blackwood Radio and Television Club.
Address required.
Bournville Radio Society.
Hon. Sec., C. L. Bastock, c/o Messrs. Cadbury Bros., Bournville.
Bradford Experimental Radio Society.
Hon. Sec., E. P. Burgess, 23, Baslow Grove, Heaton, Bradford.
Bradford Short-wave Club.
Hon. Sec., G. Walker (2AWR), 33, Napier Road, Thornbury, Bradford.
Brentwood Amateur Radio Society.
Hon. Sec., N. K. Read, Netherton, Herington Grove, Hutton Mount, Brentwood, Essex.
Brighouse and District Short-wave Society.
Royal Hotel Buildings, Huddersfield Road, Brighouse.
Bristol Amateur Radio Society.
Hon. Sec., G. E. Williams (G8DP), Hortham Cottage, Almondsbury.
Bristol Listeners' Club.
21, Old Market Street, Bristol.
British Long Distance Listeners' Club.
Tower House, Southampton Street, Strand, London, W.C.2.
British Short-Wave League.
Hon. Sec., F. A. Beane, Ridgewell, Halstead, Essex.
British Sound Recording Assoc.
Act. Sec., C. L. Appelby, 29, Valley Road, Shortlands, Kent.

C

Cambridge Short-wave Club.
C/o Mr. F. A. E. Porter, 19, Trafalgar Street, Cambridge.
Cardiff and District Short-wave Club.
Hon. Sec., H. H. Phillips, 132, Clare Road, Cardiff.
Chadwell Heath and District Radio Society.
Ralph's Cafe, Tram Terminus, Chadwell Heath, Essex.
City of Belfast Y.M.C.A. Radio Club.
C/o F. A. Robb, 46, Victoria Avenue, Sydenham, Belfast.
City and Guilds Eng. College Radio Society.
Hon. Sec., R. H. Tanner, Exhibition Road, South Kensington, S.W.1.
Clackmannanshire Short-wave Club.
Hon. Sec., D. McIntosh, 10, Cobbiecrook Gardens, Alloa, Scotland.
Coventry Amateur Radio Society.
C/o H. J. Chater, 170, Alderman's Green, Coventry.
Cranwell Amateur Radio Transmitting Society.
Radio Block, E. and W. School, R.A.F., Cranwell, Lincs.
Croydon Radio Society.
Hon. Sec., E. L. Cumbers, Maycourt, 14, Campden Road, S. Croydon.
Croydon Wireless and Physical Society.
Hon. Sec., H. J. P. Gee, c/o Messrs. Gee & Co., Staple House, Chancery Lane, W.C.1.

D

Darenth Valley Radio Club.
Hon. Sec., K. N. Hollands, 14, Highfield Cottages, Wilmington, Dartford.
Deptford Men's Institute Short-wave Radio Club.
Hon. Sec., A. S. Wilson, 14, Bennett Street, London, S.E.13.
Derby Short-wave Radio and Experimental Society.
Sec., H. Turner, Nunsfield House, Boulton Lane, Alvaston, Derby.
Dulwich Radio Club.
Hon. Sec., Eric Webb, 55, Upland Road, S.E.22.
Dollis Hill Radio Communication Society.
Hon. Sec., J. R. Hodgkyns, 102, Crest Road, Cricklewood, N.W.2.

E

Ealing and District S.W. DX'ers Club.
Hon. Sec., W. J. Colclough, 31, Lancaster Gardens, W. Ealing, W.13.
Eastbank Research Society.
Sec., J. P. Blackwood, 23, Braidfauld St., Tollcross, Glasgow, E.2.
Eastbourne and District Radio Society.
Hon. Sec., S. M. Thorpe, 74, Broderick Road, Hampden Park, Eastbourne.
East Sheen Radio Club (Proposed).
N. G. Anslow, 35, Gilpin Avenue, East Sheen, S.W.14.
Empire Amateur Radio League.
Hon. Sec., E. N. Adcock (G2DV), 206, Atlantic Road, Erdington, Birmingham.
Exeter and District Wireless Society.
Hon. Sec., W. J. Ching, 9, Sivell Place, Heavitree, Exeter.

F

Folkestone Radio Amateurs.
Hon. Sec., S. W. Thompson, 70, Sandgate Road, Folkestone.

G

Gateshead Wireless and Television Society.
C/o G. Wilkin, 4, Ravensdale Crescent, Low Fell, Gateshead.
Glasgow and District Radio Society.
Hon. Sec., J. Hair, 42, Maryland Drive, Glasgow, S.W.2.
Golders Green and Hendon Radio and Scientific Society.
Hon. Sec., Col. H. Ashby Scarlett, 60, Pattison Road, Hampstead.

H

Hackney and District Wireless Club.
Dist. Rep., E. Penrose, 2, Coopersale Road, Homerton, E.9.
Halifax Experimental Radio Society.
Hon. Sec., J. B. Bedford, Oak House, Triangle, Halifax.
Harco Radio Club.
Hon. Sec., C. W. Kemp, 124, River Way, Greenwich, S.E.10.
Hastings and St. Leonards Radio Society.
R. M. Sutherland, 59, Old Harrow Road, St. Leonards.
Heathfield Radio and Television Society.
Hon. Sec., R. J. Lee, 9, Theobalds Green, Heathfield, Sussex.
Hollywood and Whythall Radio Society.
Hon. Sec., J. Quilton, Fesmoud-dene, Shawhurst Lane, Hollywood, nr. B'ham.

I

Ilford and District Radio Society.
Hon. Sec., C. E. Largen, 44, Trelawney Road, Barkingside, Essex.
International DX'ers Alliance.
9, Stanton Road, West Wimbledon, S.W.20.
International Short-wave Club (Brighton).
Sec., J. C. Bennett, 205, Braeside Avenue, Brighton, 6.
International Short-wave Club (Guernsey).
Hon. Sec., F. S. Le Pavoux (2BTP), 8, Upper Canichers, St. Peter-Port, Guernsey.
International Short-wave Club (London).
Hon. Sec., A. E. Bear, 100, Adams Gardens Estate, London, S.E.16.
International Short-wave Club (Manchester).
H. Wild, 1, Elm Street, Middleton, Manchester.
Ipswich and District Amateur Radio Society.
Hon. Sec., D. H. Barbrook (G8AN), Radio House, St. Peter's Street, Ipswich.
Irish Short-Wave Club.
3, Clare Lane, Dublin.

J

Jersey Short-Wave Club.
Sec., Martin G. Bonoke, Crediton, Samares, Jersey.

K

Kentish Town and District Radio Society.
P. Pidsley (G6PI), 27, Herbert Street, Queen's Crescent, N.W.5.
Kettering Radio and Physical Society.
Irving L. Holmes, "Miami," The Close, Headlands, Kettering.
Kew Ministry of Labour Radio Society.
Ministry of Labour, Ruskin Avenue, Kew.
Kidderminster and District Radio Club.
Hon. Sec., H. A. Brown, 12, Stourport Road, Kidderminster.
Kingston and District Amateur Radio Society.
Hon. Sec., R. K. Shergold, Reculver, Manor Lane, Sunbury-on-Thames.
Knutsford Amateur Radio Club.
Hon. Sec., J. McDermott, Shaw Heath Cottages, Mobberley Road, Knutsford, Cheshire.

L

Lambda Radio Society.
C. F. Lamb, 4, Howley Street, York Road, S.E.1.
Leamington and Warwick Amateur Radio Society.
C/o M. C. Bunting, Rhualne, Clarendon Square, Leamington Spa.
Leeds and District Radio Society.
Hon. Sec., J. Kavanagh, 63, Dawlish Avenue, Leeds.
Leeds Radio Society.
Hon. Sec., G. F. Webster, 14, Birfed Crescent, Leeds, 4.
Leicester Amateur Radio Society.
A. Stimpson, 88, Welford Road, Leicester.
Liverpool Amateur Radio Society.
Hon. Sec., J. McLelland (2CIP), 38, Andrew Street, County Road, Walton, Liverpool.
Liverpool Short-wave Radio and Transmitting Club.
Hon. Sec., C. E. Cunliffe, 368, Stanley Road, Bootle, Liverpool, 20.

M

Maidstone Amateur Radio Society.
Hon. Sec., Michael Hedgeland, 8, Hayle Road, Maidstone.
Medway Amateurs Transmitting Society.
S. Howell, 124, Trafalgar Road, Gillingham, Kent.
Merchant Taylor's School Radio and Television Society.
Hon. Sec., R. B. Gardner, 91, Clarence Gate Gardens, London, N.W.1.
Mid-Cornwall Short-Wave and Television Club.
Hon. Sec., L. Phillips, 5, Graham Avenue, St. Austell, Cornwall.
Midland Amateur Radio Society.
C/o D. A. G. Edwards, Selwyn House, Chester Road, Sutton Coldfield.
Milnes Radio and Television Society.
Hon. Sec., F. Ridler, 7, Royd Avenue, Gilstead, Bingley, Yorks.
Morpeth Amateur Radio Society.
Hon. Sec., C. L. Towers, 2, Edward Street, Morpeth.

