Contents

Capacity Tester

Frequency Response

Thermion's Commentary

Improving the S.W. Set

From Crystal to Valve

Remote Control System

Practical Hints

Readers' Letters

Choosing a Choke

TESTED WIRELESS CIRCUITS

A Practical Book

By F. J. CAMM

60

Modern circuits of every type. Diagrams and instructions for assembling and wiring. Including Circuits for Battery and Mains-operated Receivers, Adaptors, Units, Portables, Short-wave Receivers, All-wave Receivers, Amplifiers, and a Room-to-room Communicator. This is a complete guide to the construction of all types of receivers, from crystal sets to superhet sets, from battery sets to mains sets, from all-wave to short-wave sets, from amplifiers to a room-to-room communicator. All of the circuits described have been built and tested, and in many cases wiring diagrams have been included.

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ROUND THE WORLD OF WIRELESS

Choosing a Component

Many beginners are confused when looking through radio catalogues by the wide ranges offered in some single lines. Coils may be all classed under one heading and all modern coils are designed to cover a given range, being wound to inductance values set out by the Component Manufacturers’ Federation. L.F. transformers, however, are available with various ratios and inductance values and these confuse some constructors. Similarly, there are many different patterns of H.F. choke, and this is a most important item in some circuits. Accordingly, in this issue, and also in the next, we endeavour to explain the functions of chokes in various circuits and how to determine the type of component for separate purposes. Resistances also have various ratings and this again offers some confusion. The values are, however, fixed according to the voltage to be dropped or the purpose for which they are required and the wattage may easily be calculated. It is the same with most other components, but the choke is undoubtedly the chief stumbling block and we think the various difficulties will be easily overcome when the facts are properly understood.

Thirsty Work

The fourth in the series of Maurice Brown’s “Thirsty Work” programmes is to be broadcast to the Forces on June 14th. This time, Brown has taken the B.B.C.’s mobile recording unit to a village on the borders of Northamptonshire and Rutlandshire where he found some excellent singing in the local inn. This programme will be slightly different from the three previous ones in so far as it will not be purely local. The songs listened to the Forces will hear are of a more general character and one number includes animal noises. The artists in the programme will include a gamekeeper, a forester and farm-labourers.

Second Film Festival

One of the richest scores in film musicals of the last few years belongs to the recently released “The Wizard of Oz.” It is possible that Jack Beaver’s radio version of the score was even more colourful than the original; certainly it contributed considerably to the success of the broadcast. The revival of the radio version of this odd but successful adaptation of a classic American fairy tale will be broadcast on June 17th, within three months of its first production, and will be second in the impressive list that makes up “Film Festival.” Douglas Moodie will produce and it is expected that Celia Lipton will again delight with her singing of “Over the Rainbow,” in the part of Dorothy, the little girl who is whisked away on the crest of a tornado, to the wonderful land of Oz.

My Day’s Work

Speakers in the series entitled “My Day’s Work,” to be broadcast on June 16th, will be Albert Jennings, who will describe his job in a big world; North-West Worcestershire: Walter Lovick, of Tamworth, who will tell how he keeps the “roads” clear in a coal mine; an interview with George Jones (the Warwickshire Miners’ Secretary), and H. Van Bylevelt, manager of a mine depot in Birkenhead, who will give some hints to those who, owing to the petrol control, are riding a bicycle for the first time.

Rhapsody in Black

The Music Goes Round—And Round’ came to the end of a most successful run a few weeks ago, and the listeners to afternoon programmes have probably missed this weekly spot of sparkle and sophistication. However, Roy Speer, its producer, and James Dyrenforth, its new-style compere, have put their heads together and already announce a successor called “Rhapsody in Black.” This series, which begins on June 19th, will bring to the microphone the Negro in all his moods—from the splendid simplicity and intensity of the spiritual to the amazing rhythms and other manifestations of Harlem and New Orleans.

Maurice Winnick and His Band

Maurice Winnick has just finished his successful season at the Dorchester, where he has won high praise from the connoisseurs on his particular rendering of swing; and on June 16th he will broadcast as the band of the week. This is Winnick’s first visit to the particular B.B.C. provincial studio from which he is to broadcast, though probably not his first engagement in the city itself, as he is a much travelled man, who has toured most of the musical halls of Britain with his own band before he was twenty-one years old. Perhaps he developed his taste for travel in his first job in a cinema orchestra, and made up his mind as he accompanied with appropriate music the exotic scenes of the silver screen before him, that he would visit those scenes himself. Anyway, Maurice took on the job as band-leader on one luxury liner after another, and his job took him three times round the world. He studied dance music in New York, and learned there to play the clarinet and the saxophone; but the violin is the instrument which he prefers, and with that he leads the first-class band he is conducting to-day.
A Handy Bridge for Measuring the Values of Condensers and Other Capacities

The necessity for some simple form of apparatus for capacity measurement, such as that described here, must have been felt at one time or another by every wireless enthusiast. The time and labour of fault location in service work on commercial receivers may be reduced with such gear. To the experimenter, of course, there are innumerable ways in which the ability to measure capacities will prove of interest and value.

The bridge described here is extremely effective, employing as far as possible parts which constructors are likely to have on hand, or which, at any rate, may be purchased with very little outlay.

How It Works

The action of the instrument is very easy to understand. If an alternating or intermittent potential such as that obtained from a buzzer is applied across the points A and B of the bridge circuit, shown in Fig. 2, the current may be considered to take two paths—one through the point C and the two condensers in this arm, and the other through D and the two condensers in this arm. Now it is possible by so arranging the values of the four condensers to obtain a complete test on the unit. It should be possible to assemble and complete the whole job in an hour or two. When the bridge is ready for work the scale must, of course, be calibrated on both ranges, and the circle may be used for the lower range, and the opposite half for the higher range, thus avoiding confusion between the two sets of figures.

A Simple Capacity Tester

The circuit diagram is shown in Fig. 1. The capacity tested is that of the four condensers connected in series, thus giving the difference between the capacity of condensers AC and DB. For example, if AC is .00005 mfd. and DB .0001 mfd., the difference will be .00005 mfd., which is within the working range.

The bridge illustrated is very simple in construction. It may be used with good results if the capacity to be tested is within the working range. For example, if AC is .00005 mfd. and DB .0001 mfd., the difference will be .00005 mfd., which is within the working range. For example, if AC is .00005 mfd. and DB .0001 mfd., the difference will be .00005 mfd., which is within the working range. For example, if AC is .00005 mfd. and DB .0001 mfd., the difference will be .00005 mfd., which is within the working range.
CHOOSING A CHOKE—1

Details of Various Chokes, and Their Importance in the Circuit

A

Among the various types of components which go to make up a radio receiver, there is one class which seems to be rather neglected—namely, chokes. This may be due in part to the necessary and insignificant form of its diagrammatic representation, and in part to the fact that in many cases—though not in all—the exact value of its electrical properties is not so critical, so far as circuit efficiency is concerned, as those of, say, a tuning coil or a variable condenser.

But, however this may be, chokes of one type or another do play rather important parts in the receiving equipment of to-day, and when it is desired to purchase one it is well worth choosing a type which is in every way suitable to the job in hand and likely to give long and satisfactory service.

Functions of a Choke

In order to be able to make a wise selection, however, it is necessary to understand exactly what a choke is, and what its functions in a circuit, as well as the different kinds of chokes, which have been evolved for different purposes. To begin with, then, a choke is, essentially, a coil of wire, and its principal property, on account of its application in radio circuits, is impedance. This at once calls for further explanation.

You all know that when a direct current is passed through any piece of apparatus, the value of the current flowing is limited by what is known as the resistance of the apparatus, resistance being the opposition which the apparatus offers to the flow of current. If, instead of passing a direct current through the choke, we apply an alternating current, the apparent resistance may, or may not, be the same as when a direct current was applied. If the apparatus consists of or contains a coil of any kind, the apparent resistance to alternating current will be much greater. In fact, it is possible to design a choke which has a very small resistance to direct-current flow, but a very large apparent resistance to the passage of an alternating current—and such a coil is called a choke.

Impedance

Now why should a coil offer a higher opposition to alternating current than to direct current? The answer is, because it possesses the property of inductance. As the alternating current grows from its zero to its maximum value, a magnetic field is built up in the coil and its neighbourhood, and the growth of the magnetic field within the coil induces another electro-motive force in the coil, in opposition to that originally applied, and thus tending to prevent the original current from flowing. So far as alternating current is drying away, a back "E.M.F." is self-induced, tending to maintain the flow. The coil thus presents a different form of opposition from that due to pure resistance, although its effect is precisely similar, that is to say, it limits the value of the current. This opposition is termed "impedance," and it is measured in ohms in the same way as resistance.

One point must be made clear—every choke has, in addition to its impedances, which is only operative on alternating current—a certain amount of resistance, which is effective with both direct and alternating current. The resistance, apart from any increase owing to high-frequency effects, is unvarying in value, and depends entirely on the length, diameter and material of the wire. The impedance, on the other hand, is not constant in value—it varies according to the frequency of the alternating current, being higher at higher frequencies than at low frequencies. This is because the "back E.M.F." depends upon the rate at which the magnetic field changes, and the rate of change is, of course, greater when the frequency is higher.

It is for this reason that a choke should never be specified as a choke of so many ohms impedance, because although it is possible to measure the impedance, it is necessary to state at what frequency the measurement is made. It is customary, therefore, to specify a choke as of so many hertz or microhenries inductance, for, knowing the inductance, it is possible to calculate the impedance at a given frequency. For use in the anode circuit of a high-frequency valve without a tuned-grid coupling, in such sets as portables (see Fig. 2). Its action is very similar to the first application except that the extra amplification obtainable with the tuned circuit is not achieved.

A third use for a high-frequency choke is in the anode circuit of a detector valve, as indicated in Fig. 3. Here its function is to pass the direct current to the anode, and also the low-frequency modulation, at the same time, due to its high impedance at radio frequency, choking back the radio-frequency component which is thus diverted through the reaction coil.

