SUPER-REGENERATIVE ONE-VALVERS

Practical Wireless

3D

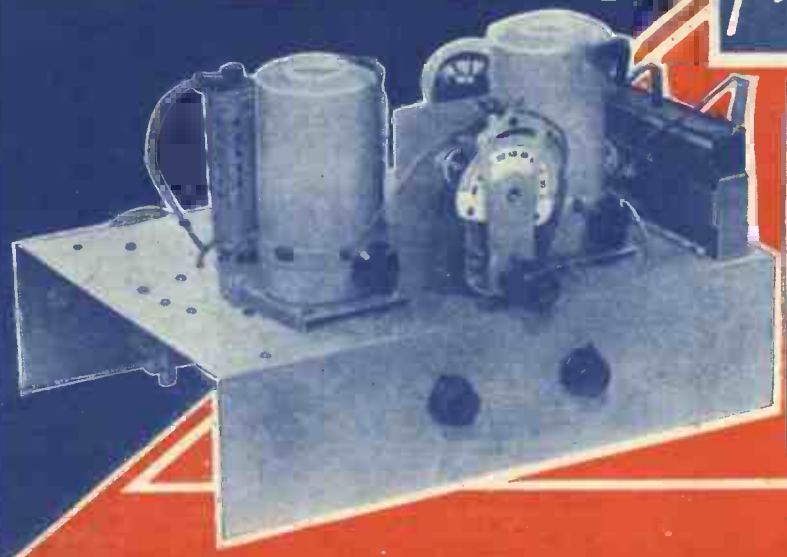
AND PRACTICAL TELEVISION

EDITED BY F. J. CAMM

Published every Wednesday by
GEORGE NEWNES LTD.
Vol. 4.——No. 85.
May 5th, 1934.
Registered at the G.P.O. as a Newspaper.

Building the PRIMA MAINS 3

A Cheap Set for Beginners



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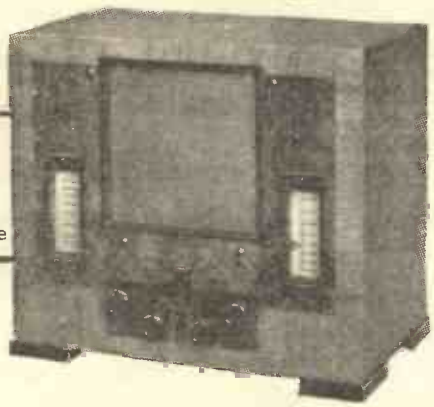

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MODEL 442. Superhet Table Model (five valves including rectifier). Fluid-light tuning in central window. Automatic volume control. A.C. only.

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ROUND *the* WORLD *of* WIRELESS

Oxford and Columbia Universities Debate

WIDE attention should be attracted by a debate between Oxford and Columbia Universities on May 5th, to be heard in the Regional programme. The resolution is: "That steadily-increasing and freer trade between the nations of the world is the chief hope for national progress and international peace." Oxford will speak in favour of the motion; Columbia against. The speakers on the Oxford side are: A. F. K. Schlepegrell, University College; Gordon Murray, Balliol College; J. R. B. Crichton, Balliol. The speakers on the Columbia side are: Herbert G. Ahrend, Valentine James Sacco, Sanford Leonard Schamus. The speeches will be relayed by the transatlantic circuit.

B.B.C. Dance Orchestra to Provide Closing Programme

THE B.B.C. Dance Orchestra, directed by Henry Hall, originally put in the Saturday evening late dance music period for first a fortnight, and then three weeks of March, are to continue indefinitely to provide the closing programme of the week. This decision is based upon the appreciative response of listeners to the change from the previous arrangement. Ambrose and his band did yeoman service by providing listeners with Saturday night dance music over a number of years, and the superlative quality of his band never was disputed. But the idea of inserting variety turns and making the 22.30 to midnight period on Saturday something in the nature of a cabaret has seized the imagination of the B.B.C. public, which has shown itself overwhelmingly in favour of some leavening of a solid hour and a half's dance music.

A Royal Night of Variety

ARRANGEMENTS have been made by the B.B.C. for the relay of the Royal Command variety performance to be given at the London Palladium on Tuesday, May 8th, for the benefit of the Variety Artists' Benevolent Fund. It will consist of a two-hour programme, and, in substitution of the turns which cannot be transmitted by microphone, listeners will hear studio and other interludes in which the variety artists are closely collaborating with Broadcasting House.

Copenhagen's Proposed New Studio

IN view of the increased number of listeners and consequent enhanced income secured by the Danish Broadcasting Corporation, a large sum of money has been earmarked for the building of a main radio centre with a series of entirely modern equipped studios.

This Summer-time Business

MATTERS are somewhat complicated by the fact that all countries do not change over on the same date. France, Belgium, and Portugal changed their clocks on April 7th, Great Britain on April 22nd, and Holland alters hers on May 15th. All other European countries will remain as they are. It is surely time some international agreement for these changes should be secured.

Mexico versus U.S.A.

IT is reported that in consequence of the failure of the North and South American Wavelength Conference, in which Mexico, Canada, the United States, and Cuba were interested, Mexico has decided to erect a number of super-power stations at Villa Acuna, Monterey, and Matamoros, on the Texas border. Such a move on the part of a neighbouring State causes some uneasiness to the American authorities, as so far, in addition to 50-kilowatt transmitters, there is only one 400-kilowatt station in the United States.

Another Attempt on the Stratosphere

ALTHOUGH so far the Russians hold the height record, another attempt is to be made shortly to elucidate still further the mysteries of the stratosphere. On this occasion the experiment will be carried out by Professor Moltchanov, of the Science Academy at Leningrad. The balloon will not carry any passengers, but will be of a true "robot" pattern; the working of the various recording instruments will be started by radio from a land station. By this method it is hoped to attain an even greater height than hitherto reached without courting the risk of disaster with loss of life.

Broadcasting in the Pacific

AN application has been made to the Federal Radio Commission for the authority to erect a broadcasting station at Agana, the capital of Guam, the largest and most populous of the Marianas Islands, in the North Pacific. It is governed as a naval station of the United States, and is used as a halfway house between America and the Far East. Radio entertainments and news bulletins in English and Spanish would be broadcast on 1,400 kilocycles (214.3 metres).

Another Wavelength Change

AS the channel occupied by Dresden (Germany) was found unsuitable, by arrangement this station now works on 233.5 metres (1,285 kcs.), a position in the band already used by Aberdeen. It is to be hoped that no interference will result, as the German station works with 1.5 kilowatts. So far, Aberdeen only shared this channel with a small private transmitter at Brussels (Belgium).

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

Hospital Ward as Studio

A WARD of the Great Ormond Street Hospital for Sick Children will serve as a broadcasting studio on May 19th, when the Daventry National Children's Hour is broadcast from there instead of from the usual studio at Broadcasting House. The artists who will entertain are Johnson Clarke, ventriloquist, Ronald Gourley, whistling solos and songs, and Rudy Starita, xylophone solos.

"The Musician at the Gramophone"

LESLIE HEWARD, conductor of the City of Birmingham Orchestra, has an interesting subject for his recital on May 10th, in the Midland Regional series, "The Musician at the Gramophone." He will illustrate by records how various composers have treated the Faust legend.

Another "Scrapbook" Broadcast

AN interesting broadcast in the "Scrap-book" series will be presented to National listeners on May 8th, and to Regional listeners on May 9th. This time Leslie Baily is determined that his "Scrapbook" shall remain a closed book until the night of the broadcast, but remembering the "Scrapbooks" for 1913 and 1909, listeners may anticipate that well-known personalities will take part and that the programme will present an extremely varied collection of memories of the year 1914. Even apart from the War, 1914 was a year full of interest. Some of the greatest figures of variety were in their prime, and another interesting thing is that never probably within living memory has there been such another bumper year for opera. There were four seasons in London, three of them running concurrently.

Ridgeway Parade

ARRANGED for January and postponed owing to heavy bookings at provincial theatres, the next "Ridgeway Parade" broadcast has now been fixed definitely for June 1st and 2nd. The return to the microphone of this lively show, which was born and christened in the B.B.C. studios, will be a change for the cast, who have been "parading" almost every town in the country. The "Ridgeway Parade" is now in its third year of tour, an achievement for an essentially radio production.

"Made in the North" Talks

CONTINUING the "Made in the North" talks about the Northern clothing industry, Mr. William Hilton will, on May 4th, broadcast a description of the making of an artificial silk dress—from the raw material to the finished product. Mr. Hilton is employed at the Lancashire branch factory of a big national firm, in the capacity of "tackler" or "overlooker"—that is to say, foreman-engineer.

INTERESTING and TOPICAL PARAGRAPHS

London Music Festival

PLANS for the London Music Festival, to be held by the B.B.C. in May, are now complete. Six concerts will be given in the Queen's Hall, those on May 4th, 7th, and 9th being conducted by Dr. Adrian Boult, those on May 11th and 14th by Bruno Walter, and the last of the series, on May 16th, by Felix Weingartner. On May 4th Carl Flesch will be the soloist in Beethoven's Concerto in D for violin and orchestra. The programme for May 7th will consist entirely of Hindemith's "Das Unaufhörliche," with Adelheid Armhold, Parry Jones, Arthur Cranmer, Harold Williams, and the B.B.C. Chorus. On May 9th, in addition to the winning Overture in a London newspaper competition, the first broadcast of Bax's new Fifth Symphony and Elgar's Variations, the programme will include the Tchaikovsky No. 1 Concerto in B Flat, with Vladimir Horowitz as pianist.

A NEW H.M.V. PORTABLE

His Master's Voice Superhet A.V.C. Portable Grand Receiver in an old-world setting. Note the pygmies playing cards.

Silver Band Concert

A BAND Concert by the Seven Sisters Silver Band, conducted by D. W. Morgan, will be broadcast in the West Region on May 10th. This band was formed in 1904 under the present conductor. Ceredig Jones (bass-baritone) will be the vocalist at this concert. He is a native of Cardiganshire and states that he is a good example of the saying, "From ploughboy to concert platform." He is a farmer's son and worked on his father's farm until he was twenty.

Marie Hall Recital

MARIE HALL, who broadcasts a recital on May 6th in the National programme, has toured fourteen countries since she made her début in 1902, and in several of them, America, Canada, and South Africa, for instance, has made three or four separate tours. Born in Newcastle-upon-Tyne, she was one of the most brilliant of Sir Edward Elgar's pupils. She completed her studies under the great Sevcik in Vienna. The Stradivarius violin which she plays came from a royal collection.

The Pierrot of the Minute

A NEW microphone arrangement of Ernest Dowson's, "The Pierrot of the Minute," will be broadcast from the Glasgow studio on May 8th. Douglas Moodie will be Pierrot and Enid Hewit will be the Moon Maiden. Douglas Moodie's voice must be extremely well known to Scottish listeners by this time. He is the Senior Announcer in the Scottish Region, and from time to time he has taken part in wireless plays and productions of various kinds. Before joining the B.B.C., Moodie was mainly concerned in theatrical work, and was at one time with the Masque Theatre.

"A Royal Night of Variety"

BY arrangement with the Organisers of the Variety Artists' Benevolent Fund, the B.B.C. will broadcast from the Royal Command Variety Performance, which is to be given at the London Palladium on Tuesday, May 8th. This year the relay from the stage will form the most important part of a two-hour programme devoted to the variety profession and entitled, "A Royal Night of Variety." In a programme arranged for the stage certain items must inevitably have a purely visual appeal which the microphone cannot transmit. This year as many items as possible will be relayed from the London Palladium, the rest of the broadcast programme consisting of studio and other interludes in which the Variety profession is to collaborate closely with the B.B.C.

SOLVE THIS!

PROBLEM No. 85

Smith had a very good two-valver employing a general purpose valve as detector and a small L.F. valve in the output stage. He used a 108-volt H.T. battery and employed a good balanced-armature loud-speaker. After reading several advertisements and becoming anxious to improve results, he decided that the fitting of a super-power valve, rated to give twice the output, would give much improved results. He therefore purchased such a valve, but was disappointed to find that results were not even so good as with the previous arrangement. Why? Three books will be awarded for the first three correct solutions opened. Address your attempts to The Editor, PRACTICAL WIRELESS, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. All envelopes must be marked Problem No. 85, and must be posted to reach here not later than the first post Monday, May 5th, 1934.

SOLUTION TO PROBLEM No. 84

Although the value of the resistance which Bradley chose was correct, he overlooked the wattage rating which was required. The one-watt resistance was overheated by the large current which was passed and its value altered immediately, and within two days it had burnt out. He required a resistance of the wire-wound type, especially designed for the purpose.

The following three readers successfully solved Problem No. 83 and books have accordingly been forwarded to them:—

C. R. Astin, 34, Essex Street, Rugby, Warwickshire.
J. Jardine, 59, Loreburn Street, Dumfries.
A. Fisher, 166, Tamworth Lane, Mitcham, Surrey.

SUPER-REGENERATIVE

AND OTHER SUPER ONE-VALVE RECEIVERS

Including Details of an All-mains One-valve Loud-speaker Receiver

WITH the comparatively low cost of modern valves there is little incentive nowadays to try to make one valve do the work of two. For this reason one-valve sets of the super type are very rarely seen. However, it is interesting to examine some of the circuits of a few years ago, more especially those which work on the super-regenerative principle, and which aimed at obtaining the utmost amplification from one valve.

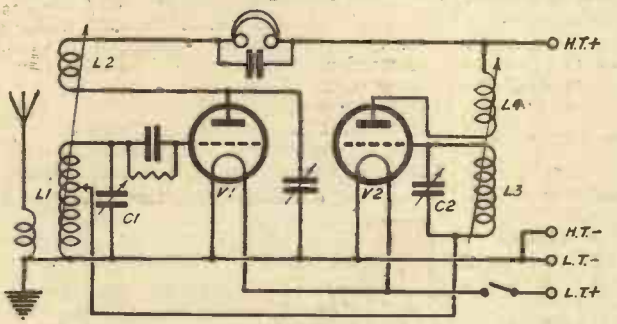


Fig. 1.—Armstrong type super-regenerative circuit employing separate oscillator valve.

The Limitations of Reaction

With the ordinary type of set employing reaction, the signals can gradually be built up by advancing the reaction control until a point is reached when the set breaks into oscillation, and howls and whistles result. During the last slight movement of the control, the increase in signal strength for the moment before the set actually oscillates is very considerable, but as soon as self-oscillation sets in the signals become distorted and disappear. With a super-regenerative circuit it is possible to increase the action beyond the oscillation point and still receive comparatively clear signals, but greatly magnified.

To understand the principle of the super-circuit it is necessary to consider a few fundamental facts. An oscillatory circuit has normally a positive resistance. This means that when a signal is induced into the circuit, oscillations will build up to a certain value dependent upon the resistance, and will remain at this value as long as the signal continues. When the signal ceases the oscillations die out.

The introduction of reaction *reduces* the resistance of the circuit, thus enabling the signal oscillations to build up to a high value. This reduction of effective resistance may be looked upon as the equivalent of introducing a *negative* resistance into the circuit.

Positive and Negative Resistance

It will be appreciated that there are three sets of conditions possible in the circuit. Firstly, the positive resistance can be greater than the negative resistance; secondly, the positive and negative resistances can be equal; and lastly, the positive resistance can be less than the negative resistance. The first condition is that which ordinarily exists, as just explained. In the second condition, when the negative resistance equals the positive resistance, the effective resistance is obviously zero.

The effect of introducing a signal under these circumstances is to start oscillations which will reach a definite value and will continue at this amplitude after the signal has ceased. This is the condition of self-oscillation with which we are all familiar.

An oscillating valve just building up the current provides an example of the third condition—namely, when the negative resistance predominates. However, this is not a state which can be permanently maintained. The object of the super-regenerative circuit is to obtain the condition of great magnification of the applied signal which is associated with zero effective resistance, but without the accompanying self-oscillation.

In the Armstrong circuit the relation between the positive and negative resistance is varied periodically, so that at one instant the positive resistance is greater than the negative, while at the next moment the negative resistance is greater than the positive. The *average* resistance, however, is arranged to be positive so that it is impossible for self-oscillation to take place. Nevertheless, during the periods when the negative resistance predominates any applied E.M.F. will be greatly amplified.

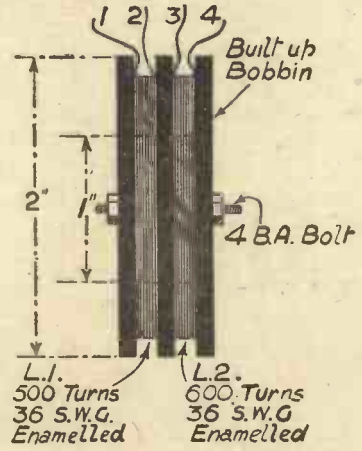


Fig. 3.—Details of the oscillator coils used in Fig. 2.

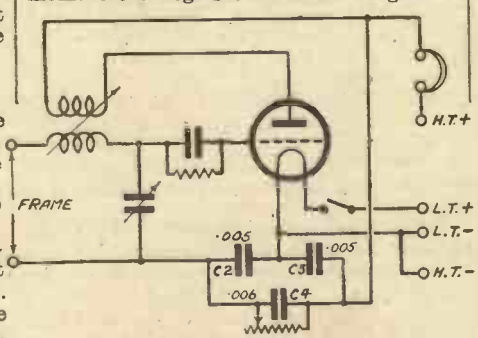


Fig. 4.—The popular Flewelling circuit.

The Armstrong Circuits

There are several ways of obtaining the periodic variations of the relationship between the positive and the negative resistance. For instance, the positive resistance or the negative resistance may be varied, or both may be made to fluctuate.