N

Newark News Radio Club.
215, Market Street, Newark, New Jersey.
Newbury and District Short-wave Club.
Hon. Sec., L. Harden, 11, Highfield Avenue, Newbury, Berks.
Newcastle Radio Society.
Hon. Sec., G. C. Castle, 10, Henry Street, Gosforth, Newcastle 3.
New Eltham Ratepayers' Assoc. (Radio Section).
Hon. Sec., E. A. Gilborn, 87, Montbelle Road, New Eltham, S.E.9.
Newport and District Radio Club.
Address required.
New Zealand DX Radio Association.
Hon. Sec., E. Watson, 37, Chancellor Street, Christchurch, N.Z.
New Zealand Short-wave Radio Club.
Sec., A. B. McDonagh, 4, Queen Street, Wellington, E.1, New Zealand.
Nelson and District Radio Club.
Address required.
North Manchester Radio Society.
Hon. Sec., R. Lawton, 10, Dalton Avenue, Thatch Leach Lane, Whitefield.
North Middlesex Radio Society.
Sec., H. A. Crouch, 27, Middleton Park, Whetstone, N.20.
Newtownards Amateur Radio Club (N. Ireland).
Hon. Sec., T. L. Kirk, Chapel View, Newtownards, Ulster.
Northampton Radio Society.
Hon. Sec., D. W. Harries, 90, Ardington Road, Northampton.
Northern Ireland Radio Society.
Hon. Sec., F. A. Robb, 46, Victoria Avenue, Sydenham, Belfast.
North Shields Radio Society.
Hon. Sec., G. A. Lee, 9a, Saville Street, W., North Shields.

O

Oxford Short-wave Radio Club.
Hon. Sec., E. G. Arthurs (2BHP), 13, Walton Well Road, Oxford.

P

Perth Radio Society (proposed).
R. Adams, 120, Canal Street, Perth.
Port Talbot Radio Club (proposed).
W. Ryan, 47, Margam Terrace, Port Talbot.
Peterborough and District Short-wave Club.
Jt. Hon Sec., W. S. Cornwell (2ACP), 80, Elmfield Road, Peterborough.
Portsmouth and District Wireless and Television Society.
Hon. Sec., F. L. Moore, 78, Laburnum Grove, Portsmouth.
Prestatyn Short-wave Club.
Hon. Sec., R. J. Stellig, Romir, Victoria Road, Prestatyn.

R

Radio Physical and Television Society.
Hon. Sec., V. R. Walker, 49, Fitzjames Avenue, London, W.14.
Radio Society of Gt. Britain.
Sec., J. Clarricoats, 53, Victoria Street, London, S.W.1.
Radio Society of Gt. Britain (Bristol Area).
Sec., A. J. Webb (2AJW), 12, Mervyn Road, Bishopston, Bristol, 7.
Radio Transmitters Union.
C/o W. H. Martin, Knockinagh, Cloughfern, Whiteabbey, N.I.
Reading Short-wave Club.
Address required.
Redhill and District Radio Society.
Hon. Sec., H. Cartwright, Radio House, Victoria Road, Horley, Surrey.
Redhill and District Short-wave Club.
Sec., S. Hassenauer, 139, Frenches Road, Redhill, Surrey.

S

Salisbury and District Short-wave Club.
Hon. Sec., C. A. Harley, 85, Fisherton Street, Salisbury, Wilts.
Scottish Short-wave Radio and Television League.
Sec., J. Nielson, 14, Bolivar Terrace, Glasgow, S.2.
Sheffield Short-wave Club.
Sec., D. H. Tomlin, 32, Moorsyde Avenue, Sheffield, 10.
Short-Wave Radio and Television Society (Thornton Heath).
Hon. Sec., J. T. Webber, 363, Brigstock Road, Thornton Heath.
Slade Radio Society.
Hon. Sec., G. Game, 40, West Drive, Heathfield Park, Handsworth, Birmingham.
Slough and District Short-wave Club.
J. H. White, 20, Chalvey Road East, Slough, Bucks.
Southall Radio Society.
Hon. Sec., H. F. Reeve, 26, Green Drive, Southall.
Southend and District Radio and Scientific Society.
Hon. Sec., F. S. Adams, Chippenham, Eastern Avenue, Southend-on-Sea.

(Continued on opposite page)

(*Continued from facing page*)

South Hants Radio and Transmitting Society.
Sec., E. J. Williams, B.Sc., Rochdale, London Road, Purbrook, Portsmouth.

South London and District Transmitters Society.
Sec., H. Cullen, 164, West Hill, Wandsworth, S.W.

Southport Amateur Radio Society.
Birch Villa, Lulworth Road, Southport.

S.T.C. Radio Experimental Society.
The Chief Instructor, Trainlug Battalion, R. Signals, Catterick Camp, Yorks.

Stoke-on-Trent Radio Society (proposed).
H. Churton, 26, Victoria Street, Smallthorne, Stoke-on-Trent.

Surrey Radio Contact Club.
Hon. Sec., E. C. Taylor, 35, Grant Road, Addiscombe, Croydon.

Sutton-in-Ashfield Society.
Hon. Sec., A. W. Fowler, 78, Kirkby Road, Sutton-in-Ashfield.

Swansea Radio Club.
Hon. Sec., R. J. Davies, Messrs. Watson and Davies, Mansel Lane, Swansea.

Swindon and District Short-wave Society.
Hon. Sec., W. C. Barnes, 7, Surrey Road, Swindon.

Smethwick Wireless Society.
Hon. Sec., E. Fisher, 33, Freeth Street, Oldbury, nr. Birmingham.

T

Television Society.
Sec., G. Parr, 68, Crompton Road, N.21.

Thames Estuary Radio Society.
F. S. A. Jenkins, R.N.W.A.R., "Cranleigh," Spencer Close, Rochford, Essex.

Thames Valley Amateur Radio and Television Society.
Sec., J. N. Roe, 19a, The Barons, St. Margarets-on-Thames, Middlesex.

Tonyrefail Short-wave Club (proposed).
E. Powell, 44, Pritchard Street, Tonyrefail, Glam.

Torrington and District Short-wave Club.
Hon. Sec., A. E. Cornish, 1, Halsdon Road, Torrington, N. Devon.

Tottenham Wireless Society.
Hon. Sec., F. E. R. Neale, 17, Whitley Road, Tottenham, N.17.

Tottenham Short-wave Club.
Hon. Sec., Edwin Jones, 60, Walmer Terrace, Firs Lane, Palmers Green, N.13.

Tunbridge Wells and District Amateur Transmitting Society.
Sec., W. H. Allen, 32, Earl's Road, Tunbridge Wells.

W

Waldron Radio Society.
Hon. Sec., W. E. Simmons, 35, Tranmere Road, Earlsfield, London, S.W.18.

Wallasey Junior Radio Club.
A. M. Wilding, 2, Wallacre Road, Wallasey, Cheshire.

Warwick School Radio Society.
Sec., P. N. G. Whitlam, Warwick School, Warwick.

Wellingborough and District Radio Society.
Hon. Sec., L. Parker, 127, Jubilee Crescent, Wellingborough.

West London Radio Society.
Hon. Sec., D. Reid, 15, Tring Avenue, Ealing Common, W.5.

Weymouth Short-wave Club.
W. E. G. Bartlett, 59a, Franchise Street, Weymouth, Dorset.

Willesden (proposed).
S. A. Reeve, 115, Willesden Lane, Kilburn, N.W.6.

Wirral Amateur Transmitting and Short-wave Club.
Hon Sec., J. R. Williamson, 49, Neville Road, Bromborough, Birkenhead.

World Friendship Society of Radio Amateurs.
Hon. Sec., A. H. Bird (G6AQ), 35, Bellwood Road, Waverley Park, Nunhead, S.E.15.

Wrexham and District Radio and Television Club.
Address required.

BUILDING 12-WATT AMPLIFIER

(*Continued from page 187*)

chassis as shown on the diagram and then connect the speaker speech coil leads to the terminals marked L.S. This method of connection is not essential, however; it is permissible to connect the leads marked "to speaker transformer primary" to the input terminals on the transformer attached to the speaker. If this method of connection is adopted the speaker should be kept reasonably near the amplifier and the leads joining them should be well-insulated.

Bias Resistances

The bias resistances R12 and R13 are of the semi-variable type, the resistance being varied by moving one of the clips. Constructors are advised to measure the resistance value across the two connecting clips before wiring is completed as the value required in these two positions is critical. If fixed resistances of another type are used they must have a wattage rating of 5 watts, or higher.

A fuse plug is specified but constructors who like to have a fuse fitted on the amplifier chassis can mount this behind the smoothing condenser C8. The mains lead should be disconnected from the on-off switch and connected to one terminal of the fuse-holder and the other fuse-holder terminal connected to the switch. A fuse having a rating of 1 amp. will be suitable.

Screening

The leads attached to the two volume control potentiometers should be screened as indicated on the diagram. The screening cover must be connected to M.C., and should not make contact with the lead passing through it. Screening of the leads connected to the grid sockets of V2, V3, and V4 could also be advocated, but this was not found necessary in practice.

10-METRE STATIONS

SOME popular 9.494-metre stations are W3XKA, Philadelphia, who may be heard between 2 and 4 p.m., relaying KYW or the N.B.C. programme; W3XEY, Baltimore, relay of WFBR, around 3.30 p.m., and W4XCH, relay station of WMC, Memphis.

W8XWI, Detroit, operates at the following times. Sundays from 7.30 p.m. to 12.30 a.m. and from 11.55 a.m. to 5.30 p.m. You will generally hear him relaying WWJ. Other popular broadcasters are W8XAI, Rochester; W9XHW, Minneapolis; W9XIL, Wisconsin, and W9XPD, St. Louis.

The Amateur Set Designer

Further Notes on Tuned Circuits and Reaction are Given in this Eighth Article of the Series

(*Continued from page 154, October 23rd issue*)

AN e.m.f. may operate upon a tuned H.F. circuit either internally or externally. Fig. 34 indicates the difference between the two cases.

As regards an internal e.m.f. the impedance of the circuit at resonance is simply R, the effective series H.F. resistance. To an externally applied e.m.f., however, the circuit if oscillating at the resonant frequency presents an impedance which is equal to L/CR ohms.

This impedance acts effectively as a resistance and is called the "dynamic resistance" of the circuit. Note how, yet again, the L/R ratio comes into play.