Special H.F. Chokes

It is clear that chokes for any of these purposes should have as high an impedance as possible at the frequencies at which they will be operated. As the range of frequencies to be covered in radio reception is very wide, it has been found impossible to design one type of choke which can be used indiscriminately on all frequencies. Therefore, there are the chokes usually specified in normal broadcast receivers. For short-wave working, special short-wave chokes are marketed.

On the other hand, for use in superheterodyne receivers, on the intermediate-frequency side, owing to the lower frequency, it is not necessary to employ chokes of such high inductance as for ordinary straight broadcast receivers. For use in the anode circuit of a detector valve as in Fig. 3, a choke of the standard type is correct.

The first point to make certain when choosing a high-frequency choke, therefore, is that it is of a type suitable for the frequency upon which it will be used—or rather the band of frequencies. This will be clearly stated by the maker, and you can hardly go wrong on this provided you can tell your dealer for what purpose you require to use the choke. Practical values for H.F. chokes are given in the table over-page.

Next, we must pay attention to the design of the choke. In order to obtain (Continued on next page.)
CHOOSING A CHoke

(Continued from previous page.)

The next point calling for attention is the matter of interaction. It is obvious that a choke comprising a number of turns of wire will produce considerable magnetic field of its own, and the magnetic effects may cause unwanted coupling with other parts of the circuit, resulting in instability. Conversely, if the choke in their turn pick up either by magnetic or electrostatic coupling, impulses from other parts of the set, which again might introduce unstable operation.

Reducing Interaction

The self-field of the choke can be reduced by winding the coil in a helical form, i.e., as two coils side by side. This results in a much more concentrated field, having very much smaller external influence. For many purposes, however, especially in modern sets, it is desirable to screen the high-frequency chokes by enclosing them completely in metal cans or covers. Here, however, a further risk may be introduced, for if the screen is so designed as to be close to the choke winding, the screen and the choke in their turn act as the plates of a condenser, and valuable high-frequency energy will be by-passed to earth and lost. Hence in selecting a screened H.F. choke, choose one in which there is generous spacing between the windings and the case.

Finally, the general mechanical design of the choke should be noted. We must usually trust to the maker to see that all internal connections are well made, and the winding properly insulated between sections and between the wire and the case. But we can select types which have sensible terminals or socketing-holes, and fixing holes which are in convenient positions, and will take screws or bolts of reasonable size, and we can see to it, too, that the choke we buy is of a general design which will withstand normal usage without damage.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Inductance</th>
<th>Self Capacity</th>
<th>D.C. Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coupling for S.G. valves</td>
<td>200,000/500,000</td>
<td>1/3 mmfd.</td>
<td>200/500</td>
</tr>
<tr>
<td>Standard H.F. Coupling</td>
<td>100,000/200,000</td>
<td>2/4 mmfd.</td>
<td>300/800</td>
</tr>
<tr>
<td>Ordinary reaction</td>
<td>50,000/200,000</td>
<td>1/3 mmfd.</td>
<td>200/700</td>
</tr>
</tbody>
</table>

CONVERTING OR ADAPTING? Clearing Up a Present-day Problem

By H. J. BARTON CHAPPLE, B.Sc.

I N PRACTICAL WIRELESS, dated May 25th, some interesting practical notes were furnished concerning the use of a short-wave converter, and at the same time mention was made of the use of an adapter. The writer then appears to be mistaken in his measure of confusion existing concerning the exact functions of these two units, and as at the present time there are many people who are turning their attention to the short-wave end of the spectrum it is useful to examine the position in regard to the two ways in which the home receiver may be made to function, although the normal range is only medium and long waves. There is little doubt that for the very best results it is preferable to employ a short-wave or ultra-short-wave receiver designed solely for this purpose, but questions of expense arise, and provided the home set would normally be inactive during those periods when short and/or ultra-short wave listening is to be indulged in, then on the face of it there seems no reason why this set should not play its part.

Different Functions

Regarding the two units themselves an adapter is usually a short-wave detector which is designed to cover the short or ultra-short wave band, or both, and is plugged into the detector-stage of the ordinary broadcast set so as to adapt it to its new purpose. The term converter, on the other hand, is used when the device functions as a result of changing one frequency into another frequency which comes within the scope or range of the home set. The adapter is, therefore, a converter, that is to say, it becomes a superhetodyne receiver, the high frequency side of the home set working as the intermediate frequency amplifier.

With these two facts clearly in mind it is now a much simpler matter to see which method is better suited to meet individual requirements. Turning first to the adapter, the first, since only the low frequency side of the home set is to be brought into commission, the quality of the results obtained will depend very much on the degree of audio gain existing, and also the frequency response. One thing that must be guarded against is insensitivity in the adapter unit. If long range working is not desired then a straightforward detector circuit alone, similar to those which from time to time have appeared in these pages, will suffice. A series of plug-in coils may be used to cover the necessary band, but it is nearer and less troublesome to use a multi-range coil, provided it has efficient switching incorporated, and is properly screened. So many of these units fail because of insufficient precaution to obtain a coil from a manufacturer of repute.

Increasing Range

When it is felt desirable to increase the listening range of the adapter, then a stage of high-frequency amplification can be made to precede the detector valve, and this two-valve combination can then work in conjunction with the audio-frequency side of the home set. Give the adapter a good chance to prove its efficiency by using a satisfactory aerial and installation, and if working on the ultra-short waves study the notes published recently in PRACTICAL WIRELESS. In order to ensure that any dipole arrangement falls within its correct category. Pay particular attention to the disposition and length of interconnecting leads between the adapter and home receiver, and cause instability will not mar the working. If the home receiver is A.C. mains driven, remember that by cutting out the normal H.F. and detector loads the volts from the rectifier unit will rise. This may cause trouble, and if the same rectifier unit is not employed to feed the adapter, then it may be found advisable to introduce a dummy load to equal the volts consumed by the non-working part of the home set.

Converter Unit

Coming now to the converter unit, it must be remembered that this functions by making the high frequency section of the domestic set into an intermediate frequency amplifier of a superheterodyne type. This part of the home set should therefore be very efficient, and as a general rule the receiver itself is left tuned at some position on the long-wave band—the best way is found by trial and error—and in many cases the tuning is not found inconvenient. On the score of cost it is generally found that the adapter is cheaper, but when performance of the greatest importance the converter is usually capable of providing the better results. Very useful operating knowledge of the short and ultra-short wave bands will be acquired, and this will pave the way to the ultimate desire of constructing a special complete set which can be used independently of the one doing duty for domestic listening.

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Car Radio Taboo

THE Postmaster-General has announced that a Defence Regulation dated May 29th provides that apparatus from certain authorised exceptions, no person shall use, or have in his possession, or under his control, any wireless receiving apparatus not in such a position as to be readily adapted for use. Any wireless receiving apparatus, even if it is not fixed in position—for example, a portable set — is to be deemed for the purpose of the regulation to be installed in a vehicle if it is in the vehicle in such circumstances that it can be scheduled of readily adapted for use. On May 31st the Postmaster-General cancelled all ordinary wireless receiving licences for the installation and working of wireless receiving apparatus on land, sea, or air. In the absence of special authority, therefore, all persons who have wireless apparatus in their premises, in motor-cars, or other road vehicles, must take immediate steps to remove all such apparatus, including aerials, from these vehicles. As the time limit set was June 2nd, no doubt all motorists have complied with this new regulation by this time.

The regulation applies whether the vehicle is in use or laid up, but the wireless licences in respect of these vehicles should be retained by the owners. No refund of licence fees can be made, but the question whether any allowance can be made in respect of their unexpired periods will be considered when the time comes to remove the present embargo, and to issue fresh licences for the use of wireless apparatus in road vehicles. Nevertheless, however, the Minister has ignored the possibility of bicycles carrying portable transmitting and receiving apparatus. Such vehicles should have been included in the Order, in my view. Also, it seems to me that it will be highly dangerous for a member of the public to use a portable set and carry it home by car. I do not know whether this will restrict the sale of portables, because people will be apprehensive that the possession of such an instrument may land them into trouble. Obviously, a picnic party seen strolling towards some fields with a hamper and a portable wireless set would be suspect.

Reserved Occupations

THERE seems little likelihood that the number of reserved occupations will impose higher age limits on those engaged in the skilled sections of the wireless industry. I mention this because some people have been indulging in wishful thinking, and spreading false information about the intentions of the Ministry of Labour.

Licence Figures

THE U.I.R. (Union Internationale de Radiodiffusion) recently published a table giving the number of licences for wireless receivers issued in each country. Here it is: Belgium, 1,148,659; Denmark, 834,566; Dutch East Indies, 193,288; Estonia, 90,876; Germany, 13,945,022; Hungary, 511,410; Iceland, 16,755; Ireland, 169,392; Italy, 1,135,000; Japan, 4,666,008; Latvia, 154,106; Lithuania, 79,681; Palestine, 43,777; Portugal, 90,836; Romania, 319,708; Switzerland, 605,574; Sweden, 107,785; Ljubljana, 22,151; Zeiberg, 35,433.

Radio Engineers’ Manual

THE “Radio Engineers’ Manual” which we are publishing in pocket-book form will be issued very shortly. I make this statement in reply to those readers who are anxious to obtain a copy. When it is ready the usual announcements will be made in this journal.

Fourpence a Week

THERE has been a gratifying number of letters from readers thanking us for increasing the price to 4d. rather than adopting the alternative of reducing the number of pages. All readers seem aware of the difficulties with which publishers and editors have to contend at the present time.

An All-dry Receiver

HITHERTO all-dry valves have not been available to members of the public. I imagine that they are now released, and that the Editor is designing a receiver incorporating them. Such a receiver will be of immense use to public to purchase a portable set and carry in their cars. Obviously, however, there is no possibility of increasing the price of wireless receivers issued in each country.