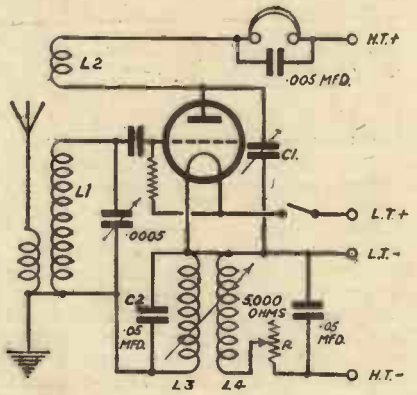


Fig. 2.—One-valve super-regenerative circuit.

One of the Armstrong type circuits in which the positive resistance is made to vary is shown in Fig. 1. The first valve V1 acts as a detector, while the second one V2 is an oscillator which produces low-frequency oscillations of about 10,000 cycles in the circuit L3, C2. A connection is taken from the lower end of L3, C2 to a tapping point on L1. Thus, when the potential of the oscillator valve grid is positive over one half-cycle, current flows from the tuned circuit L1, C1 to the grid of the oscillator valve, which results in an increase in the effective resistance of the circuit. During the second half-cycle, while the oscillator grid is negative, no grid current flows, so that the normal resistance of L1, C1 is unaltered. It is during this period that the resistance of the circuit is negative, due to the tight coupling of the reaction coil L2, and during which the applied signal currents are built up to an enormous extent. Self-oscillation will not take place, however, because the next instant the effective resistance is again positive and the signals are damped out. Owing to the accommodation of the human ear, this stopping and starting of the signals cannot be detected by the listener, and therefore reception appears to be continuous.

This two-valve circuit is used to explain the regenerative action since its working is comparatively easy to understand. However, a similar circuit using only one valve is shown in Fig. 2. In this case the valve acts both as detector and quenching oscillator. L1 is an ordinary tuning coil with a reaction winding L2, the degree of reaction coupling being controlled by the variable condenser C1. The coils L3 and

L4 for producing the quenching oscillations are included in series with the aerial coil and reaction coil respectively. The strength of the quenching oscillations is controlled by moving these coils in relation to one another, final adjustment being carried out by the variable resistance R.

For those who would like to experiment with this circuit details of the oscillator coils are given in Fig. 3. C1 can with advantage be of slightly larger capacity than normal, say .0003 mfd., where a .00015 mfd. instrument would ordinarily be used, or .0005 mfd. if a .0003 mfd. condenser is specified with the particular coils chosen, since a greater reaction effect can be used, and is indeed required, than with the ordinary regenerative receiver. The frequency of the quenching oscillations can be adjusted by trying various values for the condenser C2.

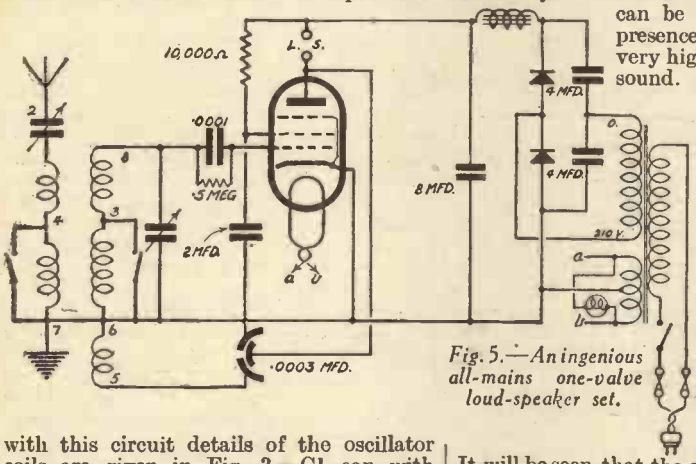


Fig. 5.—An ingenious all-mains one-valve loud-speaker set.

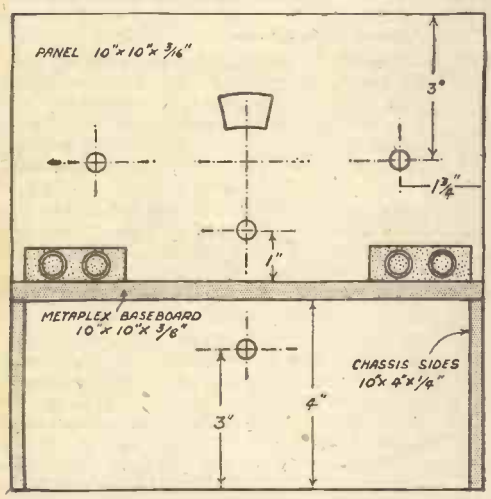


Fig. 6.—Rear view showing chassis construction and disposition of controls of the one-valve loud-speaker set.

Tricky Adjustment

The operation of a single-valve super-regenerative receiver calls for some care, as, by the very nature of the circuit, the correct adjustment is bound to be rather critical. Also, whereas with the two-valve circuit the detector and oscillator can each be adjusted independently, with the one-valver, where the valve is performing two distinct functions at the same time, any alteration of the constants of the oscillator circuit is almost certain to affect the detector circuit and *vice versa*.

The characteristic super-regenerative action takes place when the circuit L3, C2 is just oscillating and when the coupling between L1 and L2 is close enough to produce violent self-oscillation under normal conditions. If the quenching oscillations are too weak, the set will break into oscillation periodically. However, a slight adjustment of R will correct this and give the proper working conditions. The most suitable frequency for the quenching oscillations is just within the audible range, and can be determined by the presence of a continuous, very high-pitched whistling sound.

Flewelling Circuit

A circuit which has much in common with the Armstrong circuit is the Flewelling circuit. It is a super-regenerative circuit in which self-oscillation is checked by periodic condenser discharges which act on the grid of the valve. The original Flewelling circuit is shown in Fig. 4. It will be seen that the oscillator coils of the Armstrong circuit are replaced by a bank of condensers, C2, C3 and C4. These condensers have definite values, and when these are correctly chosen it is possible to get the periodic negative charge on the grid of the valve. This is due to a part of the H.F. component of the anode current being passed to the grid. The negative charge checks the action of the valve and then dissipates itself through the grid leak, when the valve immediately builds up oscillations, only to be checked once more by a repetition of the negative charge, and so the cycle goes on.

The Flewelling circuit is cheap to build up and very readily converted into the ordinary reaction circuit, but otherwise it is tricky to operate. It will be noticed that in the original circuit a frame aerial is used. The chief reason for this is because of the interference which can easily be caused if it is coupled to an outdoor aerial.

A Pentode One-valver

An entirely different one-valver from these super-regenerative sets is shown in Figs. 5-8. It employs a pentode output valve acting as a power-grid detector, and is particularly suitable for local-station reception on the loud-speaker. Owing to the absence of intervalve couplings, low-frequency oscillation, motor-boating, etc., are ruled out, and particularly distortionless reproduction is possible. The set shown here is a mains-operated receiver employing a valve of the MP/PEN type which, working as a detector-amplifier, gives something like 300 to 400 milliwatts undistorted output. The practical details and layout of this circuit are given in Figs. 6-8, while the list of parts required will be found at the end of this article.

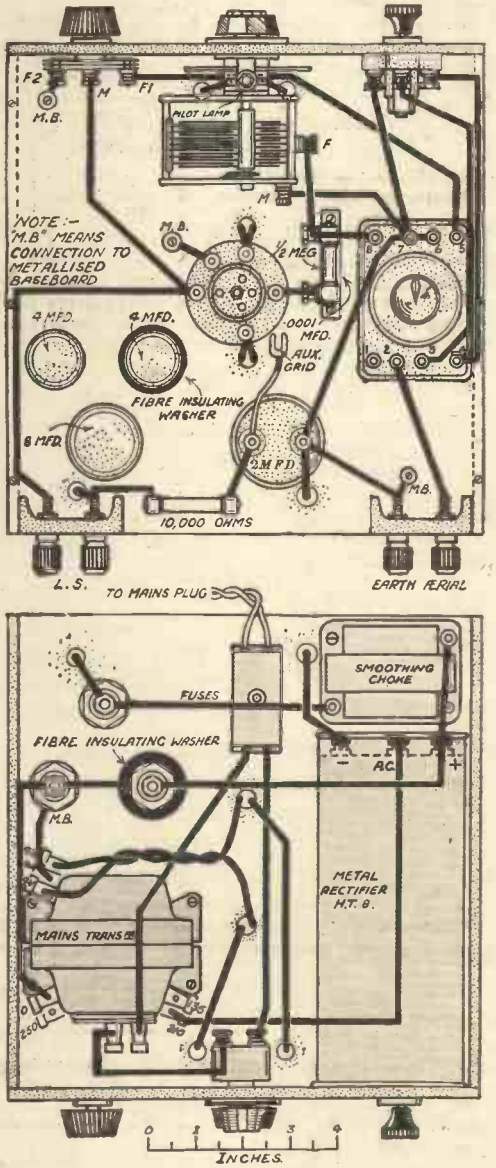
Unlike the super-regenerative type of one-valver this set is particularly easy to operate. The only controls are the tuning and reaction condensers, and the on-off and wavechange switches, although there is also a variable selectivity device incorporated in the tuning coil. However, once this is adjusted to suit local conditions it need not be touched again. Low cost (it can be built for a matter of £4 18s., excluding speaker and valve) and the high quality of reproduction are other commendable features of the receiver.

Naturally the circuit has its limitations, and although it is ideal for local reception up to a distance of twenty or thirty miles from a broadcasting station, it is not suitable for more distant reception. To obtain the full volume it is necessary to supply the valve with a generous signal input, and this usually means the use of a good outside aerial.

The construction of the receiver is perfectly straightforward, and the accompanying illustrations clearly show the lay-out.

A wooden chassis is used, with the receiver proper mounted above the baseboard, and the mains unit assembled below it. The baseboard is made of Metaplex and several "earth" connections are made to this in the same way as with a metal baseboard.

(*Continued on page 224*)



Figs. 7 and 8.—Above and below chassis views of the receiver showing all wiring details.

SUMMER-TIME RADIO

Some Points of Interest Regarding Improved Reception During the Warmer Days.

By W. J. DELANEY.

WITH the arrival of the summer it will undoubtedly be found that radio reception is not quite so regular and trouble-free as it has been during the winter months. Firstly, the arrival of the warm days, when the sun is closer to the earth, brings to this country a trouble which fortunately is not nearly so prevalent as it is in America and other warm countries. I refer, of course, to atmospherics or statics. It will be found that cracklings hitherto unheard on the receiver will become evident and mar the reception of the broadcast programmes. At the approach of a thunderstorm these disturbances may even be sufficiently noisy to warrant the switching off of the receiver until the storm has passed. If, therefore, during the next few weeks you are troubled with crackling noises, of either continuous or intermittent occurrence, the first thing to do is to remove the lead-in wire from the aerial terminal. If the noise continues unabated, you will have to look for the trouble somewhere in the receiver or its associated equipment—for instance, in the high-tension or grid-bias batteries. If, on the other hand, the noises cease immediately the lead is removed, you can blame the weather, and although the actual danger from lightning is remote, it is certainly worth while to fit some form of discharge device to the lead-in in order to prevent the accumulation of statics. The theory of these discharge devices, or lightning arresters, as they are sometimes called, is very simple, and Fig. 1 illustrates the broad principle. It will be seen that the aerial is attached to one side of a small gap as well as to the aerial terminal on the wireless receiver. The other side of the gap is joined to earth, and, to afford complete protection to a receiver, this should be a separate earth lead from that which is fitted to the receiver. When a charge accumulates on the aerial it grows until it becomes sufficiently powerful to jump across the gap and so to earth, and it is easy to see that if such a device is not fitted, there is a possibility of this discharge or jumping-across taking place between the vanes of the aerial tuning or aerial series condenser, where the latter is of the air-spaced type.

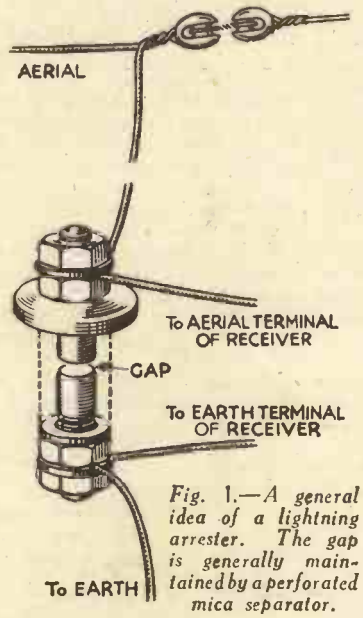


Fig. 1.—A general idea of a lightning arrester. The gap is generally maintained by a perforated mica separator.

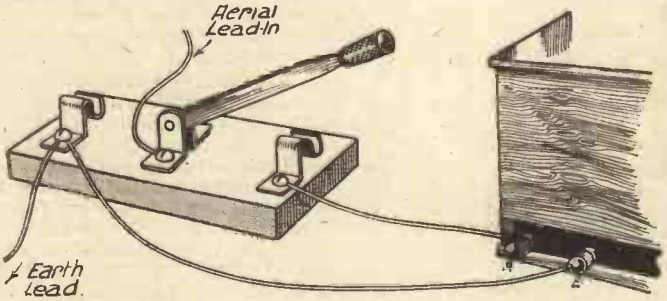


Fig. 2.—The connections to a single-pole aerial-earth switch.

Protective Switches

Devices of the above type are quite cheap and simple to fit, but many listeners prefer to fit a switch so that the aerial may be completely isolated from the receiver during the passage of a storm. A single pole change-over switch will serve for this purpose, although a more complete isolation is afforded by a double-pole switch, and the methods of connection are shown in Figs. 2 and 3. During the hot nights, the switch should, of course, be put into the safe position immediately after you have finished listening for the day. Commercial devices incorporating both the spark-gap and the switch are available from advertisers in this paper at quite modest prices.

Reduced Signal Strength

It will also be found that the arrival of the long hours of sunlight will result in decreased signal strength from many stations which can be heard at good strength during the winter months, and it is not proposed to go into the reason for this at the present juncture. Where a receiver is in use in which no H.F. amplification is afforded, this reduction in strength will be most marked on distant or weak stations, and the remedy is obviously to fit some sort of H.F. amplifier. We have given several types of amplifier in these pages, and probably the most useful one for modern requirements is that which employs a high-frequency valve of the variable-mu type. An amplifier of this type was described in PRACTICAL WIRELESS No. 20. It is a very simple matter to couple this to an existing receiver, and it will restore signals to their original power, and in many cases may even give improved results over those which formerly obtained.

The dryness of the weather during this time of the year may also yield reduced signals, due to the fact that the earth connection becomes dry and thereby proves valueless. Apart from continued watering, the earth rod or plate may be surrounded by some moisture-absorbing material, or one of the commercial forms of ever-damp earths may be fitted in place of the present connection. As has been explained before, these employ a chemical which absorbs moisture from the soil and retains it. In some cases a quantity of metallic powder is also included to increase the conductivity of the earth connection.

Battery Condition

The H.T. and grid-bias batteries rely for the function upon the moisture which exists in the depolarising chemical, and if these batteries are placed in such a position that they are unduly warmed by the sun, their life will be considerably shortened. If, therefore, your receiver is placed near a window or wall where the sun strikes for long periods, the batteries should be carefully shielded—if possible with some heat-resisting material surrounding them. If you read the makers' instructions regarding these batteries you will generally find that they request you to keep the battery in a cool, dry spot, and this injunction should be carefully carried out if you want to get the longest service from them. The acid from the accumulator will also be found to evaporate quicker in the warm weather, or at least the water from the cell will do so, and the accumulator will therefore require topping-up more frequently. Do not forget to use distilled water, and keep this in a cellar or other cool place so that you do not add warm water to the cell when carrying out this replenishment.

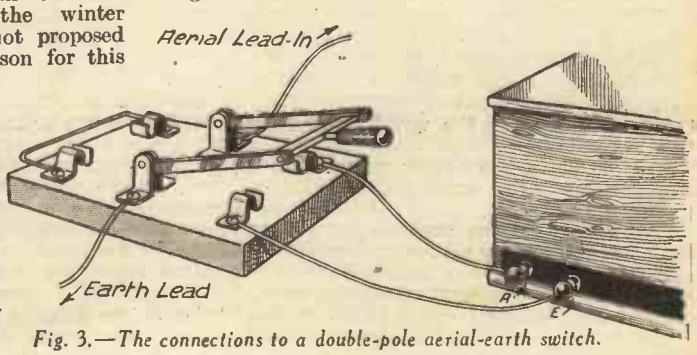


Fig. 3.—The connections to a double-pole aerial-earth switch.

WIRELESS INVENTIONS THAT ARE WANTED

There Are Still Many Discoveries to be Made in Radio, and This Article Tells You of a Few of Them.