Where high efficiency coils are used, and condenser losses are reduced to a minimum, very high values of dynamic resistance can be obtained. With some I.F. coils 300,000 ohms and more can be obtained.

Adding Tuned Circuits

One tuned circuit is, of course, essential to a receiver. Quite apart from the fact that the sensitivity of a receiver with only one tuned circuit is hardly likely to be adequate for distant reception, it must be observed that the selectivity obtainable with one tuned circuit must necessarily fall far short of that required for distant reception. By increasing the number of tuned circuits the over-all selectivity can be raised, but there are a number of aspects regarding the matter with which the amateur designer should be familiar.

There are two quite different ways in which the number of tuned circuits in a projected design can be increased.

In Fig. 35, two circuits A and B are shown as being coupled together. In Fig. 36 the same two circuits are shown as forming tuned grid and tuned anode circuits, respectively. In the case of 36 A and B are not coupled together in the sense that they are in 35—ignoring the "bugbear" of stray coupling—and it is customary to refer to them as being in cascade.

In the case of coupled tuned circuits every additional circuit added to any one coupling chain reduces the sensitivity of the receiver. If it were not for this fact there would be no technical objection to the use of several tuned circuits between the aerial and the first valve. Cascaded circuits, however, are associated with additional valves so it could hardly be maintained that reduction of sensitivity has to be considered by the designer in this case.

With a pair of coupled circuits the combined selectivity characteristic of the pair will be very dependent upon the degree of coupling between the two circuits. If the pair has very loose coupling the over-all resonance curve will be single peaked and, if the two circuits are not of very low magnification, the peak will be very sharp. As the coupling is increased the curve will at first remain single peaked, but will spread more, and the energy transfer between the two circuits will increase. With progressive increase of coupling this will go on up to a certain critical coupling value at which the energy transfer between the circuits will be maximum. At the critical coupling the resonance curve is still single peaked. With coupling tighter than the critical value the resonance curve will become double-humped and "band-pass" tuning conditions become possible.

Band-pass Tuning

As we have already seen, the characteristic of a band-pass system will give the best compromise in connection with the selectivity *versus* fidelity problem, provided that the top of the resonance curve can be kept sensibly flat, and provided that the band width for maximum response is suitable for the particular reception conditions arising. Care must be taken that the double-humped effect does not become too pronounced, for we do not want two very prominent peaks with a deep trough between them. This will come about if the coupling is excessively tight, and is also far more liable to occur when the two coupled circuits each have very high magnification values. Although this consideration is important, the designer must never allow himself to forget that, in the long run, it is the over-all selectivity characteristic of the receiver which is going to matter. It must be emphasised that, where the receiver contains several tuned circuits, and perhaps several coupled pairs, the over-all characteristics will depend upon the combined effects of all of them. For instance, if a receiver contained two rather tightly coupled circuits, and one single tuned circuit in addition, then the single peaked selectivity tendency of the latter could be made to counteract the tendency for the coupled pair to produce a trough at the carrier frequency.

A number of uncoupled circuits in cascade will give a combined single peaked characteristic provided that the ganging is accurate. Fig. 36 shows a very simple and direct form of cascading, but it should be understood that if circuit B formed the tuned secondary of an H.F. transformer with an untuned primary, then A and B will still give combined single peaked results although, of course, the effect of B will be modified in magnitude.

Fig. 34.—Diagram to illustrate internal and external e.m.f. as applied to an oscillatory circuit.

How Many Tuned Circuits for H.F., Detector, L.F.?

The receiver with one stage of H.F. amplification gives the designer a choice of either two tuned circuits or three, assuming that he is going to work along orthodox lines.

In the first case there would be one tuned circuit between the aerial and the H.F. valve, and one between the H.F. valve and the detector. In the second case there would be a band-pass pair between the aerial and the first valve, and one single-tuned circuit between the latter and the detector.

The choice between the two arrangements demands careful consideration. As a matter of fact, both arrangements are normal and are commonly used, and the matter hinges upon what the designer considers to be more important—sensitivity for distant reception, or fidelity on local broadcasts.

With no more than one H.F. valve in use microvolts are precious, if maximum reception range is the important object, and it will be advisable to restrict the number of tuned circuits to two. On the other hand, if the best possible fidelity is required on local transmissions it will pay to use a band-pass input.

We think that this gives us a suitable opportunity to remind amateur set designers of the necessity of mentally "viewing" the receiver as a whole before making absolutely final decisions regarding the design of any one particular section of it. In the case under consideration there would be little advantage gained by going to a lot of trouble to give the H.F. amplifier a particularly wide band-width of response if the L.F. section of the receiver is going to have a decidedly pronounced high-note cut-off.

Reaction

Regenerative amplification, obtained by reaction, is to be avoided whenever possible owing to disadvantages attendant upon its use but, at the same time, it must be said that the designer will be practically compelled to incorporate reaction in certain cases. The amplification to be derived from reaction is virtually a necessity if the receiver has less than two stages in front of the detector, and is required to give "general purpose" performance.

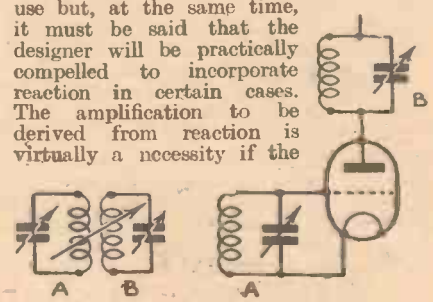


Fig. 35. — Two closed circuits coupled together.

Fig. 36.—In this arrangement the only coupling which exists is through the valve.

It should be noted that the feed back provided by reaction reduces the effective value of the H.F. resistance of the circuit to which the reaction coil is coupled. This raises the magnification of that circuit, and sharpens its resonance curve. The gain of sensitivity due to increased circuit magnification is generally the designer's chief object in using reaction. We have previously pointed out, however, that certain methods of increasing selectivity do not give the designer much latitude because he comes up against the disadvantage of loss of over-all sensitivity.

(*To be continued*)

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).

Our S.W. Adaptor : An Appreciation

SIR,—Please accept my warmest thanks for your kind reply to my letter concerning the S.W. adaptor given in your textbook on "Television and S.W. Radio." It may interest you to know that on coupling the circuit up to my 3-valve "Class B" set I was astounded to hear several stations coming through at full *loud-speaker* strength, with very little fading. It was a delightful experience to me. Of course I received more on the headphones at very pleasant strength. Those I got on the 'phones are mostly *not* European but suggest to my ears something African or South American. Not having a 2½in. former I made the coils on a 2in. one, with 3, 6 and 4 turns, with the same spacing on each coil, viz., $\frac{1}{12}$in. Wire used is No. 18 S.W.G. bare copper; spacing between coils $\frac{1}{4}$in. and $\frac{5}{12}$in. respectively. I am really delighted with results, and thank you most heartily both for the interest your excellent textbook has given me in S.W. reception, and for your kindness in extending to me further instruction as instanced in your courteous replies to my recent queries.—JAMES BRANDRETH (Liverpool).

The "Colt" All-waver

SIR,—I wonder if my experience with the Colt All-waver would be of any assistance to any other reader who has built this fine set. Also, perhaps you could give me a reason for this unusual way of getting such good results. If I connect the aerial to the lead on the Bulgin coil I get long- and medium-wave stations fine, but not short-wave stations. If I connect the aerial to No. 8 terminal on the coil, which completely reverses the proper order of working, I can tune in anything on the short waves, W2XAD, Tokio, and even CJCB Canada, and amateurs by the dozen. Perhaps you can tell me why? Thanking you for such a splendid set.—F. E. GOFFE (Henley-on-Thames).

[*It is probable that long aerial prevents reaction being obtained with aerial connected to C1. When connection is made to terminal 8, transformer coupling is being used.*—ED.]

Heard on the "Telecent"

SIR,—I have constructed the "Telecent" Short-wave Three, described in PRACTICAL AND AMATEUR WIRELESS, and it is indeed a great receiver. The 40 and 20 m. amateur bands come in very well. I have logged over 70 stations on the 10 m. band alone, and also the U.S.A. Police transmissions on 9 m. (calling all cars). The strongest "W" station on the 10 m. band is W4AHH, coming in at R9, with W1COO (using 200 watts) running a close second. I have logged K6NYV in Hawaii at R6, and also VU2CQ of Bombay, in India. My aerial is 66ft. long running east and west. It is about 50ft. high at the top end. I am a New Zealander, and am very interested to get some New Zealand stations, but up to now I have not been successful. I have several amateur friends in Auckland, and they let me know by post when they intend to be on the air. I shall endeavour to get a transmitting licence while over here.—ARTHUR DENTON (Brixton, London, S.W.).

Logged at Slough

SIR,—I have not seen a short-wave log from this district in PRACTICAL AND AMATEUR WIRELESS, so I submit mine. All stations were received during the last three weeks on a battery 0-v-1 receiver, 20 metre 'phone: W2QC, W2IY, W2CG, W2DH, W2GIG, W8HX, W3BDD, W3DDD, W1BLO, W1DLO, W1BX, W2DX, W1GJF, W1BBA, W2AWL, W2GRO, FK4AM, SV1CA, VE2HG, and HA4A.

40 metre 'phone: G2KM, G8TH, G8RO, G5TY, G8SB, G2AK, G8OG, G12CC, G8CI, G2PU, G6UX, G8FG, GA2CC, G6BW, G8FV, G2VG, G6JF, G8QP, ON4JN, and ON4UH. Wishing your paper every success.—LESLIE COOTE (Slough, Bucks).

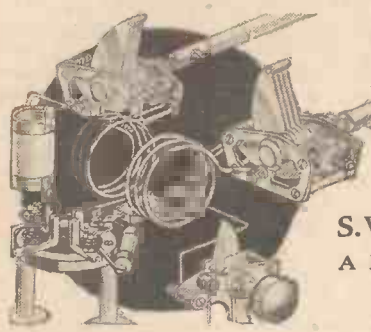
CUT THIS OUT EACH WEEK.