Newly-trained Citizen Airmen

SOME months ago a Second-Class Aircraftsmen arrived at an R.A.F. Initial Training Wing. He had been trained at the Visual Link Trainer, and had completed a physical training course from which he had learned the rudiments of air navigation. He has revised his mathematics up to matriculation standard. He has learned to receive and transmit Morse code messages at useful working speed. He has become thoroughly acquainted with the operation and mechanism of the more widely used Service armaments. He has learned the rudiments of air navigation. And, more practical than any of these, he has completed a course on the Visual Link Trainer, and so has a theoretical knowledge of the proper handling of an aircraft.

Moreover, he has been imbued with a spirit of discipline which has not robbed him of his individuality, or his initiative, but has brought home to him a keener realisation of the trust that has been placed in him. At the same time he has been taught Service etiquette and the modus vivendi of Service life. He is not an automatic ; he is one of the thousands of new citizen-airmen of the British Empire.

Air Force Require Radio Men

MENT up to 50 can now serve in the Royal Air Force provided they have experience in radio work. A new class of entry has just been created to provide personnel for the maintenance of Air Force wireless apparatus. Any young man of various ages of expected age groups are required for the R.A.F. at the moment. Young men of good education, with dash and initiative—especially those in age groups which have not yet been registered—are asked to volunteer now.

Application can be made at any Combined Recruiting Office; or to any local Labour Exchange.

Jamming Haw-Haw

I SEE that one of the daily papers has accused itself into the amusing broadcasts of Lord Haw-Haw. This is ridiculous. The daily paper seriously suggests that the time has come for the ruthless and continuous jamming of Lord Haw-Haw. This, they think, will choke the pestilential lies thrown out by Goebbels. They go on to suggest that even if the German Government retaliated by jamming our radio, we could still, through our telephones, listen to our own broadcasts. This suggestion is too ridiculous to need much comment. Haw-Haw broadcasts in English, and as I have yet to discover any Englishman who takes the slightest serious notice of him, except when we want a little light entertainment, I cannot see why we should run the risk, even if that were possible, of retaliatory jamming measures. To suggest that we should listen over our telephones to our own broadcasts is just too absurd. In the first place, less than half of the listeners have telephones, and in the event of air attacks, we should not be able to listen in, as all telephonic communications will be suspended, as of course, the broadcast. I suggest that newspapers should investigate the possibilities of their suggestions before they make themselves, as well as this country, look ridiculous. As most of them have a radio expert on the Staff, why do they not raise the question? Is it because some of the alleged experts themselves propound these amusing theses?
Musical History—4

The Music of Bach and Handel, by Our Music Critic, MAURICE REEVE

At the close of the seventeenth century, music had "attained its majority"; it was now about to reach its maturity. It was to be launched on a course which it has followed down to our own day, only diverting from its own peril. Many of the writers already mentioned had produced works which have since achieved immortality. Harmony and melody of ineffable sweetness were at composers' command. The forms they fashioned in were for the most part small, and it was in this sphere that the coming century was to mark the greatest advance and achievement. The Messiah had still a hundred years to wait, and Don Giovanni and the Chromatic Fantasy almost as long.

Range of Colours

The musician's palate had acquired a wide range of colours. The modern diatonic scale had reached its definitive form though chromatics were sparingly used. The dominant seventh without preparation, was common in modulation, and had been brought into frequent use. Monteverdi is credited with being the inventor of the perfect cadence, and other writers as well as himself used the diminished triad. The orchestra did not yet include the violin, which may sound rather like talking of strawberries and cream without the cream. But it was taking an ever larger part in things with the growth of opera, and the evolution of orchestras and their permanent orchestras. The madrigal declined, and with its collapse came that great wave of church music so indissolubly linked with the names of Bach and Handel. Once the works of Couperin, Monteverdi, Scarlatti, Purcell, etc., had been assimilated, music could look forward with confidence to its lifelong association with the Church.

Although so closely associated in the minds of most people, and always thought of together and analysed as a pair, neither man ever met the other. In fact, there is no record of either having ever heard of the other or of the other's music!

Speaking idiomatically, these two great masters may be said to have conformed the musical world for Germany. It was certainly a conquest that lasted far longer than most of Germany's conquests in other domains! Actually, a dynasty of German giants followed them right down to Wagner and Strauss, and only to-day does German music show an appreciable decline from this supreme standard. The sequence of great masters that Germany produced from Bach to Strauss, Straussian, and not even the great lines of Italian or Dutch painters, or of English men of letters, surpasses it. The German musicians of the eighteenth century rescued music from its eclipse and brought it back into the hearts and affections of the English-speaking peoples that Sir Henry had so properly regarded "as a part of Holy Writ." While Bach was the great master of elaborate and complicated texture, Handel was one of the greatest melodists who ever lived. This is not meant to suggest that the one could not write fugues, nor the other beautiful melodies; far from it. Both, broadly speaking, are that where their two styles lay. Both men's work is on the loftiest imaginative plane, Bach's perhaps especially owing to his lifelong association with the Church.

Perfect Intonation

In Bach's day there were two ways of facing this problem. One was to merely accept "perfect" intonation together with the many restraints that it imposed on musical thought and development. The other was to abandon exact purity in order to obtain the enormous benefit of being able to employ every key within the framework of the one piece. Very much in the same way as in "summer-time," where we call twelve-o'clock eleven, in order to enjoy the certain advantages which are denied us otherwise, so "equal temperament" calls G flat and F sharp one and the same thing, for the sake of increasing the range and scope of musical composition. By "flattening" here and "sharpening" there—by telling a few "fib," as one might say—everything, that music has to offer, is brought within the range of those big enough to use it. The rules governing whether a note shall be allowed a "G flat" or "F sharp" are very strictly observed grammatically. But both are now combined in the one string, and the same key on the piano keyboard.

Bach took the side of the reformers, and proved his wisdom by writing his incomparable "48 Preludes and Fugues in All Keys for the Well-tempered Clavier," a series of master works which display a range and variety of harmony, modulation and contrast that would have been impossible of achievement under the old rules, but which set the standard for all future ages.

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RESPONSE, as applied to a receiver or amplifier, is generally understood as the variation in output for an input of given voltage over a range of frequencies. Thus it is customary to give a response curve or graph on which the output (or a factor representing variation in output) is plotted against the frequency of the input signal. It would be possible to show the output in milliwatts and the input in cycles per second, but it is more usual to plot frequency against a decibel scale. The graph would then be of the form shown in Fig. 1, which would indicate that the receiver or amplifier was in the sent the ideal, since measurement of output might be made without the use of the speaker to be used with the set. And if the response curve of the speaker is "dipped" below, say, 150 cycles and above 2,000 cycles the audible output would fall below and above these points. On the other hand, if the output from the receiver went up below 150 and above 2,000 cycles, the sound output may remain constant over the whole frequency band, due to the receiver compensating for the losses in the speaker. This principle can be applied to almost every component used in a receiver, for it is obvious that if losses in one component are evened up by corresponding gains (or negative losses) in another the output may still be "straight line." There is another important point which should be considered. This is the scale to which the graph is drawn; if the scales are "open" variations in response are far more pronounced than if the divisions are "crowded." It is customary to use a logarithmic scale for frequency. This means that the distance from zero to 100 c/s is equal to that from 100 to 1,000 c/s, and from 1,000 to 10,000 c/s. Thus, the scale is more "open" at the lower frequency end. Fig. 2 shows a response curve for a well-known L.F. transformer of the paralleled type. It will be seen that it gives uniform amplification to audio frequencies between approximately 110 and 12,000 c/s, but that the amplification falls off at either end of this range. That is usual in all transformers in the lower-price range, but it is possible to obtain transformers which give "straight line" output from as low as 50 cycles to well over 10,000 cycles. Although components of this type are excellent when used with valves for which they were designed they may be no more satisfactory than others costing far less if used in conjunction with any other valves or in a circuit other than that for which they were primarily intended. Aural Effects In considering frequency response it is also necessary to bear in mind that, for practical purposes, the ear plays an important part. Its sensitiveness is comparatively low at frequencies below about 100 cycles and above about 1,000 cycles. The importance of this is especially pronounced at the low-frequency end of the audio range. Because of this, frequencies below 100 cycles are almost inaudible to many people, and particularly when accompanied by harmonics. For example, the frequency range of a piano is from 10 to 6,500 cycles, but few people would recognise any difference if, in reproducing piano music, a receiver did not respond to frequencies outside a range of about 100 to 5,000 cycles. There is another important aspect of the question, which is concerned with the setting of the volume control. If the volume seemed (to the ear) to be constant over the frequency band between, say, 50 and 10,000 cycles with the volume control turned full (Continued on next page)
FREQUENCY RESPONSE

(Continued from previous page)

on, this condition would not apply when the control
was turned down. In fact, if volume
were reduced so that a 1,000-cycle note
(to which the average ear gives maximum
response) were just comfortably audible, frequencies below 1,000 cycles would probably be
completely inaudible, whilst frequencies
over about 3,000 cycles would scarcely be
heard. This is the reason why various
methods have been employed with
"quality" amplifiers to combine a tone
control with the volume control. It also
helps to explain that good quality reproduction is impossible
when the output is less than 5 watts,
even for a receiver used in the home.

Sound Output as Air Pressure

It is not an easy matter to measure output
in terms of sound or rather in terms of
air pressure, which is a measure of sound
as it strikes the ear drum, but by the use
of special apparatus such measurements
can be made. Thus we may have a graph
similar to that shown in Fig. 3, which is a
copy of one prepared by the National
Physical Laboratory for a certain loud-
speaker. It will be seen that variation in
sound intensity is plotted against a fre-
cquency scale, whilst on the right of the
graph there is a scale referring to the acous-
tic pressure, despite the fact that the
response curve in this case is a very wavy
line to the speaker to which it refers is a high-
grade instrument. This becomes more
evident if a mean or average line is drawn
through the wavy one, or if it is noted that
the variation in acoustic pressure does not
fall below 0 or rise above 35 dynes/cm.