By FRANK PRESTON

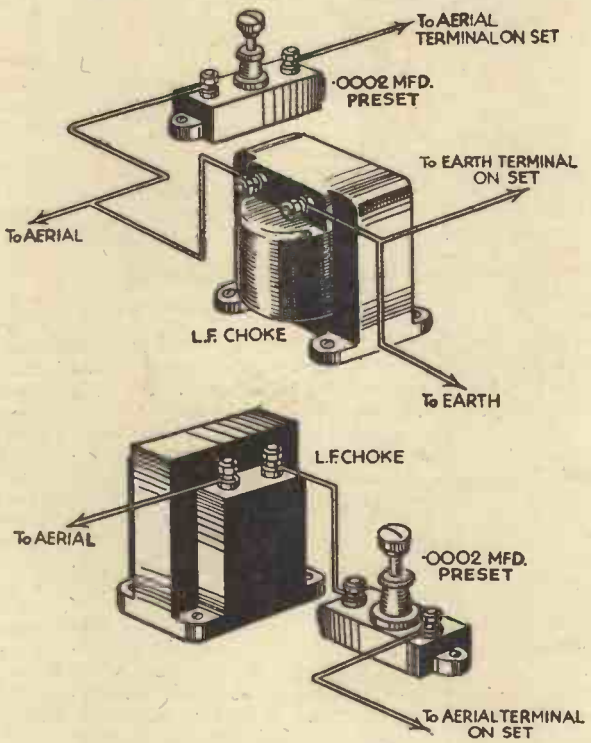
ALTHOUGH wireless, or radio, has made such rapid and vast strides during the past few years it has by no means reached finality, and there are doubtless many new developments yet to come. It might be argued by some that wireless at the present time has well-nigh reached perfection, but is that really the case? I do not think so! Reproduction by a good speaker used in conjunction with a well-designed set is very similar to the original, but it is *not quite* the same. On first thoughts it might be considered that it will eventually become *identical* to the original due to gradual improvements which are sure to be made in regard to valves, transformers, speakers, and the like. Upon reflection, however, it becomes apparent that, with the present methods of transmission and reception, this can never be the case. Why? Principally because we do not make use of what might be called stereophonic systems of broadcasting. Just as perspective and optical distance cannot be appreciated with one eye, so aural distance cannot be appreciated with one ear. Consequently, no matter how good the receiver may be and how perfect the microphone is made, it is utterly impossible to get the true effect of, say, a brass band or orchestra by means of any system of microphones connected to one transmitter working in conjunction with one receiver feeding into a single loud-speaker.

Stereophonic Reproduction

Various methods of obtaining stereophonic reproduction have been tried, but none, as yet, has proved to be practically possible. At the present stage of developments it would appear necessary to make use of two sensitive microphones at the transmitting end, these being so situated that they correspond with the two ears of a human being. The microphones would require to have characteristics similar to those of the human ears, and they would have to be connected to two different transmitters working on different wavelengths. At the receiving end two separate sets would be necessary, and each of these would have to feed separate ear-pieces of a pair of 'phones. Such a system is obviously impracticable, and the world is awaiting some clever inventor who will obtain the same effects by less clumsy means. When will that inventor come along and earn his just reward?

Of course various methods have been tried with a view to obtaining stereophonic reproduction, but none has yet been truly successful. One method which was toyed with several years ago made use of a special receiver having two detectors which were slightly out of phase, and the writer remembers witnessing a demonstration of such a set. Although excellent results were obtained they could not be compared with the original.

More recently, American investigators have attained a certain measure of success by using a multiple loud-speaker having some fifteen sections in the logarithmic horn. Each section corresponded with one microphone carefully placed at a predetermined position in the studio. But despite the elaborate schemes which were tried there was still "something" missing. Perhaps a reader of PRACTICAL WIRELESS will eventually solve the riddle of stereophony, or perhaps the riddle will never be solved, at least in our generation.



Two methods of minimizing the effects of atmospheric discharges. These are referred to in the text.

Preventing Atmospheric Interference

Another invention which is urgently called for is one by means of which atmospherics can be prevented from causing serious interference with broadcast reception. Here again we are up against a most difficult problem, and the man who finds an answer to it should have a fortune awaiting him. Atmospherics are, so far as we know, static electrical discharges in the atmosphere and, therefore, similar to ordinary electric discharges such as those produced by electrical machinery and which have received such a great amount of attention during the past year or so. But whereas it is possible to cut out the interference by electrical apparatus by removing the aerial to a point outside the field of the offending machine, and to use a long, screened lead-in to the set suitably coupled by means of impedance-matching transformers, such methods are not applicable to atmospheric discharges. The reason is, of course, that atmospherics have a comparatively unlimited field outside which the aerial could not be placed. Some aerial systems, consisting of buried wires, have reduced the effect of static interference, but by so doing they have introduced other disadvantages, such as almost uni-directional aerial pick-up effect and such like.

Methods That Have Been Tried

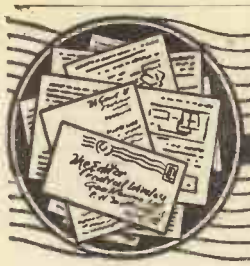
It was at one time thought that atmospherics, statics, or X's (all these names are used to denote the same thing) consisted of discharges on a very long wave-length. If this were the case it should be possible to eliminate them by means of a suitable form of wave-trap. The idea was tried of inserting an iron-core choke in series with the aerial lead-in, and also of connecting the choke in parallel with the aerial-earth circuit, but results were by no means satisfactory (see illustration). In all fairness it should be stated that in some instances the strength of the atmospherics was somewhat reduced, and the idea is worth a trial when interference is particularly severe. An ordinary L.F. choke, or even the winding of an L.F. transformer, can be used in series with the aerial, but a specially-wound low-capacity choke is to be preferred when the parallel arrangement is used.

Efficient Valves Wanted

Valves are to-day considered to be remarkably efficient components, and by comparison with their earlier counterparts they are undoubtedly extremely good. But if the usual mechanical formula for percentage efficiency (percentage efficiency of a machine is equal to the power got out divided by the power put in, multiplied by 100) they show up rather badly. For example, a so-called highly-efficient A.C. pentode requires an input of more than 13 watts to enable it to provide a (signal) output of about 2½ watts. At these figures the percentage efficiency is less than twenty per cent.—an obviously low figure.

The input consists almost entirely of the H.T. and L.T. supplies, the actual signal input forming a very small proportion of the total. What is required, then, is a valve which is more economical

(Continued on page 221)

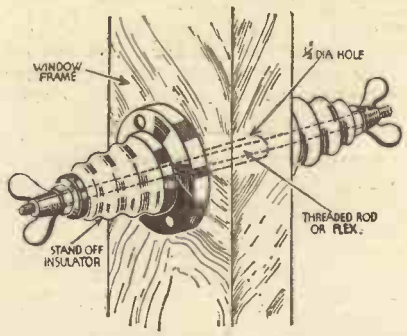


READERS' WRINKLES

THE HALF-GUINEA PAGE

An Efficient Lead-in Device

AN efficient lead-in, made from two small stand-off insulators, is shown in the sketch. I first drilled a ½in.-diameter



A lead-in made from two stand-off insulators.

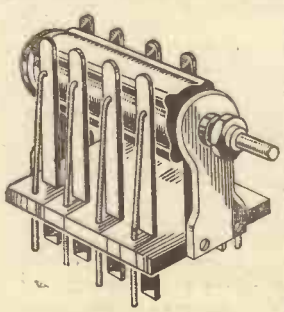
hole through the window frame. After removing the screws from the tops of the insulators a length of screwed brass rod (2B.A.) was passed through the hole in the window, and an insulator pushed over each end. A wing-nut on each end clamps the insulators tight to each side of the window. All that remains to be done is to connect the lead-in to the outside terminal and a length of flex from the inside terminal to the set.—D. W. STONE (Exmouth).

Combination Switch for the "Leader"

THE accompanying sketches show the method of switching I adopted when building up the Leader Three Battery set. Having on hand a "Wearite" multi-pole rotary switch, I used it for switching as follows, dispensing with the on-off switch and three-point wave-change switch specified :—

Blades A—A short-circuit long-wave winding on grid coil. Blades D—D short-circuit long-wave winding on aerial coil. Blades B—B work on-off filament switch. Blades C—C work pilot lights, blue, medium waves, red, long waves.

Two pilot lights were mounted side by side behind the condenser dial, and the switch was mounted upside down in a component-mounting bracket, and works as follows : Switch knob turned to left, set switched on (medium waves) and pilot light blue. Turned to right, set switched on (long waves) and pilot light red. Switch turned upright, set switched off. The two dial lights were two-volt low-consumption



A multi-pole rotary switch used for wave change and on-off switch.

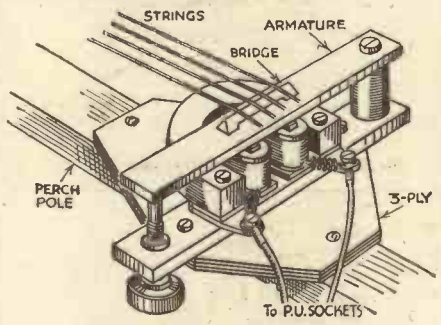
THAT DODGE OF YOURS!

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

bulbs, and covers for same were made with coloured cellophane paper. The idea can be used for any other battery set where the long-wave winding is short-circuited for medium waves.—A. L. HERDMAN (Annfield Plain, Co. Durham).

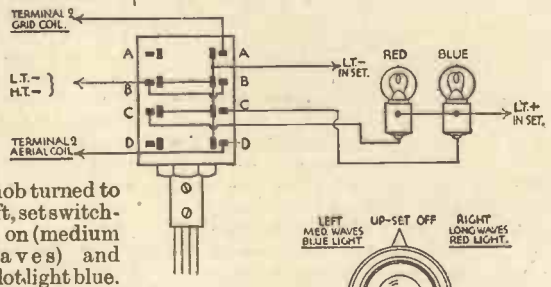
An Electric Banjo

HERE is a device which may probably interest those readers who, like myself, play a banjo or similar instrument.



An electric banjo arrangement.

Being without a vellum for my banjo, I hit upon the idea of using an old speaker unit to pick up the vibrations of the strings.

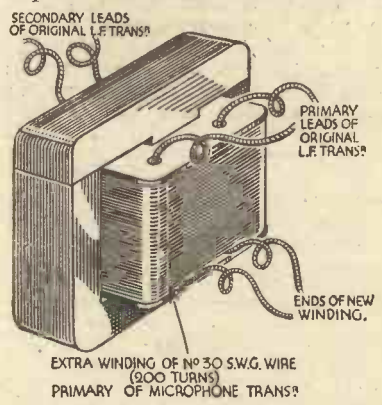


Circuit diagram of combination switch for the "Leader."

The accompanying sketch shows the idea. I fixed the unit in such a manner as to have the bridge resting on the armature, and when I connected the leads to the P.U. sockets of my set (on the "gram," of course) I was able to get enormous volume, with the lightest touch of the strings. This unique instrument has a guitar-like tone, and is particularly pleasing if played with a "steel" in the Hawaiian manner.—W. MORRISON (Stockport).

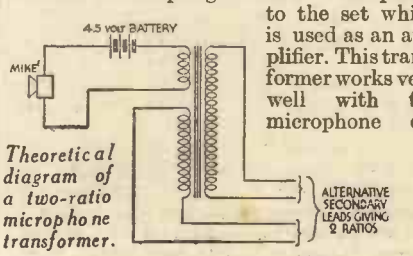
Two-Ratio Microphone Transformer

THE accompanying sketch shows a method of making a two-ratio microphone transformer from an ordinary



A two-ratio microphone transformer.

3 : 1 L.F. transformer. The case of the L.F. transformer is removed, leaving the bobbin with the windings and the stalloy laminated core. The four leads from the bobbin to the terminals on the case were removed from the terminals, and labelled, to prevent confusion between the primary and secondary leads. The laminations of the core were then taken out, and the bobbin removed alone. Over the windings on the bobbin, about 200 turns of No. 30 s.w.g. d.s.c. wire were wound, and the ends of the winding formed into loops, and a layer of insulation tape was wound on top of the new layer of wire. The laminations were replaced, and the transformer then appeared as shown above. The case of the transformer was replaced, and the original leads taken to the terminals. The new leads were brought out through two holes in the case. The transformer was then screwed down to a baseboard, and a terminal block with two terminals screwed to the board; the leads from the additional winding were attached to these terminals. The new winding is the primary of the microphone transformer, and either the original primary or secondary can be used as the secondary of the microphone transformer, giving respective ratios of approximately 50 : 1 and 150 : 1. The primary of the microphone transformer has a fairly low resistance (a few ohms) and with a 4.5-volt flashlamp battery it is suitable for coupling a carbon microphone to the set which is used as an amplifier. This transformer works very well with the microphone de-

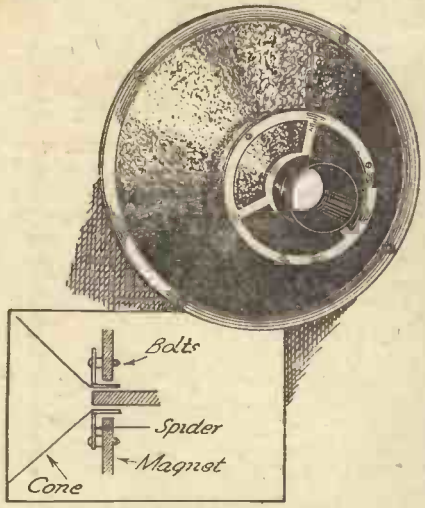


Theoretical diagram of a two-ratio microphone transformer.

READERS' WRINKLES

(Continued from previous page)

scribed in the Christmas Number of *Practical Mechanics*, which I have constructed.—J. MILSTED (Knowle, Bristol).



Improving a moving-coil speaker.

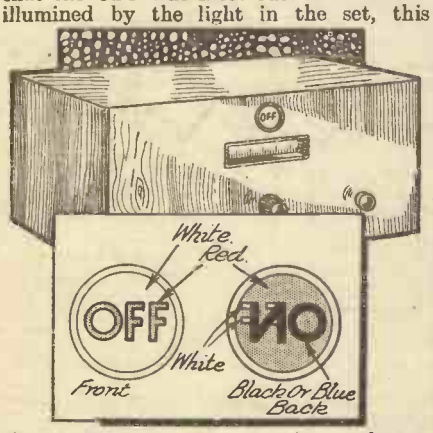
Improving a Moving-Coil Speaker

HAVING a cheap moving-coil speaker which had but little bass response, I improved it 100 per cent. by removing the centring screw, and making a large spider of stiff paper. This was fixed as shown in the diagram, care being taken to see that the speech coil was absolutely free in the magnet gap. The spider is glued on to the back of the cone and suspended by three bolts in the outer rim, spacing washers being used to hold the spider off the chassis back plate.

It will be seen that this arrangement eliminates any braking effect of a small spider.—G. E. DOUCH (Gravesend).

An Illumined "On-Off" Indicator

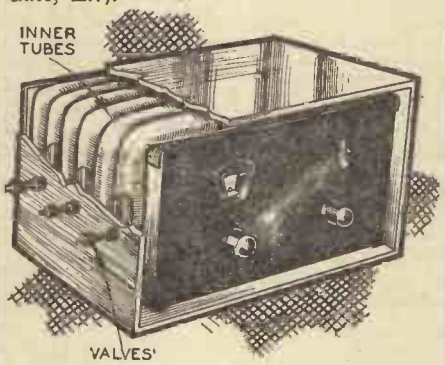
A NOVEL "on-off" indicator can be made as follows: A small glass "window" is let into the panel of a set and illumined with a 2-volt lamp wired in parallel with the valve filaments. A piece of white paper is cut to the size of the window and the word OFF inked in on one side in thick type with red ink. Hold up to the light, and on the reverse side ink in the background with red ink, taking care that you do not ink any part of the word OFF. Then, still on the reverse side, ink in the word ON reversed, in blue or black ink as shown. Fix the paper to the window so that the OFF side faces outwards. When illumined by the light in the set, this window will read ON. When the light is switched off, the window reads OFF. The light is, of course, controlled by the filament switch.—L. J. STEVENS (Bedminster).



An ingenious automatic switching indicator device.

Preventing Vibration In a Car Radio

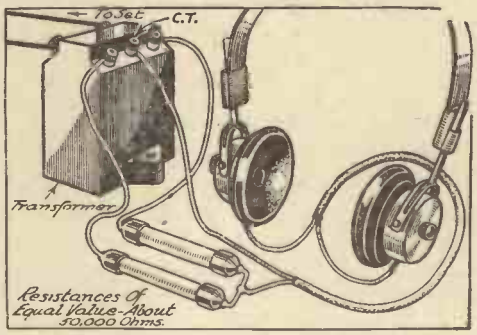
TWO or three old cycle inner tubes will do excellent service, acting as shock absorbers to a car radio set. The actual cabinet or case of the set should be first covered with felt at least around the edges, so as to eliminate heavy wear upon the tubes. The valves should project through the outer casing for easy accessibility. The air pressure in the tubes will, of course, vary with the weight of the set, and should be checked for loss now and again.—A. G. ACKROYD (Forest Gate, E.7).



Using cycle inner tubes for preventing vibration in a car radio set.

Centre-tapping Transformers

IT is often required to find the exact electrical centre of the secondary winding of an output transformer, and a simple method of doing this is illustrated herewith. The idea is that two fixed resistances of equal value are connected between the ends of the secondary, whilst a pair of 'phones is joined between the junction of the resistances and the transformer winding. When the exact centre has been found no signals will be heard in the 'phones. Signals will, of course, become weaker and weaker as the centre is approached.



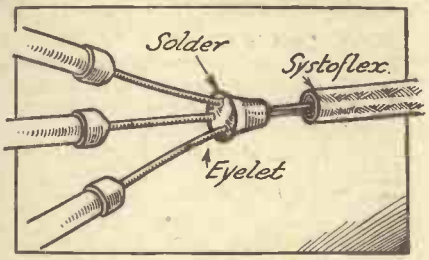
A method of centre-tapping transformers.

In making the transformer it is most convenient to make a few tappings near the "mechanical" centre of the secondary, and then to find the best of these by the method described.

A similar idea can be applied to the primary of a transformer by reversing the connections to the primary and secondary. It will be obvious that the transformer windings must be capable of carrying the necessary anode current of the output valve, but if they are not the transformer may be choke-capacity fed in the usual manner.—M. HUMBER (Harrow).

Making Multiple Connections

WHEN a number of connections have to be taken to the same point, as, for example, when wiring up several fixed condensers or resistances of the wire end type, an excellent method is that illustrated in the accompanying drawing. It will be seen that the various wire ends are pushed into one end of a small metal eyelet, a single connecting wire being slipped into the other end.