Do you know

—THAT wavelengths in metres may be converted into kilocycles by dividing 300,000 by the number of metres.
—THAT to convert frequency in kilocycles to metres 300,000 should be divided by the number of kilocycles.
—THAT to convert megacycles to metres 300 should be divided by the number of megacycles.
—THAT care must be taken to avoid the cap lead from falling on to the metallised surface of a valve as this will result in a short-circuit and may damage the valve or other components.
—THAT a leading-in wire may be fed to a receiver through a glass window without cutting the glass.
—THAT to carry out the above idea a disc of metal should be cemented on each side of the glass and the leading-in wire joined to one disc and the aerial lead to the set joined to the other disc.

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.



Short Wave Section

S.W. RECEPTION DIFFICULTIES

A Miscellany of Notes on Various Subjects of Topical Interest.

WE recently received a rather pathetic letter from one of our readers in the Irish Free State. His initials are N. K. B., but it would hardly be fair to print his full name, since his difficulties are partly of a domestic nature. Let us explain more fully. N. K. B. has written to us several times in the past and, we are glad to find, advice that we have passed on to him has been much appreciated. In his recent letter he writes: "When writing to you I feel I am writing to acquaintances. Some things I know can be overdone, and I hope I am not looking for too much information."

Of course he is not asking for too much; we have invited all of you to write to us, and we are always glad to be helpful. Our post-bag is swelling, and we now reply only to those letters that actually call for an answer, or which are requesting assistance, but we appreciate every letter and make a point of passing on all useful suggestions.

Neat Inside Aerial

To return to our I.F.S. friend. He is a short-wave enthusiast, but has reached the point of fearing that his interest might wain. This is because he has been very disappointed with the S.W. reception obtained of late. He sends us a circuit of his set, and points out that it is in an upstairs room, with the result that a good earth lead is impossible. Furthermore, he is not allowed to erect an outside aerial, and his "better half" insists that an inside aerial shall not be placed across the room, because it is unsightly. The letter concludes: "What do you advise—a divorce on the grounds of mental cruelty?" Frankly, we do not. What is more, we flatly refuse to come between man and wife. But we do insist that there is no need to lose heart.

This gentleman is using a frame aerial, with one lead from this connected to the aerial terminal of his Det.-L.F. set. The other end of the frame is free, and the earth connection consists of a piece of tin-plate nailed into a cement wall. Hand-capacity is prevalent when using 'phones, despite the usual precautions of connecting a .003-mfd. condenser between the terminals, and another condenser from the anode of the output valve to earth.

The circuit is standard, and is perfectly correct, but we do not like the aerial and earth arrangements. A frame aerial is very inefficient when used in this manner, and it would be much better to have a length of insulated wire round the picture moulding of the room. Still better, a length of Pix aerial strip could be run round the room. This material takes the form of an adhesive tape—similar to the stuff used to put round a cut finger—and can be had in various colours. By choosing one to match the wall decoration, N. K. B. would improve reception and still further placate Mrs. N. K. B.

An Earthing Problem

We agree that the earth presents an awkward problem, but not one that cannot be solved. A counterpoise could be used, consisting of a second "aerial," similar to the first, run round the skirting board; it should be insulated and connected to the

by The Experimenters

earth terminal of the set. If a loose-coupled aerial winding were added to the coil, reception would be as good as when using a simple doublet. If there are any objections to this arrangement, a long insulated wire could be run to a water pipe or to a buried plate or "chemical" earth in the ground outside. Of course, a long wire is not to be recommended, but if it is of fairly stout gauge, or of stranded wire, it will certainly be far better than the plate in the concrete. Remember, however, that when the earth lead is very long, it should be insulated.

A Useful Hint

With regard to hand-capacity, here is a dodge that sometimes works. Place a sheet of tin-plate (the side of a biscuit tin, for example) underneath the chair cushion and connect this, along with the earth lead, to the earth terminal of the set. That might seem rather "Heath Robinson," but it can be made neat and invisible.

Beyond the points raised above, we suggest that all readers in the same predicament as N. K. B. should carefully re-read our article published a fortnight ago, which dealt with the question of ensuring smooth reaction control, and allied problems.

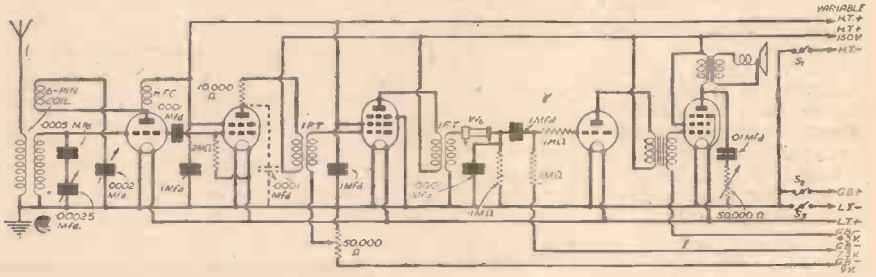
Five-valve S.W. Superhet

Mr. Walter Farrar, of Leicester, apparently wishes to build a "pukka" short-waver, and sends a diagram of the circuit he proposes to use; it is reproduced in the accompanying illustration. As can be seen, it is for a five-valve superhet of a rather unusual nature. Although frequency-changing is on the autodyne principle, with single tuning circuit, it is proposed to use a triode oscillator valve in conjunction with a screen-grid first detector. This is followed by a H.F. pentode I.F. valve, a W.6 "Westector," a triode L.F. valve, and a pentode output valve. To quote our correspondent: "The aim is not to obtain particularly good quality, but to receive a good number of transmissions at entertainment strength." Nevertheless, he has included a fixed condenser-variable resistance tone control across the output. He considers that his receiver built round this circuit will prove very satisfactory, because the frequency-changer is similar to that described in the issue of PRACTICAL AND AMATEUR WIRELESS dated August 14th of this year, which he built and used with pronounced success.

Criticism and Suggestions

On the whole, we agree, but there are a few points of criticism that we should like to raise. In the first place, we should prefer to include an H.F. choke between the anode of the S.G. first detector and the anode resistance, and/or to connect a .0001 mfd. fixed condenser between the anode and earth. These two items are marked with a cross and in broken lines, respectively, in the diagram below. The object of this is to prevent the leakage of signal frequencies into the remainder of the circuit. Another little point is that the switch marked S.1 is not necessary; the H.T. circuit is automatically broken by means of S.3, which breaks the L.T. circuit, and so prevents the flow of H.T. current. A two-point on-off switch can be used for S.2 and S.3, and H.T.— joined directly to L.T.—. Additionally, it will probably be found worth while to decouple the anode circuit of the first L.F. valve by inserting a 10,000-ohm resistance between the primary of the L.F. transformer and H.T.+, and connecting a 2-mfd. condenser between the junction of these two components and earth.

Our principal reason for illustrating this circuit, and suggesting one or two minor modifications is that it will probably be of interest to other readers.



The circuit of the five-valve S.W. superhet that a reader proposes to adopt.

Battery-set "Quality"

Despite the fact that this article is in the Short Wave Section, we simply must refer to one or two of the many letters that we have received alluding to our article in the October 2nd issue on the subject of "Quality Battery Sets." As we anticipated, some of our readers consider that we are too critical, and that our standard of "quality" is too high. One reader, A. F. Barron, of London, N.1, writes: "I know that ideas concerning "quality" differ considerably, but I am willing to back my battery radiogram against a good many of the mains sets that I have heard." Mr. Barron uses a four-valve receiver with band-pass input

(Continued on next page)

SHORT-WAVE SECTION

(Continued from previous page)

feeding into an H.F. Pen., followed by a triode detector, a driver and a B.21 class B valve. All coils are iron cored.

A Milnes 150-volt H.T. unit is employed, H.T. current averages 20 mA, and running costs are estimated at 4½d. a week. But here is the rub! Our correspondent has spent something like £30 on the set, this sum including, we presume, many "extras" that have been obtained mainly for experimental purposes. Still, he maintains that he could not have bought a ready-made set at any price to compare with it, he knows that the set will not become obsolete, and it gives far more satisfaction than any ready-made receiver could possibly give.

R.S.V.P.

In order to substantiate his claims, Mr. Barron would be glad to demonstrate his receiver any evening in the week after 7 o'clock. So if any of you can conveniently arrange it, here is a good chance to meet a fellow enthusiast, and to see what is no doubt a fine receiver. If you wish to make an appointment, just drop us a line and we will forward your letter. Here is a good opportunity of exchanging notes and comparing performances.

In Defence of Battery Operation

Mr. C. Pattonzer, of Kentish Town, writes us a letter of six sheets on the same subject. His main object is to defend the battery-operated "quality" set, and to give reasons for its popularity. He also has a few unkind words, which we endorse, about those dealers who employ thoroughly incompetent service-men and so-called engineers. As justification for the battery set, he points to those people who, because of their work, have frequently to move from one district to another—sometimes the house is "wired" with D.C., sometimes with A.C., and sometimes with gas! Mr. Pattonzer's work brings him into contact with a large number of people, most of whom, he finds, have a "down" on mains sets—and many of them, he says, have owned receivers of this type and have gone back to batteries. With this view-point we cannot agree, but we have had our "say," so we will leave you to ponder on the objections.