The latter expression, by the way, is simply
a measure of pressure corresponding to the
much larger units of lb./sq. in.

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How Frequency Modulation Works

A Simple Explanation of the New Transmitting System

MANY listeners have heard that a
system of broadcasting has been tried
out and adopted in certain parts of the U.S.A., which is claimed to be a
great improvement on existing systems. This new arrangement is known as frequency
modulation, and in view of the increasing
interest which is being shown in it the following
table will, with no doubt, prove of interest.
They are taken from a talk by Lee Milton
of the Stromberg-Carlson Mfg. Co., and are
reprinted from the American publication "Radio To-day."

Just what is Frequency Modulation ? And how does it differ from Amplitude
Modulation, the kind of radio broadcasting we have all been hearing up to now ? It is
simply a different method of superimposing
the programme on to the carrier wave. Let
us see what it looks like on the charts on
these pages.

Now whether we are dealing with Ampli-
tude Modulation or Frequency Modulation,
we start with the same kind of radio carrier
wave, and also the same kind of telephone
current " programme wave " as picked up
by the microphone. With Amplitude Modu-
lation, the programme wave is combined
with the carrier in such a way as to change
the power of the resultant wave. It adds to
the power part of the time, and subtracts
from the power another part of the time so
that the wave radiated by the broadcasting
station appears as shown at (c).

Broadcast Advantage

In Frequency Modulation the same
programme wave does not change the power
of the carrier at all but is made to change its
frequency, speeding up the carrier-wave
part of the time and slowing it down
another part of the time so that the resultant
wave from a Frequency Modulation station
looks like (d).

The chart shows you immediately the
advantage which Frequency Modulation
offers to the broadcasting station. The
programme is superimposed on the carrier
without changing its power. In other words,
the broadcasting station operates at full
power all the time. That means that it can
be much more efficient, use less valves, less

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PRACTICAL WIRELESS

June 15th, 1940
receiver and, since most static is essentially an amplitude modulation, the discriminator washes that out too. The effect is to eliminate natural static, man-made static, in fact, practically any kind of noise. A good Frequency Modulation system eliminates the carrier “his,” and most of the valve noises from the broadcast station as well as any hum modulation and valve noise in your receiver. You do not even know a Frequency Modulation radio is turned on until the music plays.

Static-free

That shows how little residual noise there is in this new system. Let me tell you one more thing that movie producers are interested in Frequency Modulation to give better sound recordings on their films. Under this plan, radio will be used for portable sound-recording apparatus out “on location,” which may be miles away from Hollywood, they will use the best sound-recording equipment at the studio and will transmit the programme to that point by Frequency Modulation radio.

Before leaving this subject, let me point out why a Frequency Modulation receiver must be a little more expensive than an ordinary one. Remember there are two more valves in the detector circuit, and a tuning eye is also desirable, so that a good Frequency Modulation radio should have eight or nine valves minimum. To take full advantage of the better FM tone, the audio amplifier must be a good Class A distortionless amplifier. The loudspeaker must be designed to respond to high tones and overtones beyond the range of normal loudspeakers, usually produced to-day, and it must have a suitable baffle.

In Frequency Modulation, if the broadcasting station is an Armstrong wide-swing transmitter sending out high fidelity, then the tuning system of your receiving set must be able to admit or accept the full frequency swing of that transmitter. Up to two horizons and a possible service range of the transmitters. Acts much like television as regards the range of the listeners. Given enough power and a high aerial, Frequency Modulation stations seem to have a fairly reliable range up to two or three horizons, and a possible service range (to listeners not located behind buildings or mountains) up to four horizons. Height of the receiving aerial is important, as well as the height of the broadcasting aerial. This distance limitation is the one limitation to good Frequency Modulation broadcasting; it will be necessary to erect transmitters in every large population centre before we can all be assured of this new and better kind of reception.

On the other hand, within its service range, a Frequency Modulation station gives reliable reception, day or night, even through stormy weather. Listeners located at a distance from the city but within range of its FM transmitter will probably get better and quieter pictures than they would from an AM transmitter in the same city. Listeners located beyond the range of the FM transmitter will, of course, have to rely on the AM station the same as heretofore. High-power cleared channel AM stations will probably always be needed, as will the International short-wave AM stations. For that reason the system proposed to the Communications Commission by the FM Broadcasters, Inc., is a combination of AM and FM stations whereby the cleared channels on the regular broadcast band will be used for long-distance and rural coverage, and FM channels will be used for reliable local service.

Coil for the Gas-mask Box Receiver

Owing to the fact that the constructional details of the coil used in the Gas-mask Box Receiver (which was described in our issue of May 11th, 1940) were given in our issue of September 30th, 1939, and that a great number of our readers appear to be without this particular copy, we reprint below the essential details. It will be noted that we have varied the original specification to suit the receiver mentioned above, by increasing the diameter of the coil former from 1.1/16" to 2 1/8". The length should be 2.14". A piece of ordinary postal cardboard, or, better still, a length of paxolin tubing, can be used for the former. If cardboard is used, it is absolutely essential to see that it is perfectly dry; in fact, it is advisable to impregnate the tube after drying it in a slow oven for a few minutes. Ordinary shellac may be used for the impregnation.

Winding Details

The actual winding is carried out with 22-gauge enamel wire, winding this wire around the former. The turns must not interfere with each other unless possibly you are on the fringe area of both stations, right on the ragged edge of their service range.

Diagram (c) is the carrier and audio wave combined in Amplitude Modulation, whilst diagram (d) is the same combined in Frequency Modulation.
MANY amateurs, when looking round to means of improving their apparatus, start to buy new parts or change components, generally without any idea as to the ultimate result of such modifications. It is worth while in such a case to start by thinking out the lines upon which one wishes to work, so that any changes which are made will lead to improved results and not to some doubtful working which may lead to further difficulties. For instance, a change in valves may be thought to give an improvement, but such a change may result in the need to modify a coupling or to use some different H.T. value, and this in turn may lead to inefficient working of another stage. These facts are more important in the case of short-wave apparatus as there is not so much latitude in this type of equipment. Furthermore, as it is desirable always to obtain the maximum performance from short-wave apparatus it is not possible to make do with that might be termed " makeshifts." Such ideas as fitting band-spread tuning have been mentioned many times in these pages, but there are other directions to which the keen experimenter may turn in an endeavour to improve, or at least to make use of his apparatus, and the following will give some ideas upon which to draw.

New Components

In the way of new parts, modern short-wave apparatus may always be taken as an improvement upon old parts, especially those which have been primarily designed for normal broadcast use, but which have been included in a short-wave set. Tuning condensers, for instance, will be found in place of ordinary reaction condenser, and in use it may be adjusted so that the reaction is as smooth as desired. Other modifications of this nature, which do not in any way involve drastic changes, are the parallel feeding of the L.F. transformer, differential in place of ordinary reaction condenser, or the fitting of extension controls.

Mains Units

A form of query which is often put to us is: "How can I use a mains unit with my short-wave set?" It is found that when a standard type of mains unit is connected to some short-wave apparatus would also be a worth-while change, whilst if terminal connections are employed it might also be desirable to make use of good solid soldered contacts wherever possible.

New Arrangements

The above details concern mainly modifications in parts, but there may also be found that a change in circuit design may be employed. Many amateurs have a circuit which they have found tried and tested, and are not on this account keen to make changes. However, one or two small changes which may be made without affecting the general performance, although leading to an improvement. For instance, the average type of short-wave detector will have the grid leak taken to the L.T. positive leg of the valve. This is a standard arrangement, but it may be found that in certain circumstances it is preferable to vary the bias which is thereby applied to the valve. For this purpose an old idea, but one which works very well, is to use a potentiometer connected across the filaments, and to return the grid leak to the arm of that potentiometer. A value of 400 ohms is quite satisfactory, and in use it may be adjusted so that the reaction is as smooth as desired. Other modifications of this nature, which do not in any way involve drastic changes, are the parallel feeding of the L.F. transformer, differential in place of ordinary reaction condenser, or the fitting of extension controls.

Mains Units

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Easily-Made Tweezers

SCREWS and other small parts often drop into awkward corners in a radio chassis that cannot be reached with the fingers, or anything else handy. In such cases a pair of tweezers, like those shown in the sketch, would be found very useful. To make them, take a piece of hard springy wire about 12in. long, and bend the middle part of the wire round a 1in. bolt, to form a loop to give the tweezers an opening spring. Flatten out the ends with a hammer, and file the ends square. — R. JENKINS (Caterham).

Illuminated Map Tuning

WHEN tuning on the medium-wave band on a home-made set, it is very convenient to know quickly to which station the set is tuned. This can be done in the following manner, with the help of the accompanying sketch. A 6BA round-headed bolt of about 2in. in length is soldered to the end of the tuning vanes of a tuning condenser, as shown in sketch. A piece of 3-ply wood 4in. wide and the length of the tuning condenser's highest point when open, is temporarily fixed behind the tuning condenser, so that when the condenser is tuned right through, it describes an arc of 180° on the plywood. The stations wanted are then marked, and drilled where marked. The bulbs are then inserted in a named cardboard map (either flat-headed) are inserted.

The station points describe an arc of 180° on the plywood. The condenser is tuned right through, it behind the tuning condenser, so that the height of the tuning condenser's highest point is raised. A piece of 3-ply wood 4in. wide and the length of the tuning condenser's highest point when open, is temporarily fixed behind the tuning condenser, so that when the condenser is tuned right through, it describes an arc of 180° on the plywood. The stations wanted are then marked, and drilled where marked.

Fitting Sub-chassis Valveholders

HAVING no facilities for drilling holes for the valveholders in an aluminum chassis, I devised the following method of overcoming the difficulty. The valveholders were bolted in position with a small washer on each bolt between the valveholder and chassis, aluminium chassis, I devised the following method of overcoming the difficulty. The valveholders were bolted in position with a small washer on each bolt between the valveholder and chassis.