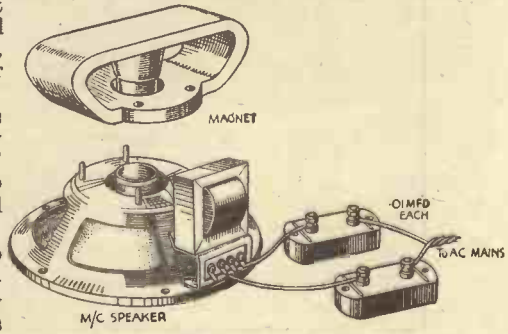


Making multiple connections.

It is then only necessary to apply a spot of solder to the eyelet to make a perfect and neat connection between all the various leads. Suitable eyelets can be obtained from any boot repairer, or from sixpenny stores for about twopence a dozen; they should, of course, be of the non-enamelled type to ensure ease of soldering.—P. FRANK (Pinner).

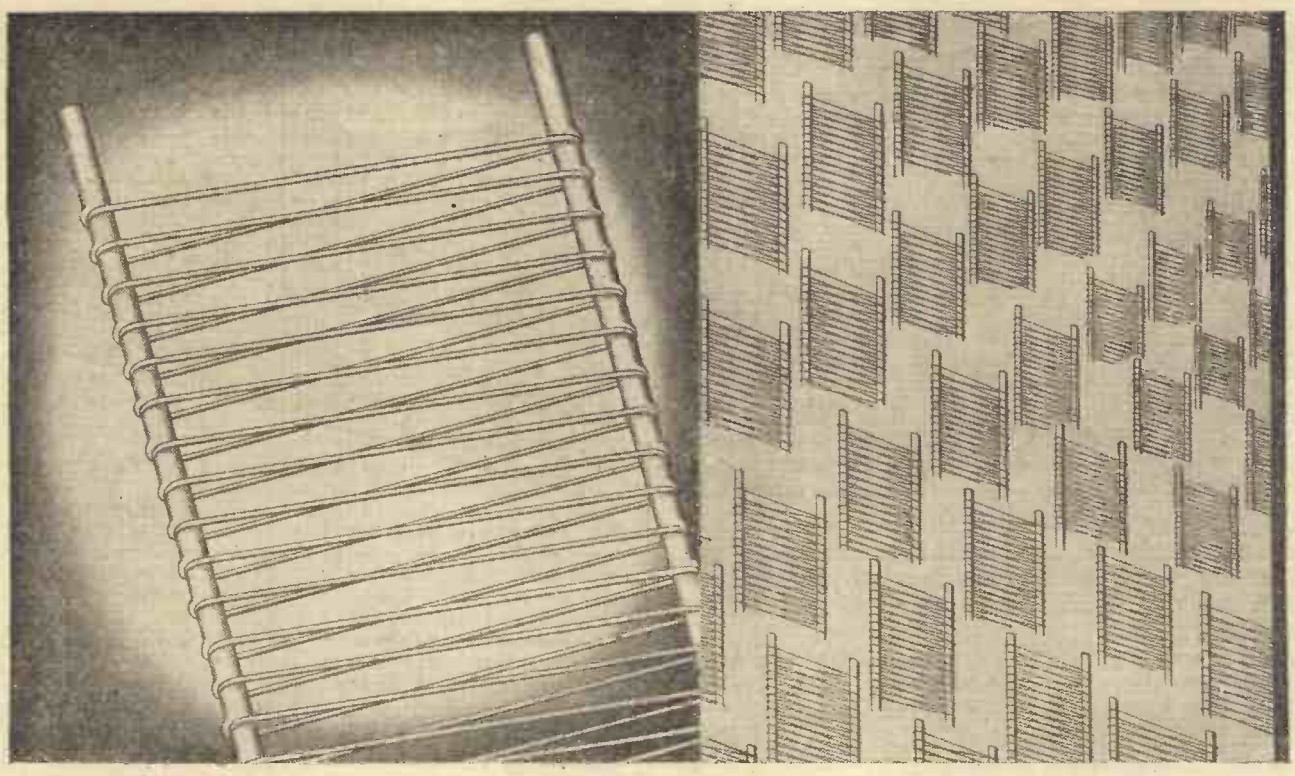
Reassembling a Moving-Coil Speaker

HERE is a wrinkle which I have found useful in reassembling my moving-coil speaker. It is particularly applicable to speakers which possess inaccessible centralizing devices. For the enthusiast with A.C. mains this is the best method. Lay the speaker face downwards, with the magnet removed, and adjust the cone until it is in its free position. Now connect two condensers in series with each (A.C.) mains lead and the transformer on the speaker. Any good mica condensers can be used, and the capacity is not critical. About .01 mfd. is suitable. Now switch on the current and place the magnet carefully in position over the coil. The speaker will hum, and the magnet can be adjusted until the hum is at its loudest, indicating that the coil is accurately centred. Incidentally it may here be pointed out that the method of vibrating the speaker at the low-frequency of 50 c.p.s. will also enable the response of the speaker to be checked. Examine the surround whilst it is vibrating at this frequency, and make certain there is no restriction.—K. UMPLEBY (Normanton).



Re-assembling a moving-coil speaker.

ACCURACY



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WIRELESS DEVELOPMENTS IN THE LAST DECADE

An Article Which Will Be of Interest Both to Those Whose Wireless Experience Goes Back to the Early Days of Broadcasting, As Well As to Newcomers to the Hobby.

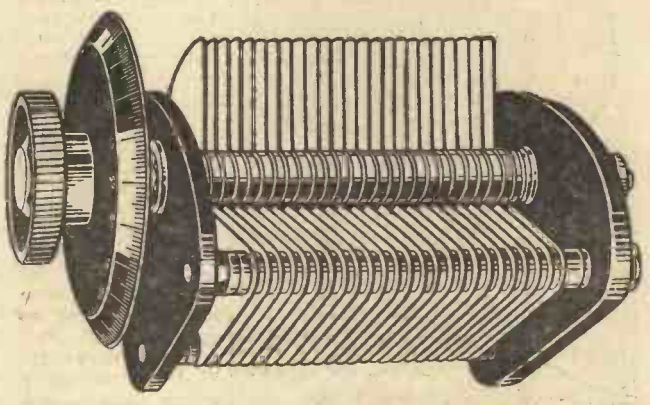
By "OLD HAND"

ONE of the most important developments which ever took place in respect of wireless set design was in connection with the improvement of reaction control, for even the earlier Det.-L.F. receivers fitted with effective reaction were far better than sets having multiple H.F. stages and not provided with reaction. The introduction of capacity, or Reinartz, reaction about 1923 did much to stimulate interest in simple non-H.F. receivers, and improvements in reception obtained thereby were so great that it was often possible to obtain even long-distance reception without the use of high-frequency amplifying valves, and for this reason the Det.-L.F. type of receiver was developed to a great extent. From this time onwards the latter type of set gained numerous adherents, and even to-day it is popular with a large section of the amateur fraternity, despite its slight disadvantages from the selectivity point of view. The "Selectone," described in these pages some time ago, is a typical example of a distinctly modern Det.-L.F. set and it undoubtedly possesses numerous advantages over those of other types.

Larger Tuning Coils

About the time of which we are speaking it began to be realized that, despite all their advantages, plug-in coils were by no means so efficient as might be desired. Experiments had already proved that the most satisfactory type was that known as the solenoid, consisting of a number of turns of wire placed on a cylindrical former. And since the greater part of our reception was carried out on wavelengths between 300 and 500 metres, a suitable coil could be made which would have no dead-end effects and which would be more efficient than any hitherto produced. Calculations were made to determine the optimum ratio between the length and diameter of the winding, and coils made according to the results obtained were found to be eminently satisfactory.

The improved results obtained with the latest coils were so good that in many cases long-wave reception was forgone in order that maximum efficiency might be obtained on the lower waveband. In other instances long-wave tuning was obtained by the insertion of loading coils in series with the solenoids. Again, in other cases both long and short-wave windings were put on the same former and short-wave reception obtained by short-circuiting the long-wave winding by means of a switch. This was, of course, the method which eventually came into universal use and which is employed to-day. At first sight, the change-over would appear to be a retrograde step in that it introduced the old dead-end "bogey." In practice, however, it was found that the effect of the dead-end was almost insignificant at the wavelengths to which the coil tuned, and that it could therefore be disregarded. Where extreme efficiency was required the new coils were wound with stranded wire which had a much lower resistance to high-frequency current. The lower resistance, besides improving the sensitivity of the set, also resulted in a decided gain in selectivity and was therefore doubly useful, especially since the increase in numbers of broadcasting stations had by this time made the question of selectivity a very important one.



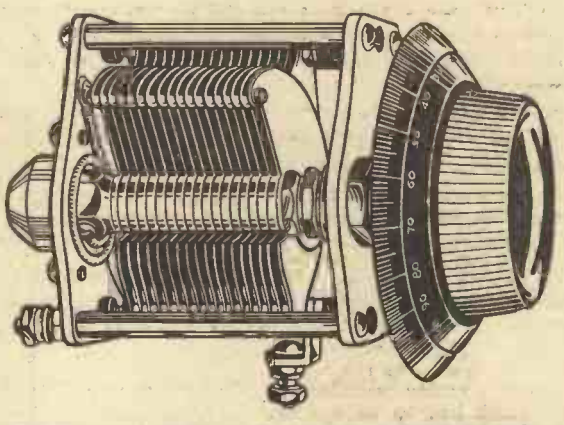


Fig. 2.—(Above) An early type of tuning condenser; note the ebonite end plates; (below) an early condenser with slow-motion drive.

Soon afterwards, still further improvements in selectivity were necessary and these were obtained by tapping the aerial coil and connecting the aerial to the tapping point instead of to one end. This had the effect of reducing the aerial load on the tuned circuit and, in many cases, if the tapping point was chosen with care, of actually making the set more sensitive.

The First Use of Screening

Soon after the larger coils became popular it was realized that when they were mounted fairly near to each other in the set (as they must be if the overall size was to be kept down to reasonable limits) feed-back occurred between them which could nullify the advantages of the neutralized H.F. valve. This latter diffi-

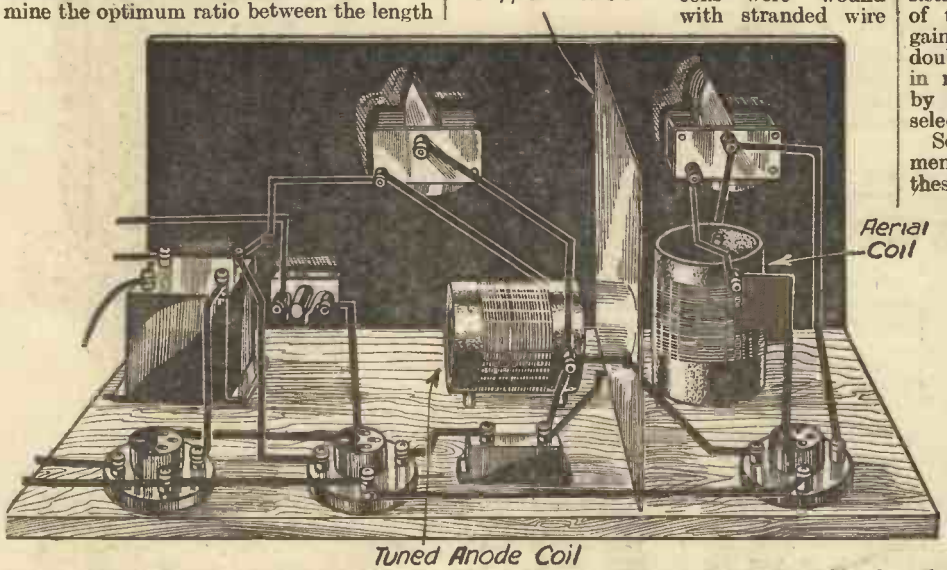


Fig. 1.—This illustration gives an impression of an early receiver using large solenoid coils and separate screens.

culty was surmounted by erecting screens of copper or aluminium between the coils or by enclosing them in screening boxes.

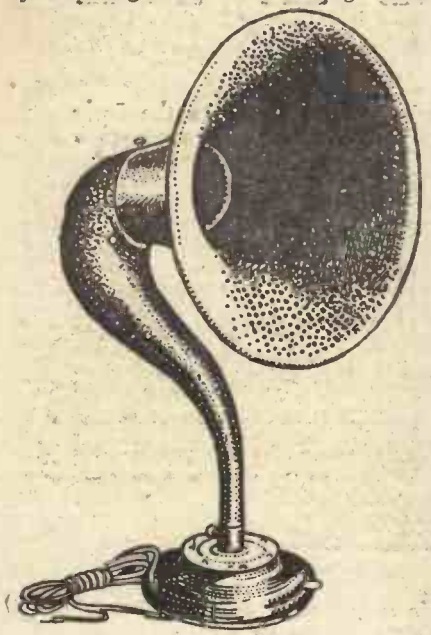


Fig. 3.—A typical horn speaker.

Fig. 1 will give an idea of the appearance of an efficient receiver employing the large solenoids and metal screens.

Ganged Condensers

With the new methods of construction and the use of screening, it was found possible to make a set using two or three high-frequency stages, each of which could give a really high degree of stable amplification, and as many as three H.F. valves were frequently employed for long-distance reception. A set of that type, however, required very skilful manipulation, due to the large number of tuning condensers (four) which had to be operated more or less simultaneously. This led to the introduction of the "gang" condenser with which all the circuits could be tuned by the movement of a single knob.

Valve Improvements

The latter important development first came into fairly wide use by about the end of 1926, so we must go back again for just over a year to observe the changes that had taken place in other directions. Probably the most noteworthy of these was in respect of valve design. The dull emitter had become an accomplished fact, but it underwent many alterations between, say, 1924 and 1927. After the first 4-volt dull emitters, 2 and 6 volters, also with dull emitting filaments, were made in various types—special high-frequency amplifiers, detectors, general purpose valves, and power valves. For some time power valves were confined to the 6-volt class, but they gradually found their way into the 4-volt, and then into the 2-volt range. It was not until about 1928, however, that the 2-volt valves were recognized as being equally efficient as their higher voltage counterparts. But in addition to the valves which have actually developed into the kind used at the present time, numerous others were tried and used with varying degrees of success. A class of valves intended for operation from dry cells and taking a filament supply of 3 volts at .06 ampere became very popular at one time, but they failed to remain in favour due to their delicacy, to the improvements made in accumulators, and to the greater facilities for accumulator charging. Another type of valve, of American origin, designed to operate on a filament voltage of 1 and a current of .25 ampere also found favour for a short time. This type was known as the Wecovalve and is still obtainable. In addition to its low-filament consumption it only required a high-tension supply of between 15 and 50 volts and was therefore very convenient for use in portable receivers. But this valve was not very efficient, nor was it robust mechanically; added to these disadvantages it could not be used with an accumulator unless a resistance were connected in series with the filament supply, and so the Wecovalve did not "reign" for very long.

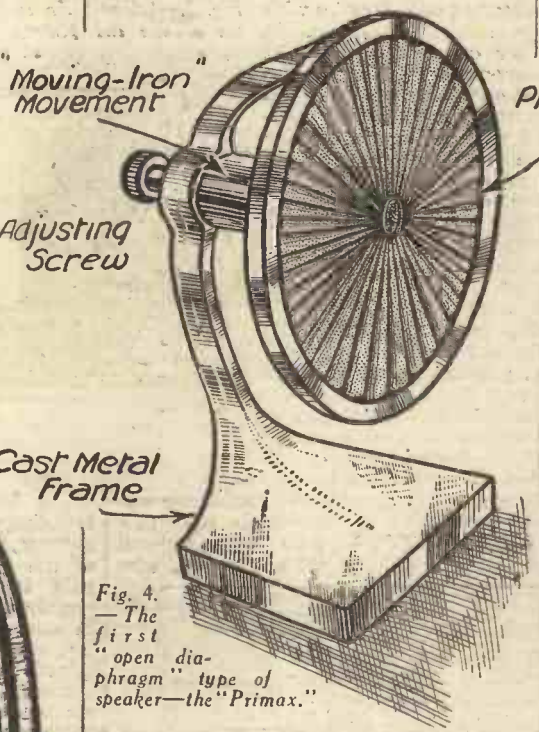


Fig. 4.—The first "open diaphragm" type of speaker—the "Primax."

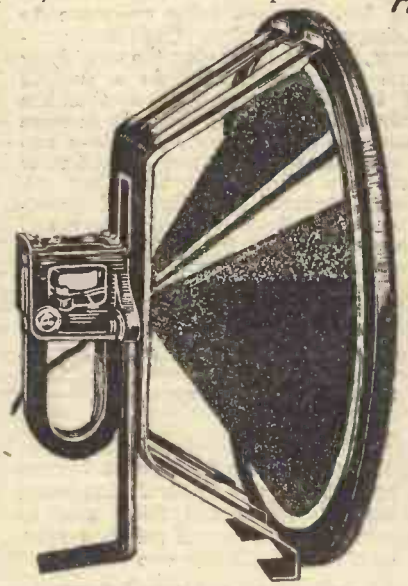


Fig. 6.—A type of speaker which was very popular at one time—the inductor-dynamic. The speaker shown was made by Messrs. Blue Spot.

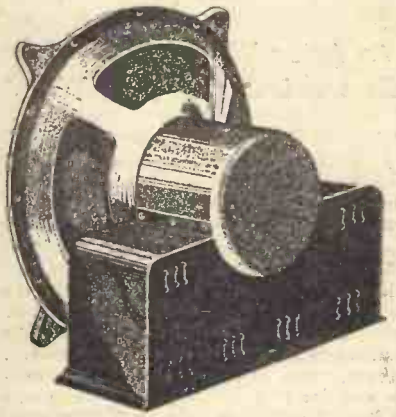


Fig. 7.—This Baker energized moving-coil unit is typical of the first moving-coil speakers.