In one important matter we are in complete agreement with our correspondent. He finds that those who have had a set for a number of years do not want innumerable stations, and are perfectly content to listen to three or four programmes, provided that "quality" is good; those who want a wider range are prepared to use a separate all-wave set for the purpose. Like Mr. Barron, he believes that the constructor scores every time, and that a "special-performance" radio set can be built only by the enthusiast. "When you buy a ready-made set you have to take what the manufacturers think you should have; when you build your own, you can have exactly what you want, and you can incorporate your own ideas." Mr. Pattonzer is perfectly satisfied with his "quality" battery set, and although the three L.F. transformers together cost nearly £5, he believes that the money was well spent. He has forgotten one thing—he did not enclose the circuit diagram of his receiver. We should be glad if he would oblige; many other readers would like to see it.

A £5 Limit

We are now experimenting with the idea of producing an inexpensive battery set that will give reasonably good "quality." Your views on a receiver that can be made for about £5, exclusive of valves and batteries, would be appreciated. One such set we are using consists of an H.F. Pen., followed by a triode and two resistance-coupled L.F. valves. After further tests, we hope to give details. In the meantime, your suggestions, please.

Cheerio.

Leaves from a Short-wave Log

Banned Broadcasts

IN Germany the "Gestapo," or secret police, secure from radio dealers lists of purchasers of wireless receivers and, in particular, of sets capable of being tuned to short waves. Strict supervision is exercised by this means over listeners when unannounced visits are made during broadcasting hours. If any person is found listening to a banned broadcast he may be arrested and charged with high treason.

The Sunday Talk from Iceland

TFJ, Reykjavik (Iceland) on 24.52 m. (12.235 mc/s), devotes thirty minutes every Sunday to a transmission of interest to listeners in Great Britain. It is timed to start at G.M.T. 18.30, and includes a concert of Icelandic music, and a short talk describing the most noteworthy points of interest in the Island.

Spanish War News *via* Morocco

Nightly at G.M.T. 21.45, on 21.36 m. (14.05 mc/s), you may hear Spanish Nationalist war news bulletins in the English language. The station, of which the call sign is EA9AH, is located at Tetuan (Spanish Morocco); its power is 20 kilowatts.

Japan or Mexico?

The 19.79 m. channel (15.16 mc/s), is shared by JZK, Tokio, and by a new Mexican short-wave transmitter, XEWW, Fortunately the Japanese station closes down at G.M.T. 21.00 and XEWW, La Voz del America Latina (Mexico City), formerly on a higher wavelength, is found relaying a programme from the medium-wave transmitter XEW in the Mexican capital. It is easily tuned in from G.M.T. 23.00 onwards, and may be identified by its peculiar signal of 4 chimes (descending scale), and single gong stroke between announcements.

Has Anybody Heard Paraguay?

A correspondent writes me that he has picked up on about 49.5 m. (6.06 mc/s) a call: *Radio diffusora . . . Paraguay*, but could not make certain whether the name of the city was Asunçion or not. So far, the only short-wave station reported to be regularly working in that country was ZP10, located in the capital, and it was last stated to be operating on 45 m. (6.666 mc/s) with a power of only 15 watts.

The League of Nations Speaks

The times of the English transmissions dealing with the activities of the present Assembly of the League of Nations have been altered; they are now as under: Every Friday from G.M.T. 00.30-00.45 through HBL, Prangins (Switzerland) on 32.10 m. (9.345 mc/s), and from G.M.T. 07.00-07.15 through HBO, on 26.31 m. (11.402 mc/s). HBL is one of the stations habitually used for the relay of broadcasts from Swiss and Austrian broadcasting studios to the U.S.A.

Two New Cuban Short-wavers

Listeners report logging on 19.3 m. (15.544 mc/s) a Cuban station giving out the call: CO9XX, and located at Tuinucu (?). It has been heard testing between G.M.T. 02.00-04.00. On 32.88 m. (9.125 mc/s), namely, on the same channel as that used by HAT4, Budapest (Hungary) CODX, Havana (Cuba) has been heard relaying a programme from CMDX in the Cuban capital.

Lourenço Marques on High Power

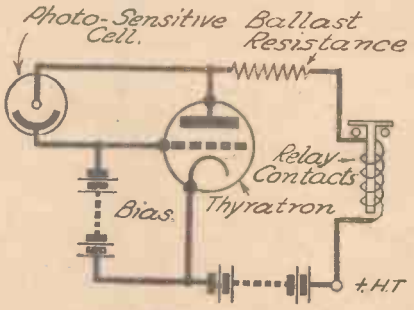
Portuguese papers state that it is proposed to erect a 50-kilowatt transmitter at Lourenço Marques (Portuguese South-east Africa).

A new Philco Model—No. A638, which is particularly useful for short-wave reception on account of the novel and effective micrometer tuning device which is provided. It is an A.C. 6-valve superhet.

POINTS ABOUT RELAYS

Mercury and Grid-glow Types are Referred To in This Article

ONE of the most interesting devices used in experimental work is the relay. The applications of this arrangement are legion, and with the aid of a relay it is possible to carry out all kinds of intricate operations, using as an initial source of supply the minutest current. For instance, a microphone may be wired into a relay circuit so that the small current which flows when the microphone is spoken into will cause the relay to operate and close a circuit through which a much greater current is passing, and this current could be employed to open a door, start some electrical machinery, or carry out some other operation. The mercury relay is not very popular with many experimenters on account of the fact that the mercury produces some form of chemical change when brought into contact with metallic surfaces, and the working of a mercury relay is thus often rendered uncertain. The ordinary electro-magnetic relay is used in telephone systems and can also be used in radio work for the control of apparatus by means of a small transmitter. Among the more elaborate types of relay are the Thyratron and the device known as a "cold-cathode" relay. The latter is actually a simplified form of Thyratron.



Circuit employing a Thyratron.

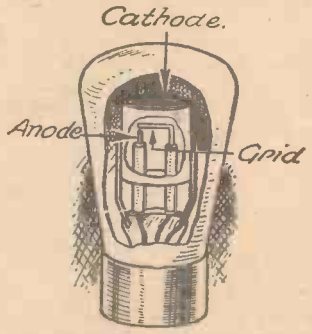
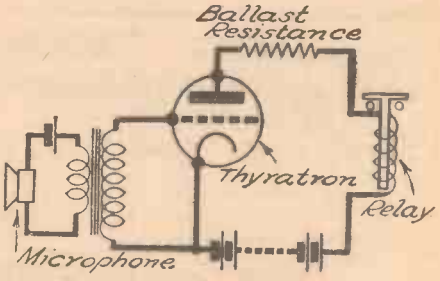


Diagram of a cold-cathode relay.

No Filament

In the cold-cathode or grid-glow device no filament or heater is employed. The cathode consists of a metal cylinder which encloses two other electrodes—a grid and anode. The anode is protected by a glass sleeve for nearly the whole of its length, and the grid wire is protected in a similar manner up to a point where it is bent over and brought nearly into contact with the anode. The actual setting of these two points is most critical. When H.T. is applied to the anode, and the grid is biased in a negative degree, free ions flow from the gas with which the bulb is filled and settle on the grid forming a space charge round it. The resistance of the device thus changes according to the space charge and consequently upon the potentials applied to the grid and anode. In the Thyratron a heated filament is used to make the response more sensitive when using low anode voltages. The attached diagrams show how the Thyratron may be used in a simple circuit to effect control of some external source either by light (for which purpose a photo-sensitive cell is included) or by sound, for which a microphone and transformer would be used.



A typical circuit for sound control.

NEXT WEEK!
FULL CONSTRUCTIONAL DETAILS OF THE A.C. ALL-WAVE CORONA 4.

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

Bradford Short-wave Club

ON Friday, October 15th, the above club had an interesting evening with Mr. Simonard's transmitter, which he brought to the club-rooms for experiments. Mr. Varley had his broadcast receiver and a microphone on the premises, and the club short-wave receiver was working. There was something of interest for everyone. On Friday, October 29th, Radio G6AZ will deliver his lecture on "Aerials," and will deal with both transmitting and receiving types.—S. Fischer, Hon. Sec., 10, Highfield Avenue, Idle, Bradford, Yorks.

The Croydon Radio Society

AN old friend, Mr. B. R. Bettridge, of the Marconiphone Co., Ltd., spoke on a new subject for the Croydon Radio Society's meeting on Tuesday, October 12th, in St. Peter's Hall, Ledbury Road, South Croydon. The topic ventilated was "Recent Developments in Cathode-ray Tubes." In application for television, the lecturer drew on the blackboard a diagram of the "gun" or electrode assembly of the Emiscope tube. There was the indirectly-heated cathode with double spiral heater, around which was a screen. In front of this was the accelerator, followed by the modulator and first anode. Finally, he showed how the spot was focused on the screen, mentioning that the beam current must be high—it was 150 micro-amps. in this tube.

Consideration of scanning circuits proved no less fascinating, and methods of deflection were carefully followed. A saw-tooth wave-form was wanted as the current for deflection must rise steadily, drop suddenly, and rise steadily again. The "blocking oscillator" circuit was particularly interesting, and Mr. Bettridge was able to describe pictorially a saw-tooth wave-form as well as others by means of his oscillograph. Many questions followed on television reception, and when the evening concluded members felt the rather complicated subject had been made far more understandable. Next Tuesday, November 2nd, heralds another member's lecture, by the Chairman, Mr. W. J. Bird, on "Sound Reproduction by Film." Needless to say, PRACTICAL AND AMATEUR WIRELESS readers are invited to this meeting.—Hon. Pub. Sec., Mr. E. L. Cumbers, Maycourt, Campden Road, S. Croydon.

The Liverpool S.W. Radio and Transmitting Club

THIS club held a very successful meeting on Monday, October 11th, and the following members were elected for the committee: Mr. J. E. Crabtree, Chairman; Mr. C. E. Cunliffe, Secretary; Mr. Whitelaw, Treasurer; Mr. Siddal and Mr. E. Davies. Mr. Whitelaw has kindly consented to let the club use a spare room at his house for the meetings. Plans are now going ahead to make this a bumper radio season for the club, and we hope to be very comfortable at our new club rooms, 18, Embledon Street, off Upper Parliament Street, Liverpool 8. Will all persons interested please call at the club room any Monday or Thursday evening at 8 p.m., or write to the Hon. Secretary, Mr. C. E. Cunliffe, 368, Stanley Road, Bootle, Liverpool, 20.