A novel method of fitting sub-chassis valveholders

The valveholders were bolted in position with a small washer on each bolt between the valveholder and chassis. Each bolt has a corresponding bulb, which should preferably be coloured to give an even luminous effect. The bulbs are then inserted in a named cardboard map (either home or ready made) in their right places: connecting wires are joined, one each from these bulbs to their corresponding bolts in the plywood. The ends of the wires are then joined. A switch may be inserted in the + lead if desired. Only one lead will connect to the accumulator as the negative is already joined via the moving vanes of the tuning condenser. — D. ZIM (Bournemouth).

L.F. Instability

AFTER an H.T. battery has been in use for several months a set may develop a high-pitched whistle and reception becomes distorted. The reason for this is, in the majority of cases, that the H.T. voltage from the battery has dropped, due to a breakdown of one or more of the cells with a consequent increase in the internal resistance of the battery. These defects are sufficient to produce instability in the circuit, particularly in the L.F. portion. Many constructors endeavour to overcome the dropping voltage by connect- ing a new battery in series with the old one, but, unfortunately, this does not overcome the trouble as the high resistance of the old battery still remains the same. The only satisfactory remedy is to use a new battery.

H.F. Choke Losses

A POPULAR method of reducing losses in an H.F. choke is to use a new battery. Although the valve legs were marked out on the underside of the chassis. These were then drilled 1in. diameter. Although the valve legs did not touch the chassis, I took the further precaution of slipping a 1in. length of insulating sleeving over each valve leg.

Practical Hints

SPECIAL NOTICE

All hints must be accompanied by the coupon cut from page 288. preferably be coloured to give an even luminous effect. The bulbs are then inserted in a named cardboard map (either home or ready made) in their right places: connecting wires are joined, one each from these bulbs to their corresponding bolts in the plywood. The ends of the wires are then joined. A switch may be inserted in the + lead if desired. Only one lead will connect to the accumulator as the negative is already joined via the moving vanes of the tuning condenser. — D. ZIM (Bournemouth).

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From Crystal to Valve

How to Use a Valve as an H.F. Amplifier for a Crystal Set, or as a replacement for the Crystal Detector.

By L. O. SPARKS

From Crystal to Valve

The addition of a valve or valves for amplification of the signals after rectification by a crystal detector has already been explained, therefore alternative arrangements are discussed in this article so that a very efficient crystal valve combination can be constructed.

After a reasonable period of experimenting with the original circuit, plus the L.F. amplifier, the constructor will, no doubt, wish to make further progress towards increasing the effective range of the apparatus. This can be achieved in two ways; a valve can be used as an H.F. (high-frequency) amplifier, between the aerial and the crystal set, or an alternative arrangement would be to replace the crystal with a triode valve acting as a simple reacting detector. The first method would increase range and selectivity while still retaining the pure reproduction qualities of the crystal, and, for these reasons alone, many music lovers will be tempted to model a circuit along the following lines. A stage of H.F. amplification, using a modern variable-mu H.F. pentode, a crystal detector, and a good L.F. amplifier employing one, two or three valves according to individual requirements. The second method, i.e., replacing the crystal with a valve detector, will appeal to those who wish to reach out to the more distant stations, and experiment with a something more alive and more active than a crystal. The advantages to be gained are these: greater sensitivity, chiefly due to the wise use of reaction, improved selectivity, which can also be put down to the reaction circuit, and considerable increase in output. Against these items we have the possibility of introducing distortion, slight extra drain on the batteries, that is assuming these have already been secured for the L.F. circuits previously described, and the cost of an extra valve. The question of distortion is, in the majority of cases, closely connected with unsuitable detector valve and incorrect operating conditions. It will be seen, therefore, that as all these items are within the control of the operator, the whole problem of faithful reproduction becomes far less serious if a little knowledge is applied.

H.F. Amplifier

A suitable circuit for this stage is shown in Fig. 1 where it will be seen that a variable-mu H.F. valve is recommended. In practice, it can be of the ordinary S.G. or pentode type, the latter being more satisfactory if powerful signals from a local station are to be received. Many readers might have a "straight" or non-variable-mu valve on hand, and wish to make use of it. That is quite permissible, although the very fine volume control provided by one of the specified type will, of course, be lost. The only modifications to the circuit shown, to enable a "straight" S.G. or pentode H.F. valve to be used, are the following. Ignore the potentiometer, fixed condenser C3 and G.B. battery, and their associated connections, and connect the bottom end of the aerial coil direct to the common negative earth line. The only modification which is required is a .0005 mfd. tuning condenser will be required, together with a four- or seven-pin valve holder, according to the type of valve used, a .1 mfd., and a .0002 mfd. fixed condenser, and a reliable make of H.F. choke. For those who wish a valve to be specified, I would suggest a Cossor 210VPT.

The circuit shown is the simplest arrangement; it is known as a "tuned-grid" H.F. coupling and, apart from being easy to construct, it is capable of giving very satisfactory results. The output from this H.F. stage is fed into the crystal circuit

Aerial Coil

This can be wound in the same manner as that described for the original crystal circuit but, as there will be no need to make provision for a reaction winding, the total number of turns can be reduced to, say, 60 and the number of tapping points consequently reduced to five. The method of connection will be clear from the diagram. An additional .0003 mfd. tuning condenser will be required, together with a four- or seven-pin valve holder, according to the type of valve used, a .1 mfd., and a .0002 mfd. fixed condenser, and a reliable make of H.F. choke. For those who wish a valve to be specified, I would suggest a Cossor 210VPT.

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(Continued on next page)
FROM CRYSTAL TO VALVE

(Continued from previous page).

via the original aerial terminal and the output condenser C.4. The actual aerial now being connected to the new aerial terminal as shown.

H.F. Transformer

This form of H.F. coupling requires two windings on the inter-valve coil, namely, a primary and a secondary. Fig. 2 shows the circuit as a whole, and Fig. 3 shows the section in question. Between the windings, two layers of thin, dry paper or other insulating material are placed, the ends of each winding are brought to the primary condenser C.5, and the condenser is connected across the ends of the primary. The coil is then wound on it, the same number of turns as mentioned above, and the condenser of the former system are no longer required. Notice that the H.F. valve and its positive anode, the H.T. supply, the fixed condenser C.5 being used for decoupling purposes. The winding of the primary is separate from the windings of the secondary.

The additional connection to the coil is to provide reaction in conjunction with the reaction condenser C.6 which is connected between the anode of the H.F. valve and the secondary winding. It should be noted that while this condenser, which is of the variable type, provides the required control of the reaction, the amount of reaction effect obtainable with the condenser specified will be governed by the number of turns of the coil used in this part of the circuit, the number of layers of the crocodile clips, it is possible to adjust matters until the most satisfactory results are obtained.

A suitable valve would be the Cosmos 210HF.

Valve as a Detector

For those who wish to dispense with the crystal detector, the tapped aerial coil described above is used to good advantage in the circuit shown in Fig. 3. The majority of connections, and the method of adjusting them, are practically identical with those used for the crystal set, but in place of the crystal a grid condenser is employed to feed the signals to the grid of the valve. The additional connection to the coil is to provide reaction in conjunction with the reaction condenser C.6 which is connected between the anode of the H.F. valve and the secondary winding. It should be noted that while this condenser, which is of the variable type, provides the required control of the reaction, the amount of reaction effect obtainable with the condenser specified will be governed by the number of turns of the coil used in this part of the circuit, the number of layers of the crocodile clips, it is possible to adjust matters until the most satisfactory results are obtained.

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Correspondence

NOW that the practice of sending reports to transmitting stations overseas is no longer permitted, one has naturally to turn to other items of interest associated with our work, and Member 6732, of Hull, shows how a very definite manner what general interest he is obtaining. His own words can best explain his activities. Since the war started I have been keeping an accurate record of the weather each day — i.e., temperature, whether sunny or dull, etc. — and I also maintain a daily log of all the short-wave stations received, noting such things as signal strength, time, frequency and atmospheres. The weather records, and the log of stations heard, are considered as one of the most interesting and illuminating results. For example, I have found that certain frequencies were much more affected by weather conditions than others. Last Easter, during the aurora borealis, VLQ was received exceptionally well.

Another very interesting letter has been received from Member 6443, of Lisburn, North Ireland, who states, amongst other things: 'About a month ago I built an R signal-strength meter. It is composed of a transformer, valve, and an 0-7 moving-coil milliammeter. After spending some time calibrating it I have now got it going very well, and it proves of great value when writing up my log.'

We certainly agree that an instrument of this type is most useful, and should certainly form part of the equipment of every member. Why not send us more details, Member 6443, so that others may benefit from the results of your experiments to other members?

Member 5767, of Bromley, Kent, also writes that a very interesting experiment he has been conducting is to use a crystal microphone and an R signal strength meter. It is composed of a transformer, valve, and an 0-7 moving-coil milliammeter. After spending some time calibrating it I have now got it going very well, and it proves of great value when writing up my log.'

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Member 6732, of Hull, writes: "The sudden lack of interest shown by members towards the proposed DX competition stirs my own interest to a wider degree. As yet I have been a 'silent' member, but now I feel that I must have my say on the subject. It is very disappointing that members who are interested in the work are adopting the following idea: the trouble was overcome. I soldered the feeder to a safety-pin, and was thus able to place the insulator on the feed and make the connections in the usual manner. The only trouble was that I had determined the correct point I was able to make an efficient weather-proof connection.