Rheostats replaced by Switch

As the new valves were designed to operate on a filament voltage of exactly 2, 4 or 6, and since dull-emitter filaments were becoming standardized, the need for rheostats vanished and these were replaced by the simpler on-off switch which is, of course, still in use.

The Demise of the Horn Speaker

During the period we are now considering (approximately 1924 to 1926) the quality of reproduction afforded by the receiver was being improved very considerably on account of the improvements being made to valves, intervalve transformers, and other components.

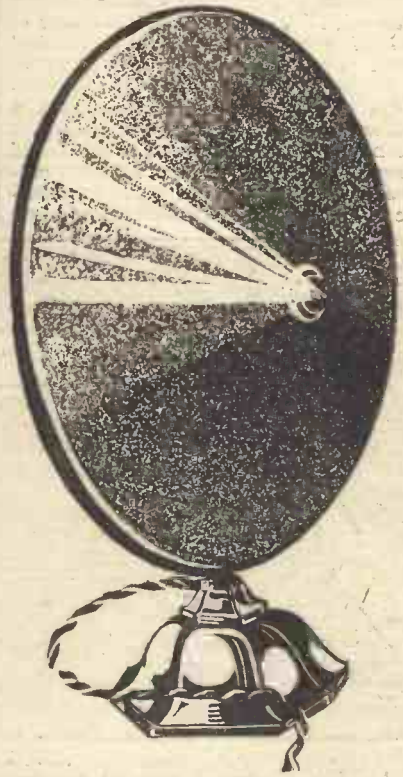


Fig. 5.—One of the first cone speakers; this was made by the Western Electric Co.

SUPPLEMENT TO PRACTICAL WIRELESS

Practical Television

MAY 5th, 1934. Vol. 1. No. 18.

A NEW TELEVISION SYSTEM

Details of a New Television System Developed in the Laboratories of A. C. Cossor, Ltd.

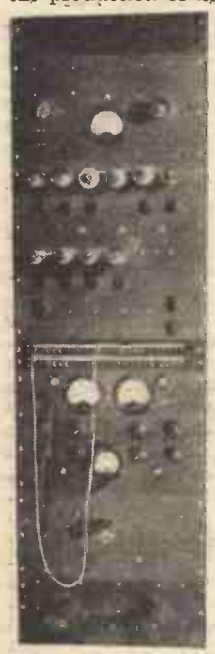
THE use of a cathode-ray tube for television is not new, but the system that has recently been developed by A. C. Cossor, Ltd., is a radical departure from anything that has been done before. The essence of the new system differs from all others inasmuch as the picture is formed by variation in the speed of the cathode beam, slightly assisted by intensity variation, and not solely by varying the beam intensity. Apart from the excellent detail obtainable with this system, other advantages are inherent features of the system, including:—

(1) Absence of any synchronization problem in the line-scanning direction. (2) A simple and practical solution to difficulties of synchronizing in the traversing direction, including automatic framing. (3) Greatly relaxed modulation requirements on the receiving oscillograph. (4) Greatly increased picture brightness for a given receiving oscillograph compared with the intensity-modulation system. (5) Improved concentration of detail in the light portions of the picture, and (6) Nearly constant percentage modulation of radio transmitter.

These points were described in a paper by L. H. Bedford and O. S. Puckle read before the I.E.E. on February 7th, 1934, entitled "A Velocity-Modulation Television System."

Velocity-Modulation Explained

Fundamentally, this system consists of the production of light and shade, not by varying the brilliance of the spot, but by varying the time taken by the spot to pass any given point; in other words the spot will travel over the whole picture in a regular manner, but not at a uniform rate. That spot speeds up for the dark portions and slows down for the light portions and, consequently, when a bright portion has to be created the spot slows down, and when a dark portion is being reproduced, the speed at which the spot travels is proportionately increased. Any degree of light and shade existing between these two extremes is, of course, obtainable by proportionate speeds.



The transmitter control panel.

The re-creation of true light and shade is dependent on the phenomenon of persistence of vision. If a light spot of constant size and brilliance describes a repeating design in which the actual speed of movement at any particular point varies from that at other points, the eye will only appreciate this state of affairs as such if the movement is very slow. If the movement is so rapid that the oscillogram is completed in the period within the persistence of vision the eye renders a totally different impression; namely, that of a stationary design, split up into various grades and intensities of light and shade.

The principle of velocity modulation, therefore, permits the introduction of light and shade into a received picture without either altering the intensity, size, or brilliance of the spot, and it is, therefore, ideal for television reception by means of a Cossor cathode-ray oscillograph tube. Moreover, the cathode-ray oscillograph is practically the only instrument which has sufficient freedom from inertia to reproduce successfully the extremely abrupt changes of velocity which are called for.

Turning to the transmitter, a few moments thought will make it very clear that it would not be possible to re-create the picture by velocity modulation if the "object" scanning were uniform; obviously, then, the transmitter must be "velocity"-scanned.

If the "object" to be transmitted is to be "velocity"-scanned, it follows that the scanning element (at the transmitter end) must also be a cathode ray, which means that the cathode ray oscillograph must serve as the source of light. At the present time, this means that the picture subject-matter will, on the grounds of scanning-light restrictions, be limited to filmed material, at least when the ordinary low-voltage oscillograph is contemplated, but it is of technical interest to point out that direct subject transmission is not considered to be outside the bounds of possibility, using a modified system of flood lighting to illuminate the "object." PRACTICAL WIRELESS published details of the stroboscope some weeks ago, and those who read it will readily appreciate how the principle underlying this instrument could be turned to account for direct "object" scanning.

These two illustrations give some idea of the results obtained with this system.

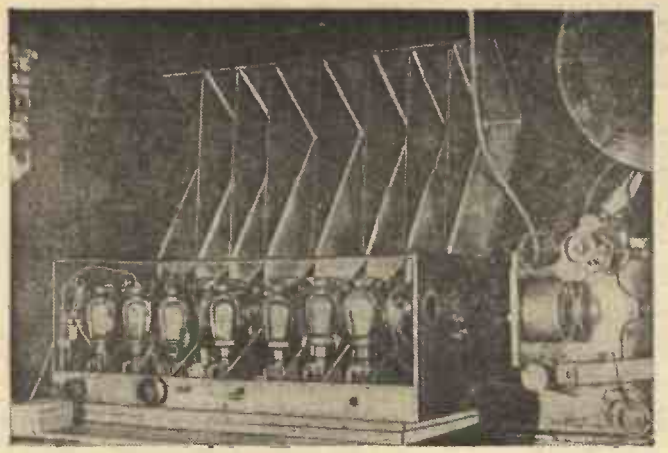
The foregoing description is, however, entirely confined to the use of films as the subject matter to be broadcast. In the opinion of the designers of this system, the restriction to filmed material does not constitute a drawback, as the same restrictions are forced upon any television service by other considerations, particularly the desirability of broadcasting to a large audience in the evening an event which takes place at a time in the day when the audience would be very limited.

How Velocity-Scanning is Applied to the Transmitter

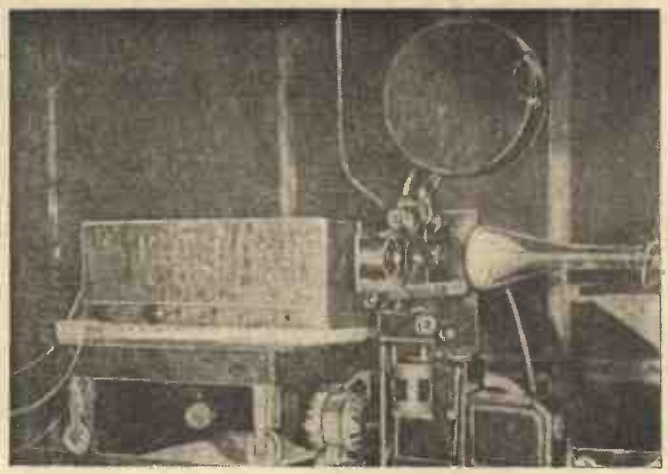
The light spot of the oscillograph at the transmitting end is focused on to a cinema film through a suitable lens, and the light, or such portion of the light that may penetrate the film, falls on to a photo-cell. Current variations through the photo-cell produce the voltage, which, duly amplified, is fed back into the scanning oscillograph is such a manner as to control the instantaneous scanning speed.

The spot must, naturally, also possess a path so arranged that it will cover every point of the picture as is customary in any television transmission. The function of this arrangement will be better understood when it is realized that a copy of the picture must appear on the screen of the transmitting tube itself, bearing in mind that the voltage dependent upon the film intensity from point to point is fed back into the tube.

In the case of transmission from a positive picture, increased light on the photo-cell must bring about a decrease of the scanning velocity, giving the appearance of light, and when the real image of the spot falls on an opaque portion of the film the spot is speeded up, giving the appearance of darkness on the transmitter. The appearance of the picture on the transmitter is an integral part of the system. No special



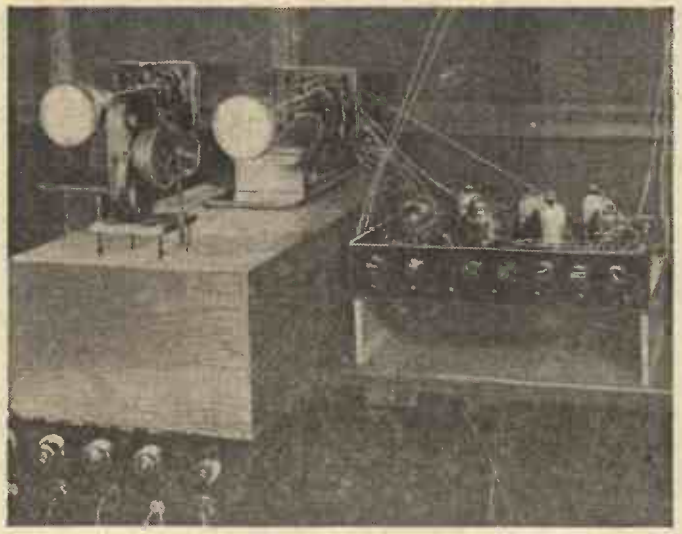
The photocell amplifier with screen raised. This section uses no less than fourteen screen-grid valves. Fortunately this is only required at the transmitting end.



General view of the experimental transmitter at Highbury. The cathode ray tube, lens, film drum, and film feed can clearly be seen. In this view the photocell amplifier is closed.

significance might be attached to this happening until it is remembered that this picture has come about solely by means of the voltages applied to the deflector plates of the oscillograph, and that the same picture, therefore, will obviously result on any similar oscillograph to which those voltages are faithfully transmitted. If two channels are available, the transmission problem is reduced, in fact, to that of connecting one pair of plates on the transmitter to a pair on the receiver, and the other pair on the transmitter to the other pair on the receiver. If this happy state of affairs were possible the question of synchronization at the receiving end would not arise. The synchronism of such a system may be described as "implicit."

This feature is undoubtedly one of the most important advantages of velocity modulation.



The experimental receiver with its cathode ray tube. The picture shows a film camera set up to record the images that appear on the screen. The second tube is the transmitter monitor and is sometimes run side by side with the receiver to check definition.

The tying together of the two pairs of plates of the receiver and transmitter would require two communication channels which is, generally speaking, impracticable. The solution adopted by the designers, making it possible to convey the intelligence in a single channel, is to sacrifice the feature of implicit synchronism in the picture-traversing direction, whilst retaining it in the line-scanning direction. Synchronization is made absolutely solid by means of a signal impressed on the line scanning, so that, in effect, the system still operates as though the synchronization were wholly implicit and not implicit in one direction only.

At this juncture it will be useful to sum up the four advantages obtained: (1) There will be a complete absence of synchronizing problems in the line-scanning direction; (2) It is unnecessary to modulate the spot; (3) Increased picture brightness, and (4) Concentration of detail in the light portions of the picture.

Intensification

The last two features result from the fact that the scanning is relatively slow in the lighter portion of the picture; both the light and scanning time not required in the dark places are made use of in the lighter portions.

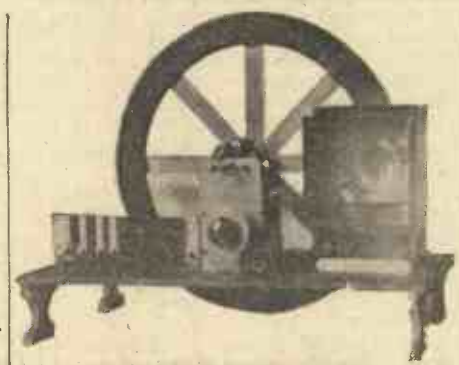
If the contrast ratio of the picture is kept low the last feature is an advantage, but not otherwise. As soon as high contrast ratio is attempted the sacrifice of detail in the dark places in favour of the light places becomes objectionable. Further, it becomes impossible to obtain a satisfactory change from one intensity to another, more particularly from dark to light, without the use of an unduly widened frequency band.

The present system, therefore, transmits a velocity-modulated picture at low-contrast level, and super-imposes intensity-modulation upon it at the receiving end.

The transmitter is at present working at a picture speed of twenty-five pictures per second, with 120-line scanning in the horizonal direction.

BENNETT TELEVISION CO. announce a new television receiver to enable the beginner to try out television receiving at a very low cost. The accuracy of the components ensure results. All necessary mounts and holders for the television components are supplied so that there is no constructional work required except to assemble the half-dozen complete units on the baseboard supplied.

The receiver is complete except for a television type lamp. This unique feature allows the amateur to try different suitable types beginning with the beehive neon costing about 3s. without holder, then, if desired, graduating to the more expensive but improved lamps which are being evolved by various manufacturers for television receivers. Operation of the television receiver is obtained simply by connecting it in place of the usual loudspeaker in the radio receiver. Two types of this kit are available, either for mains A.C./D.C. (state voltage when ordering) or 6-volt battery. The complete receiver costs £3 17s. 6d., carriage paid, and comprises: A.C./D.C. television motor, 16in. scanning disc, motor rheostat, variable, 580 ohms tapped resistance block, Bennett metal enclosed double lens holder with viewing tunnel and matched non-distorting lenses, neon holder with reflector, mounts for motor, neon, and rheostat, slotted baseboard with legs, input terminal block, screws, flex, and sundries. The Beehive neon costs 3s. extra, with outfit.



The simple nature of the instrument may be seen from this illustration.

WORKING IN EBONITE

A Practical Article Describing the Various Operations, and How to Use the Tools Correctly. By W. H. DELLER

EBONITE is supplied in the form of sheet, rod, and tubing in a wide range of thicknesses and diameters, also in about thirty different special sections, suitable for coil formers, these ranging from 1in. to 4in. in diameter.

By reason of its high insulating properties, coupled with the fact that it is easy to cut and drill, it becomes a material that is practically indispensable to the wireless experimenter. Although an easy material

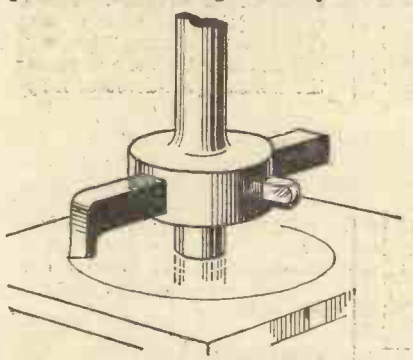


Fig. 1.—A cutting tool for making large holes in ebonite.

to operate on, care has to be taken when working with it to avoid breaking and chipping. A good deal, of course, can be done to guard against such happening by the proper selection, preparation, and application of tools.

Doubtless the majority of readers have used ebonite for panels at some time or other, and possibly had to do a certain amount of cutting and drilling. These represent the most common operations. There are, however, other ways in which it may be worked, some of them not being generally known, and with a view to assisting the reader to work this material satisfactorily, it is proposed briefly to survey the various operations.

Sawing

For work within its compass a hack-saw is suitable. Select a blade with teeth about twenty to 1in. (finer for tube). Where necessary for larger work, a panel or tenon saw may be used. In any case avoid flexing or straining the saw sideways when cutting, as this will cause splitting. Fret-sawing should be done with a saw having plenty of set on the teeth, as failure in this respect renders the saw hard to operate.

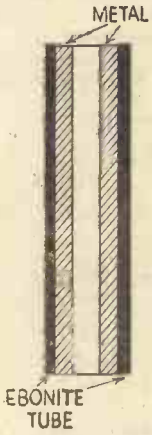


Fig. 3.—Shielding a cylindrical metal part with ebonite.

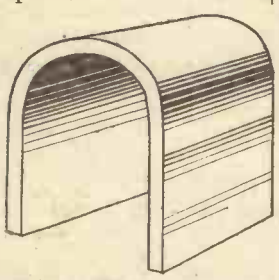


Fig. 4.—Sheet ebonite can be bent to this shape by heating.

Filing

Sawing marks can be removed with a rough file and shaped blocks and so forth can be roughed out in like manner. For finishing, however, a fine file should, where possible, be dispensed with and glass paper used instead.

Glass-papering

Long edges are best finished by rubbing on a sheet of glass paper tacked to a flat surface. For rounded edges a block of wood can be prepared with a groove corresponding to the required radius cut in it and on which the glass-paper is fastened.

Polishing

After finishing with very fine glass-paper, presuming that the polishing is to be carried out by hand, remove all scratches with flour emery powder and oil, or fine pumice powder and water applied with a piece of felt. Polish with whiting and oil and clean off dry.

Drilling

The chief trouble with drilling is the liability of the underside of the material to break away as the drill breaks through. This is particularly noticeable when using a twist drill. By slightly modifying the cutting edges of the drill this can be prevented. Grind the lips of the drill so as to reduce the rake, thus making it cut with a scraping action.