Wellingborough and District Radio and Television Society

THE new season's opening gathering of members of the above society took place at the Exchange Hotel, Wellingborough, on Wednesday, October 13th, when a lecture was given by the Hon. Sec. of the society, Mr. L. F. Parker, G5LP, entitled, "Short-wave Radio and the Amateur Bands."

Commencing with the 180-metre band, Mr. Parker paid particular attention to the fact that of all the amateur bands this was the most neglected, and that some effort would have to be made in the near future to prove occupancy of this band or it would follow the usual precedent and be confiscated for the use of the other services who were constantly clamouring for more wavelengths. This would be a very unfortunate thing for amateur radio in that the 180-metre band had quite a number of distinct advantages over other bands as local contacts between amateurs could be carried on without undue interference, as was experienced on the higher frequency bands.

In describing conditions on the popular 40-metre band the lecturer said that, as a whole, the standard of operating there, and the quality of some of the transmissions heard from amateur stations in that band, was deplorably low and was doing more than anything to bring the amateur fraternity into bad repute.

The next band dealt with was the 20-metre band, and which from a listener's point of view was the most popular on account of the enormous amount of long-distance telephony that could be heard there. After the lecture questions and discussions were dealt with by the lecturer.—Hon. Sec., L. F. Parker, 127, Jubilee Crescent, Wellingborough.

The Bideford and District Short-wave Society

THIS society, since its annual general meeting, has now begun its new session with a completely reorganized Committee. A more vigorous programme is scheduled for the new year which includes:—Installation of Transmitter; Morse Classes; Practical talks and demonstrations; General construction work. We are fortunate in having as our first President Mr. A. F. Forsythe (G6FO), and also in obtaining the services of Mr. W. Chubb (late Merchant Service) and Mr. J. Caldwell (G8US) as morse instructors. Prospective members in this district are invited to write for full particulars to the Hon Sec., W. G. Couch, "Hillside," Glen Gardens, Bideford.

Golders Green and Hendon Radio Scientific Society

THE following lectures may be of interest to readers of PRACTICAL AND AMATEUR WIRELESS, to whom a hearty welcome is assured. Both lectures will be given at the Regal Cinema, Finchley Road, N.W., at 8.15 p.m.

Thursday, October 28th: Transmitter Design and Operation by Mr. H. A. M. Clarke, B.Sc. (G6OT).

Thursday, November 11th. Fault Finding and Correction in a Wireless Receiver. By Mr. D. N. Corfield, D.L.C., Grad.I.E.E.—H. Ashley Scarlett, 60, Pattison Road, Hampstead, N.W.2.

INTRODUCING THE A.C. CORONA ALL-WAVE 4

Preliminary Notes Regarding the Design of a Mains Version of the All-wave Receiver Recently Described in These Pages.

THE unprecedented demand which has arisen for parts for the Corona receiver recently published by us has resulted in many listeners asking for a similar design, but for use on A.C. mains supplies. The arrangement of 4 valves in the manner which was employed in the Corona receiver does undoubtedly provide the listener with a receiver which may be said to offer the best all-round results. Range of reception is catered for by an efficient H.F. stage, and the use of two L.F. stages ensures that adequate volume will be experienced. The results obtained on the battery receiver will, however, be eclipsed in an A.C. model owing to the much higher efficiency of the mains type of valve. Provided that the layout is considered carefully, and components are chosen with a due regard to the purpose they have to fulfil, the circuit should be hum-free and should be just as simple to operate as the battery model. These considerations have underlined the design of the A.C. Corona 4 (excluding rectifier) which will be described in our pages next week. In the main the lines of the battery receiver are followed, and for the rectifier a valve has been chosen in this particular model.

The Circuit

The circuit consists of the four valves already mentioned, namely, a variable-mu H.F. pentode, triode detector, triode first L.F. valve, resistance-coupled to an output triode. The use of resistance-capacity coupling both between the detector and the L.F. stages has been adopted to ensure high quality of reproduction, and the output triode will handle a really good signal and will deliver, fully loaded, an output of just under 3 watts, which should be ample for all normal requirements. For tuning purposes the Wearite three-range coils are again used, two of these being ganged to provide input and detector tuning. In these coils, each separate unit is individually switched so that there are no dead-end losses and maximum sensitivity is obtained on all wavelengths. The detector valve is decoupled, and further to ensure that no H.F. currents shall leak into the L.F. side and give rise to distortion or instability, an H.F. stopper is included in the grid circuit of the first L.F. valve. On the mains side a modern transformer is employed and the arrangement of the primary and secondary windings will ensure that modulation hum will not arise, and adequate smoothing of the rectified supply is obtained with large electrolytic condensers and a satisfactory high-inductance L.F. choke.

The Layout

The layout has been arranged to provide simple construction, the mains section being included with the receiver section on a single chassis. Although some constructors prefer the separate mains unit assembly there are various difficulties which are met with in some cases, and we think that in this particular model a more compact layout will be found possible by including all of the components on a single chassis. Next week, we shall publish a circuit diagram and list of components, together with constructional details of this mains receiver.

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. B. (Wanstead).—The trouble is obviously due to some form of H. F. instability and systematic testing will be necessary to find the cause. The layout may be found to be faulty.

B. L. (Morden). The *Wireless Constructor's Encyclopaedia* may be of use, or alternatively, the various articles which we publish from time to time may give you the assistance needed.

F. G. (Walton-on-Thames). The speaker probably is not matched to the output valve and this is the cause of the distortion and failure to give satisfaction. Check this point, and then if unsatisfactory have it overhauled in case you have obtained a faulty model.

T. H. (Ballinside). A standard mains resistor can be obtained from Messrs. Bulgin, or one of the Philips Barreters could be used.

J. M. (Worthing). When a condenser is joined in series with the neon across a D.C. supply a glow will be given on connecting and disconnecting. If the condenser is sound no glow will be obtained whilst connected in this manner. If leaky, the neon will flash, the periods between the flash being governed by the leakage. A constant glow indicates a short-circuit in the condenser.

H. T. B. (Hockley). An efficient earth should prevent the trouble. Any standard L.F. stage may be added and we described a suitable one in our issue dated February 6th last. The secondary of a good L.F. transformer may be used as a stand-by-choke.

N. W. (Forest Hall). The transformer primary resistance is about correct. It is not possible to say definitely as we have no details of the component and the gauge of wire will affect the resistance, but it is usually of a low value round about that mentioned in your test.

B. M. E. (Highgate).—We suggest you write to the makers of your receiver, who may be able to supply a unit of the type you require.

J. W. (Gillingham). Write to R. O. Bridger and Co. No. 4, Factory, Shelford Place, Church Street, London, N.16, who can supply the diaphragms required.

H. R. B. (Plymouth). You may have the coil wrongly wired or it may be faulty. We are not familiar with the Telsen circuit and therefore cannot advise definitely. We suggest you communicate with the makers. We cannot supply details of a set of the other type mentioned as we did not design the coil—it was described in a contemporary.

G. L. C. G. (Lower Bebington). We regret that we cannot recommend receivers to use up old parts. Apart from the fact that we only guarantee our sets when made from parts specified by us, one or more of your old parts may be defective and thus you will introduce trouble into a new receiver by using them.

W. C. (Dordon). We regret that we cannot give coil-winding details in the form of a reply but would refer you to our latest book, *Wireless Coils, Chokes, and Transformers, and How to Make Them*, price 2s. 6d. or 2s. 10d. by post, in which many different types of coil will be found.

W. H. (Beira). It should not be detrimental to the valve if you disconnect the speaker at the point indicated. The choke must, of course, be left in the anode circuit.

BOOK RECEIVED

"Chronicle" Wireless Annual

THIS popular radio handbook, which is intended to appeal to all classes of radio users, contains 144 well-illustrated pages. For the home constructor there are a number of designs for modern receivers, including the Chronicle S.G.P. Three; the Colpak Four; The Three-Band Two; the Four-Range Three; the H.Q. Local Receiver; and the "Orchard" Short-wave Three. Wiring diagrams of these receivers are given on a separate sheet.

Another section gives some useful information to enable the ordinary listener to get the best results from his receiver, while other subjects dealt with include how best to secure reception free from interference; a Short-wave Review; Radio in America; and a review of the progress made in television during the last twelve months. Finally, constructional details are given of an ultra-short-wave three-valver for the experimenter. The price of the Annual, which is published by Allied Newspapers, Limited, is 1s.