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Because the correct tapping point by adjusting the clip until the desired results are obtained. When, however, insulated wire is used, it is necessary to place the clips and consider whether the actual gain as regards signal intelligibility will be all that one might expect. Although the untuned stage of H.F. amplification is often treated as a sufficient measure to improve the over-all efficiency of the circuit, there is much to be said in its favor, especially in view of the minor controversy which is still going on between the communication receiver enthusiast and the 0-1 men. On actual score there is no doubt that the 0-v-1 men are in the majority, and judging by some of the splendid logs they send in, there can be little doubt that the simple receiver in the hands of an experienced and capable operator can pull in the DX signals.

The analysis of members' receivers makes very interesting reading, especially in view of the minor controversy which is still going on between the communication receiver enthusiast and the 0-1 men. On actual score there is no doubt that the 0-v-1 men are in the majority, and judging by some of the splendid logs they send in, there can be little doubt that the simple receiver in the hands of an experienced and capable operator can pull in the DX signals.

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A Remote Control System

Construcional Details of a Novel Apparatus

By Cecil Andrew, A.M.I.R.E.

When amateur transmitting was closed down, there remained a void for many readers as far as experimenting was concerned. The writer used to turn his attention to the development of apparatus he had been using for the remote control of his transmitter.

It was found that this method of control can be applied to many uses, from transmitting gear to receivers, telephones, fire alarms, bell circuits, television, A.R.P. requirements, and practically every branch of scientific science.

The basis of the arrangement can be seen in Fig. 1, and is constructed from second-hand parts obtained for a few shillings from the many vendors advertising such components. In the first place a number of automatic telephone dials were obtained for about 2s. 6d. each second-hand, as well as what is technically termed a "uniselector switch" sold second-hand for about 7s. 6d. This switch was so adapted to have 50 separate double line circuits, "step by step," any one of which can be selected by choosing the number on the "dial." Upon releasing the last number, a relay automatically switches out the selecting device and places the line calling through to whatever relay or apparatus is connected to that number, thus allowing the operator to control any instrument or, if preferred, place himself in telephonic communication with that point.

Construcional Details

At the bottom of Fig. 1, on the left, can be seen the dialling box, placed there only for the convenience of photographing. Attached to this is a flexible lead connected to a valve base with 3 or 4 pins. This can be taken from point to point, and plugged into a valve-holder, so that the "exchange" can be controlled. Nearly all the relays are home-constructed from old bell coils, etc., with the exception of the bank of relays, seen in the top left-hand of the illustration, which were purchased for about 3s. each. These contain multiple contacts which allow any combination of circuits. The writer used to control his transmitter from any number of points connected to the "exchange" by a pair of line wires and earth connection. By dialling a number the mains were first switched on, another number would light the filaments, another number would bring in the H.T. to any stage, and, finally, any "mike" required could be brought in by dialling the appropriate number. It was found that home-made polarised and "latchet" type relays were the most suitable for this purpose, as one number would hold the circuit closed, and another number dialled would then release it. Fig. 1 also shows two "mercury switches" for heavy mains work.

Several of the home-constructed polarised relays were made from old type loudspeaker magnets, and when the poles of which moving from side to side soft iron arms are pivoted. These were wound with a coil connected by flexible leads to terminals. When the current was sent in one direction this arm moved across to one side contacts, and when in the other across to the other contacts.

This relay rack is at present used to remote control one or two communication receivers, and by dialling a prearranged number a small induction type electric motor is operated through very slow worm gearing to move the tuning dial of the receiver. Then another number will connect a Morse recorder to the output, and so on.

No doubt there are many other readers who prefer to keep all their apparatus and experimental receivers in their own "den" away from the risk of domestic damage, and it is in this case that remote control is so convenient, enabling one to operate from any room or fireside without loss of time. Further, a simple telephone in workshop and other rooms was found to be very useful, the interconnection being self-controlled.

The dials are purchased with contacts normally closed, but these were altered so that they remain open when the dial is at rest, and close as it is rotated. This avoids the need of extra relays, and is much more simple for the purpose. The bottom two rows of contacts on the selector switch are all connected together with the exception of the last one, and this arrangement is used as a self-restoring device. By pressing the white button on the control box, this switch returns to "zero" ready for the next selection. Inside the box is a 4½ volt battery connected to a D.P.D.T. switch so that the polarity can be reversed on the "line" to operate the polarised relays in either direction.

Operation

In the normal position when all relays are at rest, the "A" and "B" lines (Fig. 2) can be traced right through from the D.P.D.T. switch and the line plug sockets to the "A" and "B" contacts upon which the two wipers are resting, so that any current sent through the line or apparatus connected to it will have a through connection to any relay on those pair of contacts on selector switch. Immediately the dial is operated and leaves its normal position, the contacts marked "C" will earth the "C" line through the 6-volt battery and operate the change-over switch, thus pulling the two contacts off the "A" and "B" wipers over to the selector switch circuit, and every time the dial passes a contact number the selector switch is operated once, and moves the wiper to the next pair of contacts. This cycle of movements takes place for the number dialled, and therefore the selector wipers always move to correspond to the number required.

Fig. 1.—The general arrangement of the complete remote control apparatus.

Fig. 2.—Diagram of connections for the remote control system described in the text.
allow us to operate the relay connected to this number by turning the D.P.D.T. switch which sends a current through the line, or we can plug into the line any apparatus such as, a telephone, or radio, etc.

When the use of this number has been completed, the zero set button is pressed, which "earths" the "B" line, and by holding down this button for a few seconds, the bottom row of set contacts which are all connected together except the last one, pass a current through the selector magnet which now has the contact breaker on this selector set, and can now operate the rotary wipers moving around until they rest on the last unconnected contact when the circuit is broken, and the selector comes to rest ready for the next dial operation.

There will be found on the "unselector switch," usually five rows of 23 contacts. The top two rows are used for the line contacts and the bottom row used and connected for zero set. If more than 25 lines are required, it will be necessary to employ the top two rows for "A" line and the third and fourth rows for "B" lines, cutting off the wipers on one side only. This will give 50 lines. All this seems very complicated but is really quite simple in practice with the apparatus described. A ratchet relay is shown connected to numbers 1 and 2. When No. 1 is dialled, and a current passed through the line, the armature is drawn down under the latch which holds this down against the bottom contacts. By dialling the next number this latch is "unlocked" to allow the armature against the top contact. The polarised relay moves from side to side on one number only, according to the direction of the switch. The writer has observed that his relays that only two lines and earth are required for full scale operation, but three lines are shown in Fig. 2. This order of simplify the diagram, but the reader will soon discover many variations for himself.

It might be mentioned that the selector was developed from an old H.T. battery, but the writer uses old wet high tension accumulators for economy.

New Cossor Transportable

THE recent introduction of "all dry" valves has led to some interesting portable receivers and this has been well illustrated by the new Cossor transportable, illustrated on the right. The new valve dispenses with the need for an accumulator for the L.T. supply, and as a result a more compact and lighter type of receiver is possible. The L.T. supply is obtained either by a small separate dry cell, or by a section of a special type of H.T. battery designed for the purpose. This is the arrangement used in the Cossor receiver, the battery being of the 90-volt type. A self-contained frame aerial is fitted, and there are four valves in the receiver. The output stage is a pentode, and the circuit is of the superhet type with permeability-tuned I.F. transformers. Automatic grid bias and A.V.C. are included in the circuit, whilst the output is fed to an 8m. P.M.F. receiver. There are three controls, the centre being a slow-motion tuning with concentric tone wiper, and the other two being wave-change and volume controls. Normally no earth is required with the receiver, but sockets are provided for when desired an external aerial and earth may be employed. There are also sockets for the inclusion of an external loudspeaker, these sockets being provided with switching.

Specifications Published.
521299.—Koester-Brandes, Ltd., and Beatty, W. A.—Radio-receivers.
521300.—Cole, Ltd., E. K., and Robertson, N. G.—Method of making electric connections in radio-receivers or the like.
521367.—Jones, W., and Pye, Ltd.—Television and like systems. (Cognate Application 145359.)
521390.—Philips, Ltd.—Superheterodyne wireless receiving-sets.
521185.—Phillips Lamps, Ltd.—Radio receiving-sets.
Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at the uniform price of 1s. each.

New Cossor Transportable

The wavebands covered are from 190 to 560 and from 530 to 2000 metres, and the cabinet measures 20in. by 16in. by 10in. deep. The price of the receiver is £9 17s. 6d.

Philo Wade

PHILIP WADE, well-known member of the R.B.C. Repertory, who is also familiar to listeners for his work as an author and an adapter of works for broadcasting, will be recalled a recent adaptation of the novel of F. Pickwick Papers." One of his plays, which is to be produced in the Home Service programme on June 14th, by Howard Rose, is "Wedding Group." This is a revival of a work which was originally produced five years ago. The story begins with a modern setting on the eve of the wedding of the young couple. The bride's mother shows the young couple an old family photograph album in which there is a family wedding group which dates back before the Crimean War. In a delightful way Philip Wade brings this wedding group to life and tells the story of the romance behind it.

Cabin No. 3

THE cruises of luxury liners have not provided such a spate of romance and crime stories as might have been expected, but Florence A. Kilpatrick has used the subject as the central idea of a very exciting play which is to be produced by Peter Oresswell on June 13th. This is a story of a trip from Rio de Janeiro to Tilbury, and the main characters are a wealthy woman globe-trotter, her pretty young companion, and a stowaway who appears to be mixed up with a gang of emerald thieves who are after the globe-trotter's jewels. There is both crime and romance in the play, for the pretty young companion manages to save the designing stowaway from his worst self and the story has a happy ending.

BOOKS RECEIVED

DEFINITIONS AND FORMULAE IN RADIO AND TELEVISION ENGINEERING.
By A. T. Starr, A.M.I.E.E. Published by Sir Isaac Pitman and Sons, Ltd. 50 pages. Price 7d.

This useful pocket handbook, intended for students of radio engineering, contains a large number of definitions, formulae and circuits, covering all aspects of radio, and based on standard practice. The book contains sufficient information for refreshing the memory as occasion requires.
A "Quality" Equipment

Sir,—I enclose a photograph of my equipment which I have built with the aid of the knowledge obtained from your excellent papers.