When drilling deep holes clear the drill frequently. This is important with slender work, as the cuttings which form up solid in the drill flutes will not allow subsequent material to escape, and unless cleared will finally burst through the wall of the hole.

Use a cooling agent consisting of soapy water for the drill to counteract the heat generated, when deep holes are being drilled by machine.

The best type of cutter for drilling large holes or cutting circles is that shown in Fig. 1. When cutting large circular holes or "washer like" pieces, a pilot hole is first drilled in the ebonite to fit the spigot on the front of the cutter holder. For cutting holes the outside edge of the cutter is made to cut in advance by grinding at an angle. The illustration shows the cutter just starting.

Tapping

It is not necessary to use a taper tap for starting fine threads in ebonite; in fact, it is best not to do so. A plug-tap having a slight lead will make a more decided and finished thread in one operation. This does not apply, however, where coarse threads are used.

Turning

All work should be well supported in order to reduce springing to a minimum. Tools must be kept sharp and the work cool by constant application of soapy water. Grind the tools so that they have very little top-rake.

The slotting of ribbled coil formers is best carried out if the tube is mounted on a mandrel. Failing a lathe, a method by which such formers may be accurately slotted is illustrated in Fig. 2.

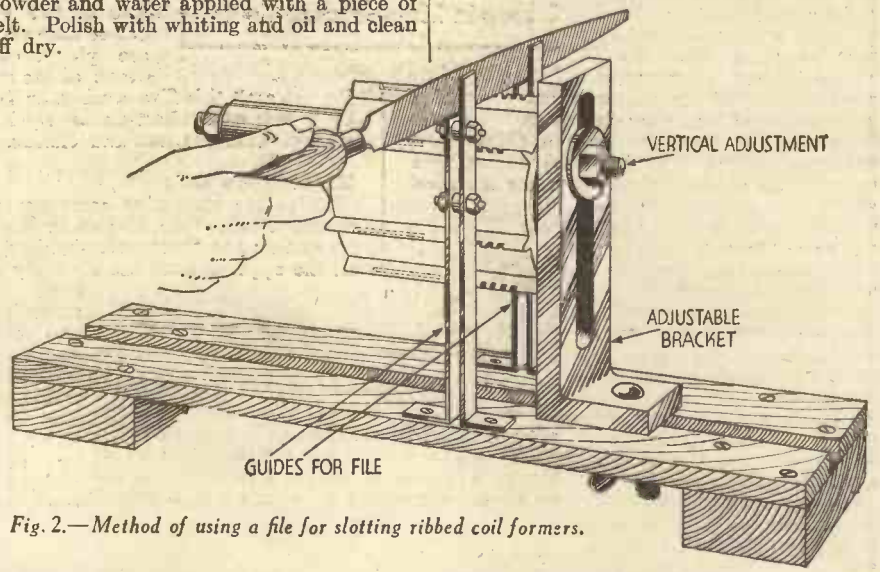


Fig. 2.—Method of using a file for slotting ribbed coil formers.

Slotting Ribbed Coil Formers

As will be noticed, the apparatus required to facilitate this operation consists of two wooden slats, screwed on to a block of wood at each end to form a base. On the right-hand end of this is an angle bracket, adjustably mounted by means of a wing nut. In the vertical face of the angle

(*Continued on page 220*)

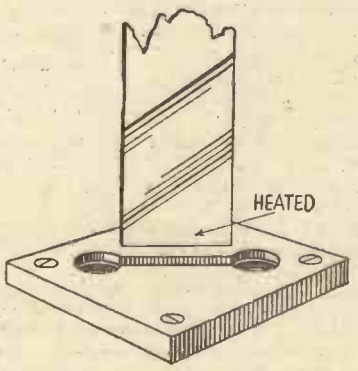


Fig. 5.—Burning a shaped slot or recess in a piece of ebonite.

Constructional Details of Our Latest Three Valver, which is both Simple to Construct and Efficient in Performance

BUILDI THE PRIMA M

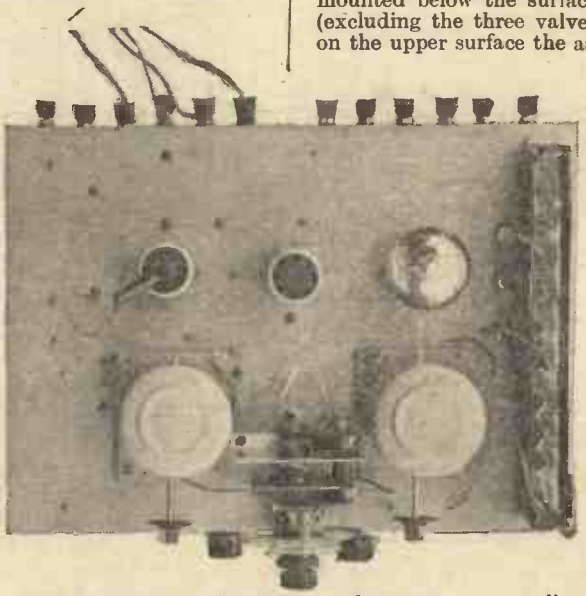
A Powerful Three-Valver, with

AS we explained last week, this receiver has been designed to incorporate all the advantages of the mains-driven wireless set, without the risks which some readers think exists when handling apparatus intended for subsequent connection to the house supply mains. The list of parts which we published in last week's issue, and which is repeated on page 214 of this issue, shows that the initial expense is very low for a receiver of this type, and that the all-metal chassis, upon which the parts are assembled, is supplied ready made, with all holes drilled. The actual task of construction, therefore, resolves itself to the mere assembly of a number of parts by means of nuts and bolts, and in this respect a child could carry out the work with the wiring plan and the photographs, which are included in these pages, before him.

Modest in First Cost and Cheap in Maintenance Costs

Assembling the Components

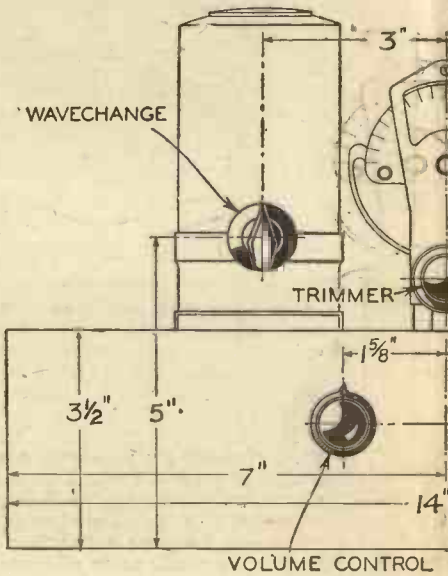
The order of assembly may take any desired form, no part having been included in this receiver in such a manner that it requires a definite scheme to be followed in order that various components will not have to be removed in order to get some other part in an out-of-the-way place. Therefore, proceed as you wish, preferably mounting the under-surface components first, in order to enable the chassis to stand firmly on the table or work bench whilst this part of the construction is being carried out. Make certain that the nuts are really tightly locked, and for this purpose you can safely employ a spanner (one of the PRACTICAL WIRELESS gift spanners will prove invaluable). The resistances are provided with their fixing holes in insulating material, so that there is no need to worry with insulating washers or other troublesome measures to prevent short-circuits. Insulation will, however, have to be carried out in regard to the terminals, both those on the rear strip and those which are mounted on the surface of the chassis for the application of grid bias voltages to the detector and output valves. Washers are specified in the List of Components, and are obtainable from the makers of the terminals which are used, and these are designed exactly for the purpose for which they are now used, namely to enable the terminals to be safely mounted on an all-metal chassis. The stepped ebonite portion is placed on the outside of the chassis, the terminal passed through, and the fibre washer placed over the rear of the terminal before the locking-nuts are placed over the shank of the terminal. Do not omit this fibre washer, or there will be a risk of a short-circuit arising from contact with the nut and chassis.



This photograph and the one on the opposite page will assist you in wiring the Prima.

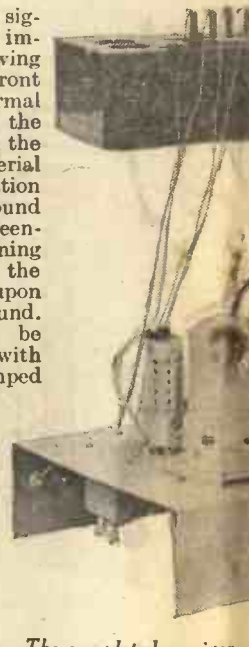
Mounting the Coils

There are only nine components to be mounted below the surface of the chassis (excluding the three valve-holders), whilst on the upper surface the assembly confines itself to the mounting of the two coils, the ganged-condenser assembly, and two grid-bias clips. The latter are held by one bolt each, and the condenser assembly is mounted by means of its vertical screening plate and with two long bolts and the distance pieces provided. The central illustration on this page shows how these are inserted between the chassis and the lower part of the slow-motion dial, and when these have been locked the condenser will be rigidly held and the dial settings will always remain constant. When mounting the coils it is essential to get them in the correct position, as the method of winding which has been adopted in each coil has been arranged to provide maximum results under the conditions for which the coil is intended. Thus the aerial tuning coil is provided with a transfer-tapping point so that the aerial may be changed from a tapping on the medium-wave coil to a point on the long-wave coil in order to provide equal and adequate selectivity on both wave-bands. The detector grid coil is provided with a tapping a short distance from the "upper" end of the coil in order that the damping imposed by the normal grid-detector may be lightened



These dimensions will assist you in

and selectivity and signal strength thereby improved. When viewing the chassis from the front (that is, the normal position for tuning) the KGO coil is fitted on the left. This is the aerial coil. The identification of the coil may be found by removing the screening can and examining the inner surface of the ebonite former upon which the coil is wound. A small label will be found near the top with the letters clearly stamped thereon.



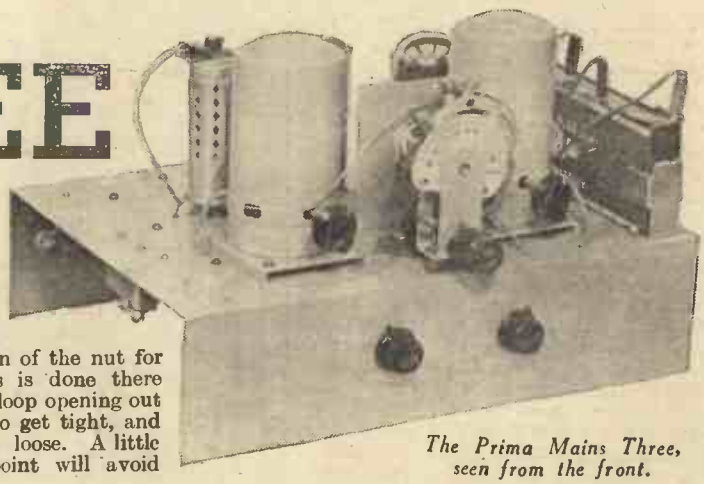
No Insulation Required

With regard to the reaction condenser

A Mains Receiver which is as Simple to Construct as a Battery Receiver

The completed receiver and rea

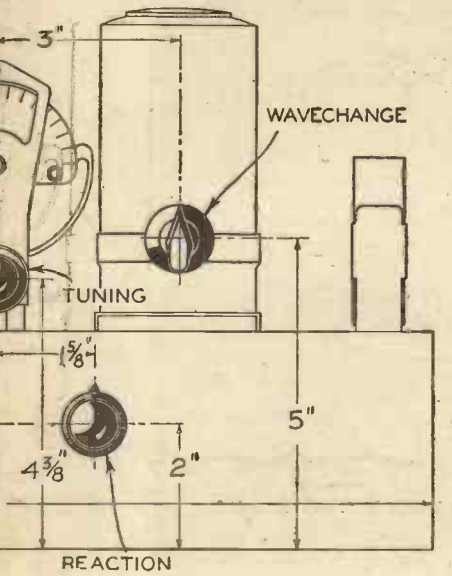
ING—
IAINS THREE
a Ready-Made Mains Unit



The Prima Mains Three, seen from the front.

A Set for the Beginner or the Expert

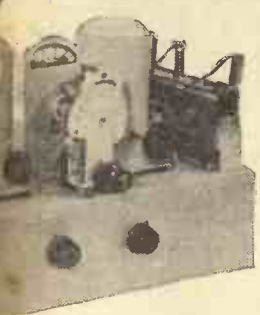
and volume control, these are mounted on the metal chassis without the intervention of insulation washers. Examination of the wiring and theoretical diagrams will show that the moving vanes of the condenser and the spindle of the volume control are joined to earth, and as the chassis is earth connected the return connection for these two points is automatically obtained.



preparing the panel or cabinet front.

Wiring Up

The actual wiring may be carried out in any particular manner to the choice of the constructor. Ordinary flex may be used for the heater wiring if desired, although in the original model 22 gauge tinned copper was used and this was passed through small diameter systoflex tubing. Soldering is called for only at two points, namely on the volume control. Note the earth-return leads, which are carried out by means of wires joined direct to the fixing bolts, and make certain that these make really good and tight contacts. Remember the little point about the direction of the loop which is made in the wire before the nut is placed into position. The loop should be made in the same direction as the rotation of the nut for tightening, and if this is done there will be no fear of the loop opening out when the nut begins to get tight, and the wire thus coming loose. A little care spent on this point will avoid troubles due to crackling, etc., which might arise if the lead is loose.

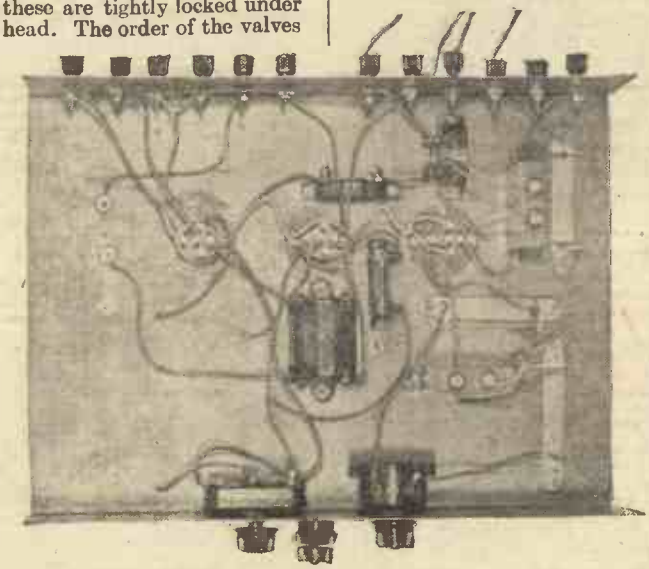


onnected to the mains unit dy for use.

The First Mains Receiver to Employ a Commercial Mains Unit

The Inter-Unit Connections

Connection from the receiver to the mains unit is made by means of flexible leads, provided at the ends with wander plugs. Note the correct position of these on the wiring diagram, and to ensure that the leads do not come loose with consequent risk of short circuits, fit good spade ends to that end which is attached to the chassis, and make quite certain that these are tightly locked under the terminal head. The order of the valves may be seen from the illustration on the first page of this article, the S.G. valve being on the left and the pentode on the right. The 16-volt grid-bias battery should be fitted in the clips with the positive end at the front, and the plugs should be inserted with the positive plug in the positive socket, and G.B.2 in the 9-volt socket. The remaining socket should not be inserted unless the instrument is being used for gramophone-record reproduction. Let it rest on top of the bias battery, and do not let it touch the chassis. Of course, if preferred, a change-over switch may be fitted to the rear of the chassis, in the place which has been left vacant, and this will enable the plug to remain in its correct socket and the change from radio to gramophone made without any trouble. If this is not done, however, the receiver may be used for gramophone reproduction simply by plugging the bias plug No. 1 into the 1.5 volt socket and connecting the pick-up to the two appropriate terminals on the rear of the chassis.



A below-chassis view of this interesting three-valver.

The Mains Unit

As has been mentioned, the receiver is designed for use with a ready-made mains unit and this is Type AC4, made by Mains Power Radio, Ltd. An examination of the specification of this unit will show that it is designed to deliver a maximum voltage of only approximately 150 volts, and not 250 volts as may be at first thought. The majority of mains valves of the present day are designed for a maximum H.T. voltage of 200 or 250 volts, but obviously to employ such a high voltage it is essential to employ some form of rectifier capable of delivering a constant output, and insulation, smoothing, and other parts of the complete circuit have all to be increased in the interests of safety and quiet working. The P.T. 425 valve which has been fitted in the output stage of the Prima is designed, however, for a maximum H.T. voltage of only 150 volts, and we can, therefore, use a lower-powered mains supply with a consequent saving in initial cost. It must not be thought that the employment of this type of valve and mains unit will result in decreased power. The rated output of the

(*Continued overleaf*)

THE PRIMA MAINS THREE

P.T. 425 is just under 1 watt and this is, of course, ample for normal home requirements.

Low Maintenance Costs

There is also a further saving which is effected by employing a low-voltage mains unit and valves in this manner. We refer to the cost of running the complete receiver. The three valves employ 1 amp. for each of the first two valves, but the pentode only requires .25 amps. The total wattage for heating the three valves is therefore 9 watts. The total anode current is in the neighbourhood of 27 milliamps, which, at 150 volts, gives a wattage of just over 4. Allowing for all losses, the total wattage of the complete apparatus will not exceed 20, and thus the current taken from the mains is much less than that required for the average electric lamp. Stated in another way, one unit of electricity will enable the receiver to be used for fifty hours, and at 6d. per unit (a high figure for most districts) the cost of operating the receiver for normal listening periods will be about 6d. per fortnight.