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 1/- .. 4d. " "
Practical Mechanics .. 7½d. " "
Wireless Magazine .. 1/3 " "

The index letters which precede the Blueprint Number indicate the periodical in which the description appears: thus PW refers to PRACTICAL WIRELESS, AW to *Amateur Wireless*, PM to *Practical Mechanics*, WM 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

	Date of issue.	*No. of Blueprint.*
CRYSTAL SETS.		
Blueprint, 6d.		
1937 Crystal Receiver	9.1.37	PW71
STRAIGHT SETS. Battery Operated.		
One-Valve : Blueprint, 1s.		
All-wave Unipen (Pentode)	—	PW31A
Two-valve : Blueprints, 1s. each.		
Four-range Super Mag Two (D, Pen)	11.8.34	PW36B
The Signet Two	29.8.36	PW76
Three-valve : Blueprints, 1s. each.		
The Long-Range Express Three (SG, D, Pen)	24.4.37	PW2
Selectone Battery Three (D, 2 LF (Trans))	—	PW10
Sixty Shilling Three (D, 2 LF (RC & Trans))	—	PW34A
Leader Three (SG, D, Pow)	22.5.37	PW35
Summit Three (HF Pen, D, Pen)	8.8.34	PW37
All Pentode Three (HF Pen, D (Pen), Pen)	29.5.37	PW39
Hall-mark Three (SG, D, Pow)	12.6.37	PW41
Hall-mark Cadet (D, LF, Pen (RC))	16.3.35	PW48
F. J. Camm's Silver Souvenir (HF Pen, D (Pen), Pen) (All-wave Three)	13.4.35	PW49
Genet Midget (D, 2LF (Trans))	*June* '35	PM1
Cameo Midget Three (D, 2 LF (Trans))	8.6.35	PW51
1936 Sonotone Three-Four (HF Pen, HF Pen, Westector, Pen)	17.8.35	PW53
Battery All-Wave Three (D, 2 LF (RC))	—	PW55
The Monitor (HF Pen, D, Pen)	—	PW61
The Tutor Three (HF Pen, D, Pen)	21.3.36	PW62
The Centaur Three (SG, D, P)	14-8-37	PW64
The Gladiator All-Wave Three (HF Pen, D (Pen), Pen)	29.8.36	PW66
F. J. Camm's Record All-Wave Three (HF Pen, D, Pen)	31.10.36	PW69
The "Colt" All-Wave Three (D, 2 LF (RC & Trans))	5.12.36	PW72
Four-valve : Blueprints, 1s. each.		
Sonotone Four (SG, D, LF, P)	1.5.37	PW4
Fury Four (2 SG, D, Pen)	8.5.37	PW11
Beta Universal Four (SG, D, LF, Cl. B)	—	PW17
Nucleon Class B Four (SG, D (SG), LF, Cl.B)	6.1.34	PW34B
Fury Four Super (SG, SG, D, Pen)	—	PW34C
Battery Hall-Mark 4 (HF Pen, D, Push-Pull)	—	PW46
F. J. Camm's "Limit" All-Wave Four (HF Pen, D, LF, P)	26.9.36	PW67
All-Wave "Corona" 4 (HF Pen, D, LF, Pow.)	9.10.37	PW79
Mains Operated.		
Two-valve : Blueprints, 1s. each.		
A.C. Twin (D (Pen), Pen)	—	PW18
A.C.-D.C. Two (SG, Pow)	—	PW31
Selectone A.C. Radiogram Two (D, Pow)	—	PW19
Three-valve : Blueprints, 1s. each.		
Double-Diode-Triode Three (HF Pen, DDT, Pen)	—	PW23
D.C. Ace (SG, D, Pen)	—	PW25
A.C. Three (SG, D, Pen)	—	PW20
A.C. Leader (HF Pen, D, Pow)	7.4.34	PW35C
D.C. Premier (HF Pen, D, Pen)	31.3.34	PW35B
Ubique (HF Pen, D (Pen), Pen)	28.7.34	PW36A
Armada Mains Three (HF Pen, D, Pen)	—	PW38
F. J. Camm's A.C. All-Wave Silver Souvenir Three (HF Pen, D, Pen)	11.5.35	PW50
"All-Wave" A.C. Three (D, 2LF (RC)	17.8.35	PW54
A.C. 1936 Sonotone (HF Pen, H.F. Pen, Westector, Pen)	—	PW56
Mains Record All-Wave 3 (HF Pen, D, Pen)	5.12.36	PW70
All-World Ace (HF Pen, D, Pen)	28.8.37	PW80
Four-valve : Blueprints, 1s. each.		
A.C. Fury Four (SG, SG, D, Pen)	—	PW20
A.C. Fury Four Super (SG, SG, D, Pen)	—	PW34D
A.C. Hall-Mark (HF Pen, D, Push-Pull)	24.7.37	PW45
Universal Hall-Mark (HF Pen, D, Push-Pull)	9.2.35	PW47
SUPERHETS.		
Battery Sets : Blueprints, 1s. each.		
£5 Superhet (Three-valve)	5.6.37	PW40
F. J. Camm's 2-valve Superhet Two-valve	13.7.35	PW52
F. J. Camm's £4 Superhet	—	PW58
F. J. Camm's "Vitesse" All-Waver (5-valver)	27.2.37	PW75
Mains Sets : Blueprints, 1s. each.		
A.C. £5 Superhet (Three-valve)	—	PW43
D.C. £5 Superhet (Three-valve)	1.12.34	PW42
Universal £5 Superhet (Three-valve)	—	PW41
F. J. Camm's A.C. £4 Superhet 4	31.7.37	PW59
F. J. Camm's Universal £4 Superhet 4	—	PW60
"Qualitone" Universal Four	16.1.37	PW73
SHORT-WAVE SETS.		
Two-valve : Blueprint, 1s.		
Midget Short-wave Two (D, Pen)	—	PW38A
Three-valve : Blueprints, 1s. each.		
Experimenter's Short-Wave Three (SG, D, Pow)	—	PW30A
The Prefect 3 (D, 2LF (RC and Trans)	7.8.37	PW63
The Bandspread S.W. Three (HF Pen, D (Pen), Pen)	29.8.36	PW68
"Tele-Cent" S.W.3 (SG, D (SG), Pen)	30.1.37	PW74
F. J. Camm's Oracle All-wave Three (H.F., Det., Pen.)	28.8.37	PW78
PORTABLES.		
Three-valve : Blueprints, 1s. each.		
F. J. Camm's ELF Three-valve Portable (HF Pen, D, Pen)	—	PW65
Parvo Flyweight Midget Portable (SG, D, Pen)	19.6.37	PW77
Four-valve : Blueprint, 1s.		
Featherweight Portable Four (SG, D, LF, Cl. B)	15.5.37	PW12
MISCELLANEOUS.		
S.W. Converter-Adapter (1 valve)	—	PW48A

AMATEUR WIRELESS AND WIRELESS MAGAZINE

	Date of issue.	*No. of Blueprint.*
CRYSTAL SETS.		
Blueprints, 6d. each.		
Four-station Crystal Set	12.12.36	AW427
1934 Crystal Set	—	AW444
150-mile Crystal Set	—	AW450
STRAIGHT SETS. Battery Operated.		
One-valve : Blueprints, 1s. each.		
B.B.C. Special One-valver	—	AW387
Twenty-station Loudspeaker One-valver (Class B)	—	AW449
Two-valve : Blueprints, 1s. each.		
Melody Ranger Two (D, Trans)	—	AW388
Full-volume Two (SG det., Pen)	—	AW392
B.B.C. National Two with Lucerne Coil (D, Trans)	—	AW377A
Big-power Melody Two with Lucerne Coil (SG, Trans)	—	AW338A
Lucerne Minor (D, Pen)	—	AW426
A Modern Two-valver	—	WM409
Three-valve : Blueprints, 1s. each.		
Class B Three (D, Trans, Class B)	—	AW386
New Britain's Favourite Three (D, Trans, Class B)	15.7.33	AW394
Home-built Coil Three (SG, D, Trans)	—	AW404
Fan and Family Three (D, Trans, Class B)	25.11.33	AW410
£5 5s. S.G.3 (SG, D, Trans)	2.12.33	AW412
1934 Ether Searcher; Baseboard Model (SG, D, Pen)	—	AW417
1934 Ether Searcher; Chassis Model (SG, D, Pen)	—	AW419
Lucerne Ranger (SG, D, Trans)	—	AW422
Cossor Melody Maker with Lucerne Coils	—	AW423
Mullard Master Three with Lucerne Coils	—	AW424
£5 5s. Three: De Luxe Version (SG, D, Trans)	19.5.34	AW435
Lucerne Straight Three (D, RC, Trans)	—	AW437
All-Britain Three (HF Pen, D, Pen)	—	AW448
"Wireless League" Three (HF Pen, D, Pen)	3.11.34	AW451
Transportable Three (SG, D, Pen)	—	WM271
£6 6s. Radiogram (D, RC, Trans)	—	WM318
Simple-tune Three (SG, D, Pen)	*June* '33	WM327
Economy-Pentode Three (SG, D Pen)	*Oct.* '33	WM337
"W.M." 1934 Standard Three (SG, D, Pen)	—	WM351
£3 3s. Three (SG, D, Trans)	*Mar.*, '34	WM354
Iron-core Band-pass Three (SG, D, QP21)	—	WM362
1935 £6 6s. Battery Three (SG, D, Pen)	—	WM371
PTP Three (Pen, D, Pen)	*June* 35	WM389
Certainty Three (SG, D, Pen)	—	WM393
Minitube Three (SG, D, Trans)	*Oct.* '35	WM400
All-wave Winning Three (SG, D, Pen)	*Dec.* '35	WM396
Four-valve : Blueprints, 1s. 6d. each.		
65s. Four (SG, D, RC, Trans)	—	AW370
"A.W." Ideal Four (2 SG, D, Pen)	16.9.33	AW402
2HF Four (2 SG, D, Pen)	—	AW421
Crusader's A.V.C.4 (2 HF, D, QP21)	18.8.34	AW445
(Pentode and Class B Outputs for above: Blueprints, 6d. each)	25.8.34	AW445A
Self-contained Four (SG, D, LF, Class B)	*Aug.* '33	WM331
Lucerne Straight Four (SG, D, LF, Trans)	—	WM350
£5 5s. Battery Four (HF, D, 2LF)	*Feb.* '35	WM381
The H.K. Four (SG, SG, D, Pen)	*Mar.* '35	WM384
The Auto Straight Four (HF Pen, HF Pen, DDT, Pen)	*April* '36	WM404
Five-valve : Blueprints, 1s. 6d. each.		
Super-quality Five (2HF, D, RC, Trans)	*May* '33	WM320
Class B Quadradyne (2 SG, D, LF, Class B)	*Dec.* '33	WM344
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) A.C.	23.6.34	AW439
Mantovani A.C. Three (HF Pen, D, Pen) A.C.	—	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)	—	WM379
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	*Apl.* '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)	1.7.33	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.)	—	AW320
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-wave (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-valver 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 amplifier) (1/-)	*Dec.* '35	WM399
De-Luxe Concert A.C. Electrogram	*Mar* '36	WM403
New Style Short-Wave Adapter (1/-)	*June* '35	WM388
Trickle Charger (6d.)	*Jan.* 5, '35	AW462
Short-Wave Adapter (1/-)	*Dec.* 1, '34	AW456
Superhet Converter (1/-)	*Dec.* 1, '34	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 Converter (1/-)	—	WM408

QUERIES and ENQUIRIES

Valve Connections

"I have noticed that certain valve types are available with different numbers of pins on the base and I should like to know the advantages and disadvantages of the different patterns. For instance, in an H.F. pentode I see I can obtain one with 5 pins and another with 7 pins. What are the extra pins used for, or are they left blank?"—F. E. (Shrewsbury).