The top of the rack contains an 8in. Epoch speaker (P.M.), which I use for DX work, though this was only put there to take the place of a low-power C.W. transmitter which I was going to put in the rack if transmitting had continued. The middle rack contains the H.F. portion of the rig, and this consists of a VP215 R.F. amplifier which is tuned on all bands, which are fed into a triode detector. This part takes care of the DX, and it has a S.W. range of 12-60 metres, while the usual broadcast bands are also included.

A turntable is next, and this is fitted with a crystal pick-up for quality work with records. The bottom rack holds the most important part of the gear, which is the L.F. amplifier.

When on the radio the valve line-up is LP2 (transformer coupled to the detector), which is in turn transformer-coupled to a 10 (Class B) valve, which has an output of over 2 watts. When over to the gramo, the line-up is HL2 (pre-amplifier resistance) coupled to an LP2, which is transformer-coupled to the output valve. The quality with this line-up is exceptionally good, and the output of the Class B valve is fed into a Deleston (P.M.) 10in. speaker. Switching for the L.F. amplifier is done by a multi-cut-out switch, while the two D.P.T.P. switches are for cutting out the Class B valve when working on 'phones, or the DX speaker. The speaker case may interest some quality 'fans,' as it consists of a strong box 2ft. 6in. square by 1ft. deep. The inside is lined with felt 1in. thick and corrugated paper on the outside. The front is 5-ply wood, and perforated zinc corrugated paper on the outside. The speaker is capable of good results, so he decided that it should be so.

PRACTICAL WIRELESS is certainly doing its bit 100 per cent. in keeping the less-wired public informed of all the latest developments in this ever-expanding field. May it long continue to do so!—J. T. Jackson (New Barnet).

Station CR7BE

Sir,—In a recent issue of PRACTICAL WIRELESS, R. Scotten, of Leyton, states that he picked up a Portuguese East African station broadcasting on 20.8 metres, which station would be CR7BE Lourenço Marques, Mozambique, on 38.8 metres (9.71 m/s). This station can be heard broadcasting in English from 20.00 to 21.00 B.S.T. every night.—C. Merritt (Evelham).

Correspondent Wanted

H. TOBIAS, 56, Reginald Road, Crosby, Seathorpe, Lines, would like to get a corresponding writer who has built the "Midget S.W. Two."

A Simple S.W. One-valver

Sir,—I enclose a short log of stations received with a single-valve short-wave set I have built, which may be of interest.

Aerial tuning condenser is .0001 mfd. Coil: Grid winding 6 turns No. 16 bare copper wire on 6in. ribbed former. Reaction winding 1 turn No. 20 D.C.C. wire. Grid condenser is .00005 mfd. grid leak, 2 mQ. Ordinary broadcast tuned transformer and reaction condensers, .0005 mfd. These I made by removing half the plates in double condensers, ordinary air-spaced .0003 condensers. An ordinary short-wave H.F. choke is used.

Solution to Problem No. 403.

When Matthews added his screen potentiometer he overlooked the fact that this was joined between H.T. positive and B.T. negative, and accordingly a switch should have been included to isolate this when the set was switched off. Failure to do this resulted in the battery discharging continuously with the results which he experienced.

The following three readers successfully solved Problem No. 403 and books have accordingly been forwarded to them:—M. Dalling, Yorktown Road, Sandhurst, Berks; W. Brown, 46, Blantyre Street, S.W.12; D. McLean, 49, Newall Drive, Glasgow, S.1.

OPEN TO DISCUSSION

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).

With this set and an aerial consisting of 10in. of No. 16 copper wire connected vertically to the grid terminal of the coil, I have logged the following stations: EA7BE, WZECR, EKIEF, WICBW, WIDL, LJYJ, ES1E, ES4G, DJKJ, KE1ND, WIXDK. With an aerial of approx. 15ft. No. 20 enamel-covered wire hung round vertically to the grid terminal of the coil, the following commercial stations have been logged: W2XAD, 2RO6, DJD, GSQ, WIXAL.

Prize Problems

PROBLEM No. 404.

KENT had a three-valve battery receiver which gave splendid results on 'phones, but when he connected a loud-speaker he was disappointed with the results. He assumed that the speaker was in good condition and capable of good results, so he decided that perhaps results would be improved if he did not use a direct output feed. He accordingly decided to parallel feed the speaker, but as he had not got a suitable L.F. choke available he used a 50,000-ohm fixed resistance (bearing in mind that the effect would be to reduce circuit sensitivity). He fed the speaker from the anode through a .1-mfd. condenser, but the results were worse than ever. What was wrong? These books will be awarded for the first three correct solutions opened. Entries must be addressed to The Editor, PRACTICAL WIRELESS, George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2. Envelopes must be marked Problem No. 404, in the top left-hand corner and must be posted to reach this office not later than the first post on Monday, July 17th, 1940.

June 15th, 1940

I am a regular reader of your journal, and have always found it a great help to me.—W. G. Morris (London, S.E.).

"Radio Training Manual"

Sir,—May I take this opportunity of expressing my congratulations with the "Radio Training Manual"? I have studied this unique book from cover to cover, and have found that it fully explains a number of points which are extremely valuable, and yet are passed over lightly in most text-books.

In particular I was highly interested in the chapters on the design of the detector stage and the principles of receiver design. A "Midget S.W. Two", with a set for the technical side of things as well as the constructive, would, I am sure, appreciate a series of articles in PRACTICAL WIRELESS incorporating such interesting subjects as high-frequency transformers, stability in high-frequency circuits, separating the chokes, electrical current components ; and oscillatory circuits.

To be brief, a series embracing the whole of the modern radio receiver, and dealing with it in detail, as you have done with the detector stage in the "Radio Training Manual,"—Most enthusiasts wish to know why this, and the other must be of such value, instead of being told that it should be so.

PRACTICAL WIRELESS is certainly doing its bit 100 per cent. in keeping the less-wired public informed of all the latest developments in this ever-expanding field. May it long continue to do so!—J. T. Jackson (New Barnet).
Tone Improvement

"I have a four-valve battery set which, whilst good so far as all normal requirements are concerned, could, I think, do with some improvement in the quality of its reproduction. This is particularly applicable to the gramophone side, and if I append a circuit and would be glad if you would suggest a good tone-control device which would be guaranteed to give good results. I have tried several schemes without any real improvement."—K. M. (Wokingham).

Your circuit modifications may have been effective, but your speaker, the cabinet, or other acoustic details may have prevented the effects from being noticeable. Have you tried a "constant" tone-control device? This might give the desired improvement and it should be included across your volume control used with the pick-up. A 20k ohm and a 15mm condenser in series. The condenser is joined to the earth end of the pick-up volume control and the end of the choke is connected to the other part of the variable resistance having a value between 5,000 and 10,000 ohms. The resistance is brought to your pick-up by a winding on the pickup volume control, the best point being found by experiment. About one-fifth of the winding is generally satisfactory. The tapping is, of course, on the earth end. If you cannot tap the volume control you can obtain a similar effect by connecting a fixed resistance in series, but it is preferable to tap the control as this then enables the resonant circuit to be cut out at low settings and this gives the desired compensation.

Economy Amplifier

"I wish to build an economy amplifier, capable of giving a really good output for domestic purposes. I do not want dancing volume, but something a little above the average.—J. H. (Cambridge).

Although an untuned stage may not give as much improvement as a tuned stage there are advantages to be gained by its inclusion. Firstly, the inclusion of the valve before the detector will result in a slight increase in amplification. Secondly, the inclusion of the stage between aerial and detector tuned-grid circuit will overcome erratic effects due to the damping of the aerial, and probably result in smoother reaction and consequent increase in the strength you may obtain on some distant stations. Another point is that on the lower wavelengths the gain obtained by using a tuned H.F. stage is not appreciable and thus there is no object in using the tuned circuit. The buffer stage, as the untuned arrangement is called, is, however, always worth while.

Noisy Controls

"I am finding it difficult to adjust my volume control without a noisy background. I am afraid, however, that the control itself is not responsible, as I have examined it very carefully and the arm is not responsible for the noise, as I am afraid, however, that the control itself is not responsible, but that when volume is turned up the increased vibration causes a poor contact to be jarred in some other part of the set and that this gives rise to the noise.—A. E. (Isleworth).

It is possible to get noise from a control which apparently has good contact. But this would only occur if H.F. was present, and in a poor H.F. resistance would be responsible. In some cases this could be overcome by shunting the control by a fixed condenser. If the control is on the L.F. side of the receiver there should be no H.F. present and faulty H.F. filtering would therefore be the thing to overcome. You may find, however, that the control itself is not responsible, but that when volume is turned up the increased vibration causes a poor contact to be jarred in some other part of the set and that this gives rise to the noise.

L.F. Transformer Design

"I have been looking into the question of improving my set and have come across a small problem which I should like you to solve. I have two transformers, at least five years old. They are substantially constructed, and I have always understood that this is one of the most important features of an L.F. transformer. It now seems that modern transformers are extremely small and I am not certain that by purchasing one of these I shall obtain any improvement from the quality point of view. I wonder if you could confirm this?"—H. E. R. (Colindale).

You have apparently overlooked the fact that modern transformers do not always employ the old form of core. In the early types of transformer ordinary Stalloy stampings were employed, but many modern transformers make use of special alloys such as nickel-iron, where it is high inductance to be obtained in a much smaller space, and therefore, it may be possible in certain circumstances to obtain better quality with a modern small transformer than with an old pattern large transformer of poor design. It is, of course, still possible to obtain high-quality transformers of substantial design, such as the Fernandes.

S.W. Oscillator Coil

"I am reading about superhet's. I see that the oscillator section has to tune to 465 kc/s. From tables I find that this is equivalent to about 600 metres. Now I have a short-wave set working down to 9 metres, and I wonder if you could confirm this. I find it only has a few turns of wire and is tuned by a very small voltmeter, so I fail to see how it can go up to 600 metres. Perhaps you could explain this point to me."—S. L. (S.E.14).