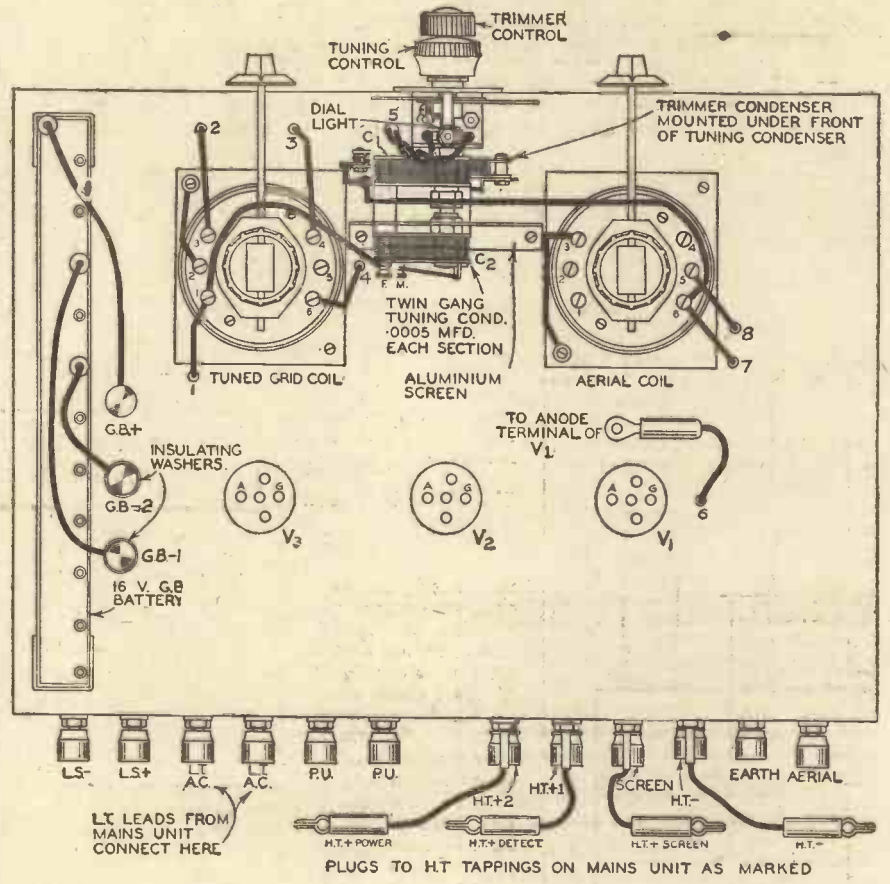
In many districts the power supply will cost only 1d. or even less, and therefore if the mains plug is used in conjunction with the power socket, as distinct from the lighting sockets, the cost will be 1d. for a fortnight's use. The claim for economy is therefore fully justified in the case of a receiver of this nature, although the results are not by any means comparable with the low costs of building and operation. The life of modern valves will ensure that there will be little need of replacement costs, at least until the receiver is rendered obsolete due to general improvements in the technique of both broadcasting and reception.

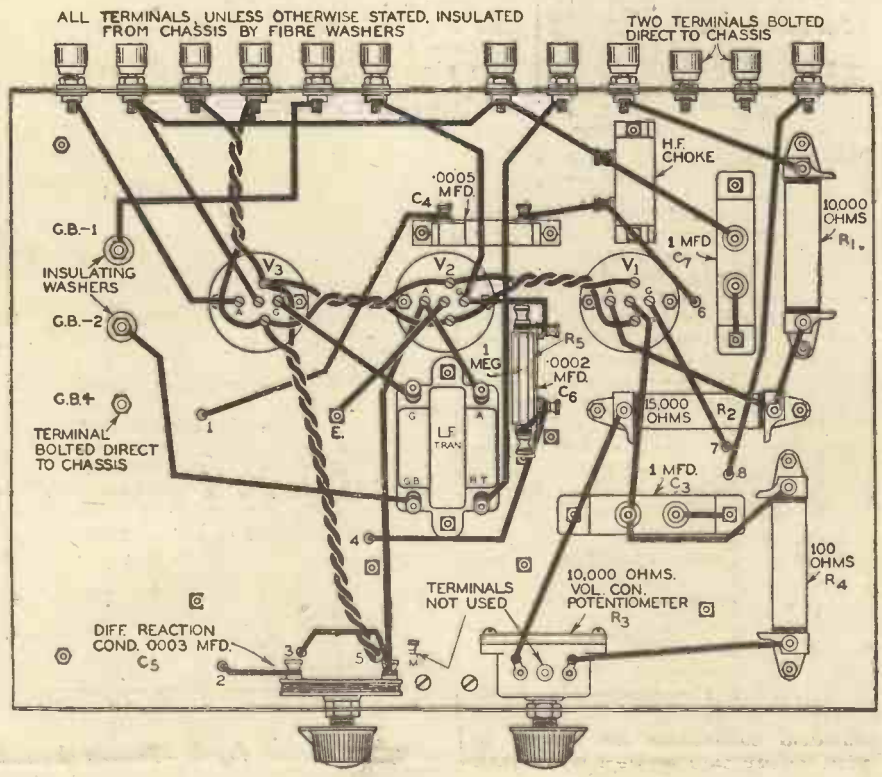
Next week we will describe the method of connecting the receiver to the mains unit, and will give, in addition, some useful operating notes.

LIST OF COMPONENTS

One "Prima" Steel Chassis—Peto-Scott.
One "Prima" Special Two-gang Tuning Condenser—Ormond R.366 (C1 & C2).
Two Tuning Coils: one Type KGO and one Type KGR—Colvern.
One .0003 mfd. Differential Reaction Condenser—Graham Farish (C5).
One 10,000 ohm Potentiometer—Cosmocord Log Type (R3).
Three 5 pin Chassis mounting Valve-holders—Clix.
Three Strip Wire-wound Resistors—Colvern Flat Type (100 ohms, 10,000 ohms, and 15,000 ohms) (R4, R1, R2).
Two 1-mfd. Fixed Condensers, 500 volt D.C. working—Peak (C3 & C7).
One H.F. Choke—Graham Farish "Snap."
One .0002 mfd. Fixed Condenser—Graham Farish (C6).
One .0005 mfd. Fixed Condenser—Graham Farish (C4).
One 1 megohm Grid Leak—Graham Farish (R5).
One 3½ : 1 L.F. Transformer—Ormond.
One pair Grid Bias Battery Clips—Bulgin No. 1.
Fifteen Terminals, one each marked L.S.+, L.S.—, A, E, G.B.—1, G.B.—2, G.B.+, H.T.—, Screen, H.T.+1 and H.T.+2; two each marked L.T.A.C. and Pick-up—Belling Lee Type R.
One Packet Terminal Insulating Washers—Belling Lee.
One Safety Anode Connector—Clix.
Seven Wander Plugs—Clix.
Four Spade Terminals—Clix.
Connecting Wire, Flex, Screws, etc.
One Ormond Loud-speaker.
Three Valves (Osram VMS4, MH4 (Catkin) and PT425).
One Mains Power Radio Mains Unit—Type A.C.4.
One 6 volt Dial Light Bulb—Bulgin.
One 16 volt G.B. Battery—Lissen.

Top and Sub-Baseboard Wiring Diagram for the PRIMA MAINS THREE





THE EASY ROAD TO RADIO

THE BEGINNER'S SUPPLEMENT

HOW TO READ A CIRCUIT DIAGRAM. PART I.

By H. J. Barton Chapple, Wh.Sch., B.Sc., A.M.I.E.E.

WORDS are not always the simplest and best understood way of conveying information. They are most certainly not the clearest medium for recording the exact positions and junctions in the network of wires which constitute the circuit of even the simplest radio receiver. As a matter of interest, I have just dictated a description in words of the circuit of a simple two-valve set; it would occupy, if printed, nearly half a page of this book—and by the time you had read to the end you would have forgotten half the beginning. Practically all the information contained in that long-winded description could have been recorded in one clear photograph occupying less than a quarter of the space, as will be evident from the illustration reproduced in Fig. 1 which indicates very clearly the bulk of the wiring of a simple receiver. Every component is visible, and the various connections to them can quickly be traced.

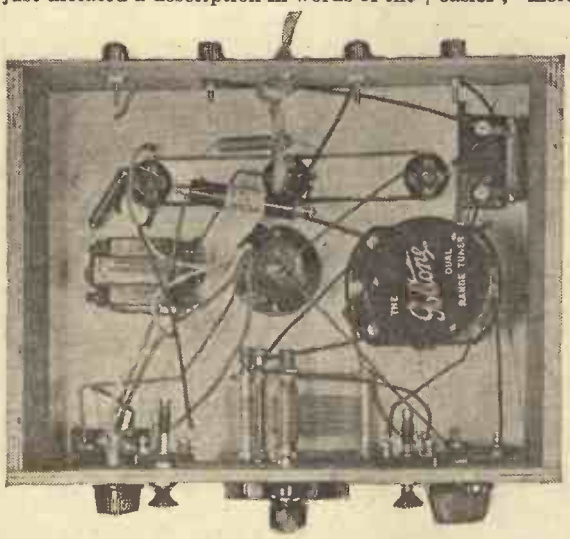


Fig. 1.—Photograph of a 3-valve receiver, showing the actual wiring.

A Better Method

But if you examine this picture closely you will see that some of the wires are hidden behind components, and that in a few instances you are in doubt as to exactly where some of the connections are made. All these doubts, however, are cleared up in a semi-diagrammatic representation of the same circuit. Here, individual components are spaced far apart, and in some cases are moved slightly from their actual positions in order to make the runs of wires clearer. Radio engineers have developed a still simpler form of picture, in the circuit diagram. The advantages of circuit diagrams are that by using conventional signs instead of actual pictures of components, the work of preparing the drawings is much easier; moreover, as the diagram is intended merely to show the way in which the various parts of the receiver are connected together and not the exact route of each wire, a simpler layout can be adopted, as will be realized by comparing the circuit diagram shown in Fig. 2 with the actual point-to-point wiring chart in Fig. 3, these two drawings referring to the same set.

As, however, there are many listeners, especially newcomers to radio, who find some difficulty in reading theoretical circuit diagrams, it may not be out of place to explain the conventions employed for these useful pictures and to show what may be learned from them.

First of all, then, it should be understood that certain signs are employed to represent different kinds of components. A first selection of these is given in the Fig. 4 illustration.

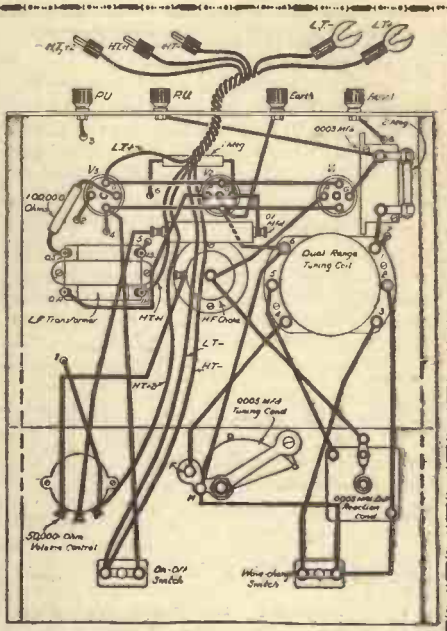


Fig. 3.—Point-to-point wiring diagram of the set.

In this illustration I have indicated all those components which refer to the high-frequency side of a radio receiver, and also the principal types of valves used in all stages of a set. For the most part they call for no further explanation. It will be observed that in one or two cases alternative symbols are given; both forms may be found in different diagrams. In the case of the two symbols for a fixed resistance, most engineers use the square-topped form only for resistances wound in a special non-inductive manner. In all diagrams where an arrow is marked across a component, it is intended to show that the value of the component or its coupling is variable. The difference between the symbol for two coupled coils (also used for a high frequency or intermediate frequency transformer) and that for an iron-cored low-frequency transformer is merely the added vertical lines in the latter, which are meant to represent the laminated iron core.

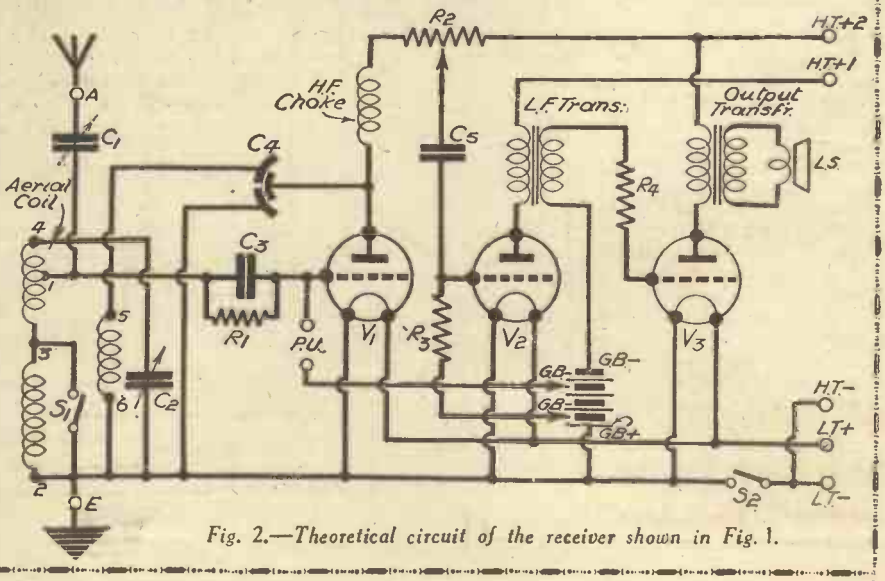


Fig. 2.—Theoretical circuit of the receiver shown in Fig. 1.

THE BEGINNER'S SUPPLEMENT

(*Continued from previous page*)

Turning to the diagrammatic representations of valves, these are fairly straightforward. The round and the oval forms are both used, although the latter are generally reserved for those types such as pentodes, which have many electrodes.

Some Examples

In order to proceed to some examples of actual circuit diagrams and to show how they may be interpreted, we must now examine the ways in which actual wires and connections are indicated (Fig. 4). A

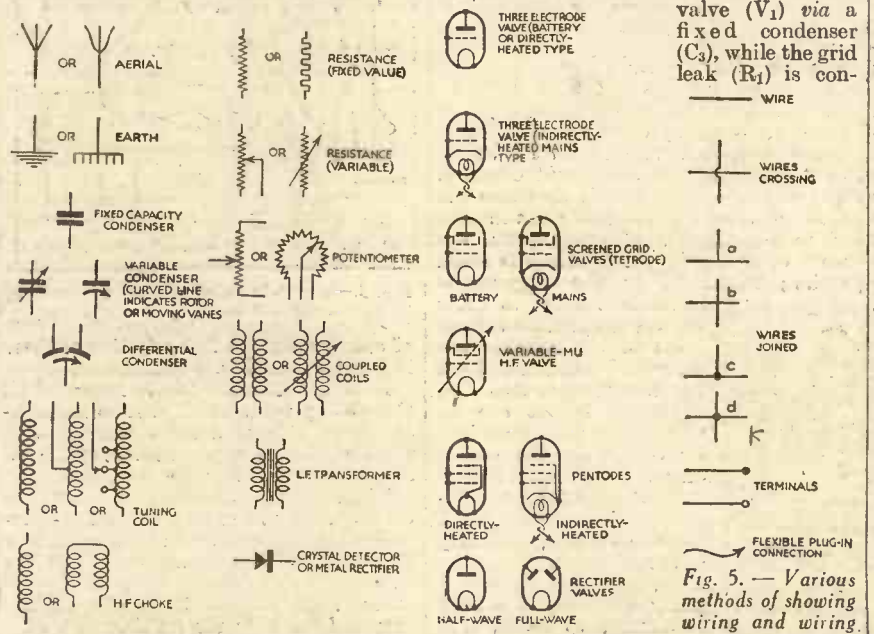


Fig. 4.—Standard symbols used in a theoretical circuit diagram.

straight line shows a wire. Where it is necessary to indicate two wires which cross but do not join, a little curved bridge is made in one line. Joined wires are indicated as shown. Those with a clear black dot at the junction are the better methods, as at C and D, because some engineers, especially Americans, use the form shown at B for wires which cross but do not join.

Having mastered the chief symbols used in circuit diagrams (there are a lot more, but we will deal with them in the next instalment) we are now in a position to read and to obtain useful information from the conventional circuit diagram.

For a start, we will examine the simple diagram given in Fig. 5 and see what we can learn from it. At the first glance we see at the left-hand side the familiar signs for aerial and earth connections. We can, therefore, say at once that the diagram refers to a radio receiver and not to a simple amplifier. Then we see two symbols indicating valves, so the receiver is a two-valve set; and a further inspection of these reveals that they are battery valves, one a triode and the other a pentode. So far, by the most casual inspection, we have gathered that the diagram is of a two-valve battery set comprising detector and pentode output stages.

Looking a little closer it is clear that the aerial circuit consists of a tapped coil (L_1) tuned by a variable condenser (C_1) and that the designer has adopted that familiar device for obtaining a high degree of selectivity—a series condenser (C_2) in the aerial lead.

Next, the diagram shows that the detector operates on the popular leaky-grid system, for the signal voltage is transferred to the grid of the detector valve (V_1) *via* a fixed condenser (C_3), while the grid leak (R_1) is connected between the grid of V_1 and the positive side of the detector filament.

Fig. 5. — Various methods of showing wiring and wiring connections.

Further Analyses

Now examine the group of symbols representing the pieces of apparatus between the detector and the output valve (V_2). At the top of the diagram is indicated a high-frequency choke (H.F.C.), the function of which is to obstruct the passage of high-frequency impulses into the low-frequency portion of the receiver. Just below this choke a connection runs to the variable-reaction condenser (C_4) by means of which the amount of high-frequency energy fed back to the reaction coil (L_2) can be controlled.