IN some modern valves there are blank pins, and these have to be left in order to enable a minimum number of valve designs to be employed. It would, in fact, be desirable if all valves were made with octal bases so that valveholders could be standardised. However, with regard to the H.F. pentode you refer to you will find that in the 7-pin valve you are provided with two additional connections not present in the smaller base. These two connections are to the metallised surface and to the priming or auxiliary grid. In the ordinary way the metallising would be internally joined to the cathode, but by using a separate connection you can adopt a spearate earth wire, and this may also be employed for the auxiliary grid. Greater stability is often obtained by this method of connection.

Transformer Ratios

"I have only recently started in the radio game and am confused by the fact that I see L.F. transformers available from 3 to 1 up to 9 to 1 in ratio. How is one to determine which ratio should be used in a given circuit? Are there any special rules to adopt regarding overloading, etc., or is it possible to use any type and take steps to avoid overloading?"—W. K. (Deal).

THE ordinary L.F. transformer is generally only available in ratios from 1.75 to 1 up to 5 to 1. The latter ratio would give the highest step-up and consequently would be used when a minimum number of L.F. stages is in use. Where the highest quality is desirable, you would use the lowest ratio, and in this respect the Ferranti 1.75 to 1 transformer is claimed to give results equivalent to an ordinary resistance-capacity coupled stage, with greater gain. The higher ratios, such as 8 and 9 to 1 are generally for push-pull circuits of the Q.P.P. or Class B type, and must, therefore, be used in these particular circuits.

Winding Coils

"I wish to make some experimental coils for use in circuits I try out from time to time. What is the best form of winding to adopt—the straight or solenoid arrangement or the pile or duolateral winding? Have you described a coil winder which could be made at home for winding coils of the type which I require?"—B. L. O. (Glasgow).

WE published details of a very satisfactory coil winder in last week's issue, and you have no doubt seen this by now. The medium-wave or short-wave coils should be wound on the solenoid principle, spacing turns on the shorter ranges. For the long-waves it is desirable to use a pile winding in order to reduce size and self-capacity. You will find it difficult to construct a machine to give you a good wave form for this type of coil and therefore a sectional winding in pile formation must be used, and this will give you the desired features. Divide the long-wave winding into at least three sections.

Meter for Q.P.P.

"I had an old receiver in which I used a milliammeter in the anode circuit of the output valve to indicate overloading and distortion. I have now built up a new set in which I use a Q.P.P. circuit, and I find that the needle on the meter keeps flickering and will not keep still. After some worry I found out that this is quite in order, and that it is due to the fact that the anode current of the output stage varies with the signal. I am anxious to fit some form of meter in order to show the normal current, so that I can keep a careful watch on H.T. and G.B. supplies and wonder if the meter can be altered in any way so that it will remain steady in spite of the signal currents. Perhaps you could help me in this."—V. L. A. (Gillingham).

YOU cannot easily alter your meter, but you can make a simple form of galvo, which will give you the desired results. You will require two small coils of wire wound round, say, an ebonite or paxolin former. These should be mounted inside a small box and separated by about 1in. In between these coils pivot an ordinary flat piece of iron or steel, or a needle dismantled from an old pocket compass. Attach to the centre of this needle a pointer running over a scale. Connect the two coils, one in each anode circuit, and the mean current will cause the needle to take up a certain position, after which you can mark the scale at that point, and thus see the state of the output stage. The needle in this case will not fluctuate with the signal.

Remote Control

"Is there any way in which I can switch my set off from the different rooms in my house where I have extension loudspeakers? I have tried running an ordinary on-off switch and wiring from the speaker, but it will not work the set. The latter is an A.C. mains model, and I do not want to run A.C. wiring to the speakers. I believe there used to be an automatic switch on the market at one time, but I cannot now obtain this, and my local dealers have not heard of any alternative."—G. B. (Wolverhampton).

MESSRS. BULGIN can supply a remote control which will answer your purpose. This costs 17s. 6d. for the relay which will control the switching of the set, and push buttons and special multi-cable wiring are also obtainable for use with this device. The apparatus consumes very little current and may be operated from a small battery or a special winding on the mains transformer.

Hand-capacity Effects

"I made up a short-wave three, with detector and 2 L.F. stages. The circuit is quite standard, but I have been unable to overcome hand-capacity effects. The condenser is of the special low-loss S.W. pattern, and is mounted direct on a metal panel which is earthed through the metal chassis. The reaction condenser is joined to the anode and reaction coil and a large insulated washer is used on the panel to avoid capacity between this and earth. Do you think this is the cause of the trouble? Would it be worth while using an ebonite panel with a metal screen behind it and extension handles?"—L. D. (Leicester).

THE trouble may be due to the reaction circuit or to the earthed panel. We have found that in some cases it is worth while earthing the panel or metal screen quite separately, insulating it from the chassis and components mounted upon it, and running a separate earth wire to it. You will probably find, however, that by placing the reaction condenser between earth and the reaction coil or reaction winding, connecting this winding to the anode, and mounting the reaction condenser direct on the metal panel, that results will be satisfactory.

£5 Superhet

"I have saved all my back numbers and blueprints, and am now thinking of building up the £5 Superhet. Unfortunately I have been unable to do this before owing to lack of funds. I wonder if this set has been modernised, or whether I could use any up-to-date coils in it in place of those originally specified which are not now obtainable?"—H. C. A. (Bracknell).

THE receiver was modernised in June last, and in place of the coil unit originally specified we now recommend a Varley BP. 111 unit. Full details of the wiring for this coil and a circuit will be found in our issue dated June 5th last.

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.

The coupon on page 192 must be attached to every query.

Miscellaneous Advertisements

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AERODYNE, MODEL No. 49, ALL-WAVE, Screen Grid, Battery Receiver. Wave range 15 to 50 metres, 200 to 550 metres and 800 to 2,000 metres. Valve sequence, Screen Grid, Detector, Pentode, fitted in handsome Walnut Cabinet of oblong design. Brand new, in sealed cartons as from the manufacturers, **£4 10s.** each.

Carriage of 2s. to accompany remittance in each of the above cases.

AERODYNE 4-VALVE BATTERY TRANSPORTABLE, complete with Mazda and Mullard valves, in most attractive Walnut Cabinet, large Rola P.M. Moving Coil Speaker. Brand new, listed 10 gns. Our Price £3 5s.

Special offer of American Constructrad **SHORT-WAVE KITS.** These Kits cover a wave-band of 15 to 600 metres by means of 5 Interchangeable Plug-in Coils. Same are easily assembled and are sent out sealed as from the makers, complete with stamped metal chassis, metal panel and all necessary parts to make up a successful short-wave receiver.

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37/6d. 3 Valve Battery Kit, complete with Valves.
42/6d. 3 Valve A.C./D.C. Kit, complete with Valves.
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Orders for the above Kits must be accompanied by 1s. as part payment for postage.

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LISSEN GENERAL PURPOSE IRON-CORED COILS, complete with reaction suitable for Aerial and H.F., without Switch. List price 8/6d., Our Price 3/3d.

All the above coils are fully screened.

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11/6d. 350-0-350, 150 m.a., 2-0-2 volts, 2.5 amp, 2-0-2 volts, 4 amp, 2-0-2 volts, 2 amp.
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(Continued in column three)

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CALLERS, AS USUAL, TO 165 & 165a, FLEET ST., E.C.4 (Next door to Anderton's Hotel), Central 2833. **New Branch: 50, HIGH ST., CLAPHAM, S.W.4 (Macaulay 2381).**

PREMIER "TROLITUL" Short Wave CONDENSERS, Certified superior to Ceramic. All-brass Construction, 40 mmfd., 1/7; 100 mmfd., 1/10; 160 mmfd., 250 mmfd., 2/6; Double Spaced 15 mmfd., 2/9; 40 mmfd., 3/6. S.W. H.F. Chokes, 9d.; screened, 1/6. All-Brass S.W. Condensers with integral slow-motion, .00015 Tuning, 4/3; .00015 Reaction, 3/9.

NEW 1-VALVE SHORT-WAVE RECEIVER OR ADAPTOR KIT. 13 to 86 metres without coil changing. Complete Kit and Circuit, 12/6. **VALVE GIVEN FREE!**

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SHORT-WAVE COILS, 4- and 6-pin types, 13-26, 22-47, 41-94, 78-170 metres, 1/9 each, with circuit. Special set of S.W. Coils, 14-150 metres, 4/- set with circuit. Premier 3-band S.W. Coil, 11-25, 19-43, 38-86 metres. Simplifies S.W. receiver construction, suitable any type circuit, 2/6.

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(Continued from column one)

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RADIOMART

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