This is a point where thinking in metres, kilocycles, and kilowatts is rather easier than in feet and hertz. In any case, you are confusing you. You have also overlooked the fact that the Oscillator stage is a separate department. This consists of a single L.F. stage, designed to tune to 465 kc/s and that this frequency has to be developed in the frequency-changer stage. However, if you think in kilocycles you will see that the required frequency is obtainable, even down to 1 metre. Take, for example, a station working on a wavelength of 15 metres. This is a frequency of 20,000 kc/s. Now to tune the oscillator section to 20,046 kc/s you would have to tune the oscillator circuit to either 20,465 kc/s, or 20,000 minus 405 kc/s, or 495 kc/s. A frequency of 20,465 kc/s corresponds to a wavelength of about 14.65 metres and 19,535 kc/s corresponds to a wavelength of about 16.55 metres and 19,353 kc/s corresponds to a wavelength of 17.55 metres, and thus you see that there is very little variation between the actual tuning circuit and the oscillator circuit, and you do not need a very accurate tuning. We trust the above explanation clears up your difficulty.

Midget Coil Connections

"I built up your small receiver some time ago, with a Bulgin midget coil in it. I dismantled the set and now wish to make up a similar one, but I have lost the code for the coloured leads of the coil. Is it possible to give me the wiring for this component?"—R. T. (Edinburgh).

The coil in question had a fixing bracket it and you should find it. I have removed this in dismantling the set, as it is in contact with the lower end of the grid condenser and must be earthed. The tuning condenser should be joined to the green lead and the on-off wavechange switch should be joined between earth and the blue lead. The grid condenser may be connected to the green lead or to the red one which is already connected to the tuning condenser (the other side of which is, of course, earthed). The primary winding has been split, 16 grey and yellow, the latter being the earthy end.

The coupon on page 286 must be attached to every query.
Reducing Adjacent Channel Interference
Details of a New Type of I.F. Transformer

The sensitivity of modern superhet receivers is such that when they are tuned to the frequency of any given broadcast channel, they respond to some extent to signals in an adjacent channel, and it is desirable to provide some means for reducing the adjacent channel interference. Such reduction is best effected in the intermediate frequency circuits because in these circuits the currents to be transmitted are of the same frequency for all signal channels and, as the broadcasting wavelengths are spaced apart by 10 kilocycles, the currents corresponding to adjacent channels to be attenuated are also of fixed frequency of 10 kilocycles above and 10 kilocycles below the intermediate frequency respectively.

The coupling arrangement about to be described provides an inexpensive means for the reduction of adjacent channel interference, and has the advantage that it requires a minimum of adjustment.

Fig. 1 shows three cascade-connected transformers, 1, 2 and 3, the first of which is a frequency changer, while the others are intermediate frequency amplifiers. The input circuit of the valve 1 includes the primary winding 4 of a coupling transformer which has secondary windings 5 and 6, connected in series in the input circuit of the valve 2. Similarly, the input circuit of valve 2 includes the primary winding 7 of a coupling transformer which has secondary windings 8 and 9 connected in series in the input circuit of the valve 3.

The primary windings 4 and 7 and the secondary windings 5 and 6 are tuned to the intermediate frequency by condensers 10, 12, 11 and 13 respectively, these condensers being adjustable, in the manner of the usual trimmer condensers, for the purpose of initial adjustment. When so tuned, the voltage in the secondary of each transformer is displaced in phase with respect to the voltage of the primary winding by 90 degrees when the intermediate frequency is correct. When this frequency is correct, however, from the correct value, this phase relation changes and the secondary voltage becomes more nearly in phase with the primary voltage, or more nearly displaced in the direction of the shift in frequency and, of course, the magnitude of the phase displacement is dependent upon the magnitude of the frequency shift. The secondary winding 6 of the first transformer and the secondary winding 9 of the second are untuned, but these windings are coupled to their respective primary windings to have in them a voltage which is at a fixed phase relation with respect to the primary winding, and which therefore constitutes in the primary circuit a replica of the primary voltage. Accordingly, this voltage may be made exactly equal and opposite to the voltage in the secondary winding 5, or 8, when the frequency has shifted from the intermediate frequency by the amount of 10 kilocycles.

The voltage of the secondary winding 5 may be adjusted to be equal and opposite to the voltage of the winding 6 at a frequency of 10 kilocycles above the intermediate frequency, and similarly the voltage of the winding 8 may be made equal and opposite to the voltage of winding 9 at a frequency of 10 kilocycles below the intermediate frequency. Thus, at these two adjacent channel frequencies, infinite attenuation in the system is produced, the adjacent channel above the intermediate frequency being infinitely attenuated in the coupling device 4, 5, 6, and the opposite adjacent channel being infinitely attenuated in the coupling device 7, 8, 9.

Voltage Adjustment

The voltage adjustment producing infinite attenuation can best be obtained by the use of resistors as shown at 14 and 15, one of these resistors being in circuit with winding 6, and the other in circuit with winding 9. These resistors may be either in series with the respective windings or in shunt, and the diagram illustrates both methods of connection. Both resistors may, of course, be connected in the same way, and their values are selected to assist the securing of the desired phase relations between the voltages in the secondary circuit.

Since the voltage on winding 5 is displaced in phase from the voltage on winding 6 by 90 degrees at the intermediate frequency, it will be observed that windings 4 and 5 may comprise the normal transformer coupling coils, since at the intermediate frequency the coupling is appreciably affected by the winding 6. For this reason windings 4 and 5 do not seriously affect the frequency at which infinite attenuation occurs, with the result that adjustment to take care of such manufacturing variations to secure the infinite attenuation of the adjacent channels is not necessary. In fact, it has been found that the adjustment of the coupling between windings 4 and 5 and, similarly 7 and 8, to secure infinite attenuation at the adjacent channels is not more critical than the adjustment for critical coupling in the conventional intermediate frequency transformer.

Fig. 2 shows the structure of the transformer comprising the windings 4, 5, 6, in Fig. 1. While the arrangement of the windings and the structure of the transformer may vary widely, in the construction shown the secondary winding 5 comprises two coils arranged at one end of a coil support 16, and the primary winding 4 comprises two coils arranged near the opposite end. The winding 6 is arranged on the opposite side of winding 4 from the secondary winding 5 and is more closely coupled to winding 4 than is winding 5.

This system was developed in the laboratories of the G.E. Company of America.

NEW RECORDS

Dance Music

AMBOSE and his Orchestra have made two new records this month. They are "You Made Me Care," with a vocal by Vera Lynn and "Makin' 'em Come Down" on Decca 7452, and "Indian Summer" and "My Capri Serenade" on Decca F 7453. Jack Payne and his Band also supply dance music with "Walkin' Thru Mockin' Bird Lane" and "A Little Rain Must Fall" on Rex 9775; Joe Peterson, who sings "I'm Praying Tonight for the Old Folks at Home" and "You Made Me Care" on Rex 9777, and George Elderick with "Arm in Arm" and "Light up Your Face with a Smile" on Rex 9778.

Rex

VOCAL recordings are supplied this month by that popular radio star Elsie Carlisle, with her version of "Walkin' Thru Mockin' Bird Lane" and "A Little Rain Must Fall" on Rex 9775; Joe Peterson, who sings "I'm Praying Tonight for the Old Folks at Home" and "You Made Me Care" on Rex 9777, and George Elderick with "Arm in Arm" and "Light up Your Face with a Smile" on Rex 9778.

Dance music is supplied by Billy Cotton and his Band with "The Navy's Here" and "Let the Curtain Come Down" on Rex 9770, and "In Old Dutch Garden" and "Rainbow Valley" on Rex 9769. Another popular dance band—Jay Wilbur and his Band—have also recorded this month. They play "Indian Summer" and "Dancing Is Another Name for Love" on Rex 9767.

Music for Dancing is Another Name for Love, and on the other a quick-step "There's a Boy Coming Home on Leave" and "You Made Me Care," which is a waltz.

Fig. 2.—Method of winding the type of I.F. transformer described in this article.
**PRACTICAL WIRELESS**

### Metal Panels

**THE present shortage of metal has resulted in some difficulty in obtaining aluminium or copper for panels, chassis, etc. It may therefore be worth while remembering that a solid sheet of metal is not essential for the average receiver where screening is required. A very good substitute for a metal panel is an ebbonite or wooden sheet, backed by ordinary perforated zinc. This is still available in fair quantities and as a screen is quite effective. Another alternative is to use fine mesh wire-netting.**

This is obtainable with tin mesh (used for bird aviaries) and on most apparatus, when earned, offers a satisfactory H.F. screen. This material is, in fact, often employed in factories and test-rooms for screening off a section of the area for test purposes. A chassis could be made from perforated zinc, which solders nicely and offers only the difficulty that it is not rigid. Strengthening pieces may, however, be placed at corners or along edges, and ordinary plywood or angle strip from the popular constructional toy may be used for this purpose.

### Test Apparatus

**A DIFFICULTY which often besets the designer of an all-purpose type of test instrument is the selection of various voltage or other tappings. There is usually a range of outputs available at each type of test and it is often found that the most satisfactory plan is to use one or two flexible leads in conjunction with a number of sockets. Whilst this is a good plan there is the difficulty that should the plug be in a wrong socket the instrument may be damaged by connecting the test leads to, say, a high voltage for test purposes. Such a difficulty may be overcome by fitting a fuse, but this generally affects the range of the instrument or its accuracy. A better plan is to make use of a multi-contact selector switch, or a bank of such switches, so arranged that all that has to be done is to turn the indicator to the range desired and the internal switching is automatically carried out. This, of course, still leaves the human element, namely, that one must watch that the instrument is correctly indicated before making the test, but it simplifies the procedure as there will only be one indicator to attend to.**

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