From the high-frequency choke a connection is taken to one side of the primary winding of the low-frequency transformer (T_1), the other end of this winding being connected to a terminal marked H.T.+1.

It is not usual, in a circuit diagram, to indicate all the batteries, a row of dots or circles representing a terminal strip being the general practice. These circles, shown at the right-hand side of Fig. 5, represent the terminals of the set, and are marked H.T.—, G.B.+, L.T.—, L.T.+, and so forth, thus clearly indicating where the batteries are to be connected.

In addition to the terminal H.T.+1 to which the primary of the low-frequency transformer is joined, there is another marked H.T.+2. This means that the full voltage of the high-tension battery should be applied between H.T.— and H.T.+2, while the H.T.+1 is plugged into a lower tapping of the high-tension battery.

The two terminals of the secondary winding of the low-frequency transformer are joined respectively to the control grid of the pentode valve (V_2) and to a terminal marked G.B.—, by which negative grid-bias is applied to the valve.

Finally, the anode is connected direct to one of the loud-speaker terminals, while the second speaker terminal is joined to H.T.+2. From H.T.+2 also, another wire runs back to the auxiliary grid of the pentode.

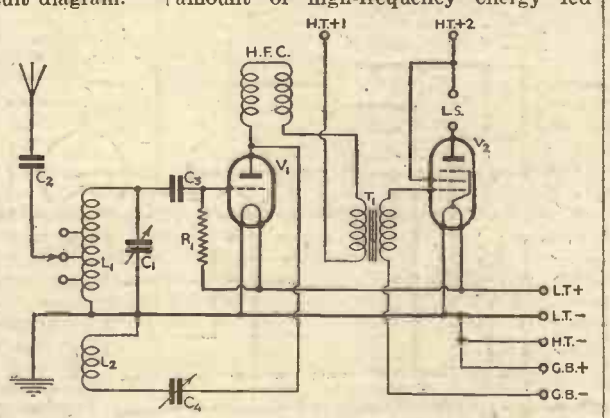


Fig. 5.—A theoretical circuit to be studied in conjunction with the latter part of this article.

TWO USEFUL HINTS

Choice of Valve-holders. While there is a difference, electrically, between valve-holders of different manufacture, the general type is, for all purposes and uses for reception on the regular broadcast band, entirely satisfactory, and one holder is near enough as good as another. Therefore, unless special reasons are stated why a particular type of valve-holder is to be used one can be permitted to use his own discretion. Of course, if the selection is very poor and the item purchased because it is less expensive, the deficiency will present itself. This is usually noticeable as poor stability, decreased volume, and even distortion. One point should carefully be noted in buying this component, namely, the resiliency of the socket contacts. While this is not actually an electrical consideration, it resolves itself into one during the operation. Contacts made of poor-quality material after a certain period of usage will fail to spring back into normal position when the valve is removed, and upon re-insertion of the valve, the contact between the valve legs and the holder will not be so good.

Fixed Condensers. Fixed condensers are somewhat akin to valve-holders. The position of the condenser governs its exact choice. If it is to be used in a position where the capacity must be accurate, as in some wavelength tuning circuits, it is best to use the make specified, thus taking advantage of the experience gained by the designer of the circuit. His selection is based upon the knowledge that the one he mentions has the desired accuracy.—K.

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2	Colvern Tuning Coils (1.K.G.O.; 1.K.G.R.)	0	19 0
1	Ormond L.F. Transformer, type R.5./531 3½ : 1		7 6
1	Set of Specified Valves	2	11 6
1	Peto-Scott Lucerne Kompact Cabinet	15	0

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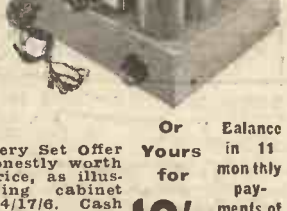

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IMMEDIATE DELIVERY—CASH—C.O.D. or H.P.

FILTERS, CORRECTORS, AND BOOSTERS

An Explanation of Various Practical Methods of Tone Compensation

CAUSES of distortion, which may or may not be avoidable, are defects in the "response" of various circuit components to different frequencies. To an extent, such distortion can be minimized by careful circuit design and the judicious selection of component values, but the real cure for this type of distortion is to absorb energy at those frequencies which are in excess, or, alternatively, to boost those frequencies which are deficient. Actually, both methods can be used, although the "boosting" method, since it involves the generation of energy, is not so commonly employed. It is proposed, first of all, to discuss the more usual corrector and filter circuits, their effects, and their practical applications.

General Correction for Excessive Treble

If the defect in reproduction is undue shrillness, from whatever cause, a simple remedy is to connect a condenser and variable resistance in series across the output of the set, that is, across the loud-speaker, as illustrated in Fig. 1. A suitable value for the condenser, which should be of the mica dielectric type, is .01 mfd., while the resistance should have a maximum value of 25,000 to 50,000 ohms.

The effect of this arrangement will be to reduce the proportion of the higher frequencies (commonly called "top") fed into the speaker, with the result that the proportional reproduction of bass will be increased and a fuller, richer tone will be obtained. The reason for this effect is that a condenser has a lower impedance, that is, offers less opposition to high frequencies than to low frequencies, and if connected in parallel with the speaker, will by-pass a greater proportion of the higher frequencies, thus preventing them from affecting the speaker.

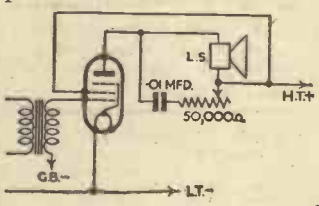
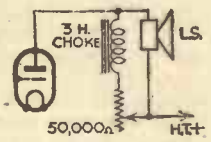


Fig. 1.—A simple treble suppressor for a pentode output circuit.

The amount of "top cut" depends upon the capacity of the condenser and the value of the resistance in series with it. The values given above are correct for most purposes, and the top cut can be adjusted by varying the series resistance. The chief application of this particular arrangement is when the output valve is a pentode—a type of valve which is rather apt to over-accentuate the treble. It is also valuable if the response of the speaker itself is too shrill, and, in fact, in all cases where excessive treble is the result of defects in the output stage itself.

General Correction for Excessive Bass

It is not often that complaints of excessive bass are heard, but with certain types of loud-speaker there is a tendency to "boominess" which makes an improvement in the treble response desirable. Usually, this may be arranged in one of the earlier stages of the receiver, as will be described later, but for the sake of completeness a corrector circuit applicable to the output stage is here given. One form of such a circuit is a low-frequency choke of about 3 henries and a variable resistance connected in series, and the whole shunted across the speaker, as indicated in Fig. 2. This device is very similar to the treble suppressor shown in Fig. 1, the choke being substituted for the condenser. In this case, the choke offers a greater opposition to the treble than to the bass notes, and a larger proportion of the bass will be by-passed from the speaker circuit.



Another similar device is shown in Fig. 3, where a condenser, shunted by a variable resistance, is connected in series with the loud-speaker. This arrangement is only effective when the speaker is fed from the output valve by a choke-filter circuit as indicated. The effect of the condenser by itself would be to choke back the bass very considerably, but this action is controlled by adjusting the variable resistance. As previously stated, these forms of bass suppressors are very seldom employed. They are, however, interesting because they demonstrate valuable principles, and are employed in modified forms in other parts of a radio receiver, as will be explained later.

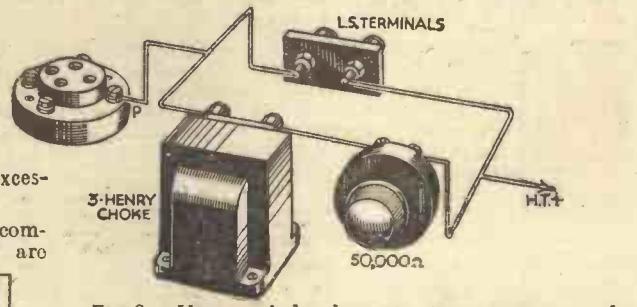
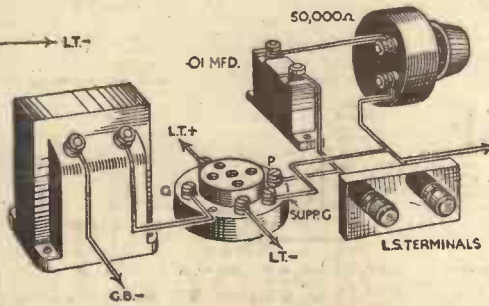


Fig. 2.—Using a choke shunt circuit as a corrector for excessive bass.



It is, of course, possible to combine the treble limiting circuit in Fig. 1 and one or other of the bass limiters, to give a wide range of tone control. Such a combined arrangement, however, is of value only to the experimenter, who is constantly chang-

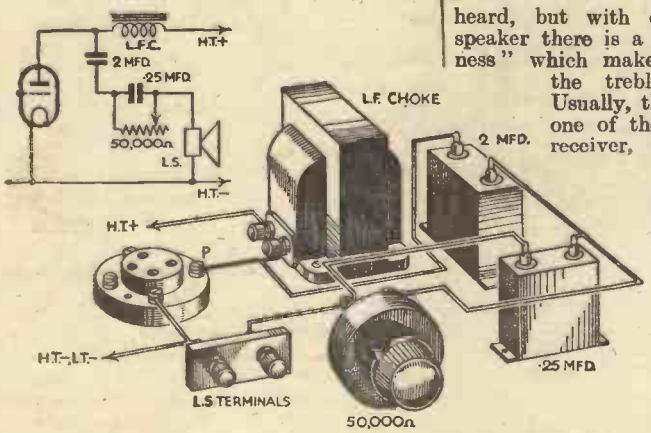


Fig. 3.—Correcting for excessive bass in choke-coupled output circuits.

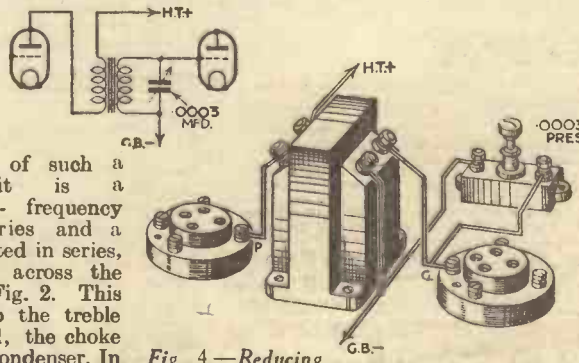
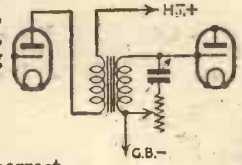


Fig. 4.—Reducing treble response by a pre-set condenser shunted across the L.F. transformer.

ing his speaker and output valve, and it seems scarcely worth while, to make provision for adjusting both treble and bass.



Tone Control in the Early Stages

It is frequently advisable to correct faulty tone, not in the output stage, but in earlier sections of the set. This may be required to compensate for defects in the performance of individual components, for defects in design of the circuit, or for unavoidable distortion such as that introduced by highly selective tuning circuits, or by certain types of volume control circuits. Fig. 4 shows a variable (pre-set) condenser connected across the secondary of a low-frequency transformer for this purpose. A capacity of .0003 mfd. is about right here, although if the condenser is shunted across the primary winding a much larger value, say .01 mfd., is required to give a similar degree of control.

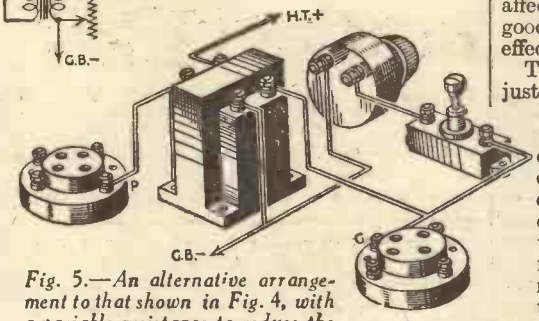
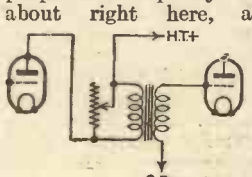


Fig. 5.—An alternative arrangement to that shown in Fig. 4, with a variable resistance to reduce the risk of resonance.



There is some risk that the condenser, in conjunction with the transformer winding, will form a tuned circuit which will resonate at some particular audible frequency, and thus set up low-frequency oscillation. This risk can be reduced by connecting a variable resistance in series with the condenser as in Fig. 5, or eliminated entirely by using a resistance shunt instead of the condenser (Fig. 6). In this case, however, both treble and bass will be cut; some overall decrease in strength will occur.

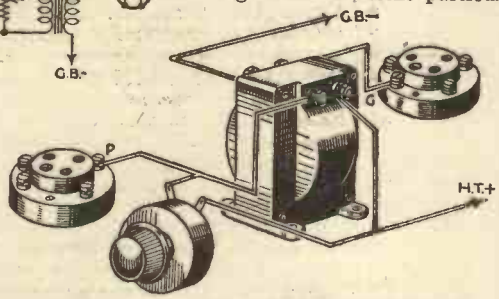


Fig. 6.—A variable resistance across the primary of the L.F. transformer cuts "top" without introducing resonance.

It might here be mentioned that bass can be cut by decreasing the capacity of a series condenser. Thus, in Fig. 7, the value of the coupling condenser C in the choke-capacity coupling arrangement will greatly affect the bass response, a large value giving good bass response and a small value effecting a considerable bass cut.

Two further points arise from what has just been said. First, the combination of a condenser in series with a transformer winding may be employed in certain circumstances to compensate for a deficiency in response at certain frequencies. Second, a tuned circuit consisting of a condenser and choke with, perhaps, a variable resistance, may be employed as a filter, to remove certain frequencies entirely or tone them down considerably.

(To be concluded)

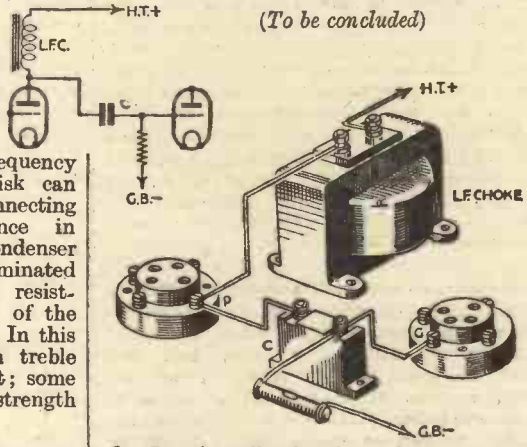


Fig. 7.—A small value of coupling condenser C will cause a cut in bass response.

By the Editor.

Iceland Calling

RADIO-TELEPHONE communication between all parts of Iceland and Great Britain is among the services to be provided by new Marconi short-wave transmitting and receiving stations which have just been ordered by the Iceland Posts and Telegraphs Administration for erection near Reykjavik. In addition, the new stations are to be used for short-wave broadcasting and for transmitting weather bulletins by radio-telegraphy at regular intervals. This wireless meteorological service will supplement the present cable meteorological services to Great Britain, France, Germany, Holland, Norway, Sweden, and the United States of America.

All the equipment for the stations is being designed and constructed at the Marconi Works, Chelmsford, and will assist in the employment of British engineers and craftsmen. When the installations are completed Iceland will possess the most up-to-date short-wave stations of their class in the world, incorporating the latest developments in radio technique. The transmitter will be of entirely new design, with a novel system of low-power keying and tone modulation—the direct outcome of the intensive research recently carried out by Marconi engineers into the problems of television transmission. Tests have shown that this new "television" modulation system gives remarkable fidelity of reproduction in telephone circuits and is also suitable for continuous-wave telegraph operation.

The telephone equipment will also include "privacy" apparatus, which will make speech transmitted from the Reykjavik station unintelligible in ordinary receivers by the frequency inversion system. The Marconi Company is also supplying terminal equipment, so that calls can be made to and from telephone subscribers not only in Reykjavik but in all parts of Iceland.

New Radio-gramophone Robot

FOR the first time in history of the combined radio and gramophone industries a radio-gramophone is to be produced at a comparatively inexpensive price which will change its own records. The first instrument of this kind, which was marketed five years ago, cost £120, was five feet in length, and weighed nearly a quarter of a ton. Within the next few days the "His Master's Voice" Company will be despatching from their factories at Hayes the first of the new instruments, called the "H.M.V. Superhet Five Forty-Two Auto-radiogram," in which an automatic mechanism weighing only 28 pounds will change up to eight 10in. or 12in. records automatically.

The experiments that have gone on behind the scenes in the H.M.V. Research Laboratories at Hayes to produce a simple record-changing mechanism which would be inexpensive to make, have been a romance in themselves. Behind closely-guarded doors more than thirty different types of mechanism have been evolved and three of these have been placed into manufacture. Up to now the cheapest reliable automatic radio-gramophone has cost 48 guineas, but with the introduction of the new model, which will cost 27 guineas, thousands of people who have been unable to have programmes of record and radio with the utmost ease will now be able to enjoy them in the same way as their more fortunate rich friends.

The new mechanism is a masterpiece of ingenuity and will play up to eight records continuously without being touched by hand, switching off after the last one; play eight records and repeat the last one indefinitely; or repeat a single record for as many times as the listener desires. It can also be used as an ordinary gramophone and the automatic mechanism cut out of operation.

High-Frequency Pentode as L.F. Amplifier

THE Mullard Universal valves are famous for the number of revolutionary changes embodied in their design and construction. We understand, also, that Mullard advocate an unusual course in connection with low-frequency amplification—the use of a screened pentode, hitherto associated in this country with high-frequency amplification only.

The diode is, of course, an efficient detector, but it cannot amplify signals after rectification; it is advisable, therefore, to include in the circuit an efficient L.F. amplifier in order fully to load an output pentode. For this purpose, Mullard recommend the use of the S.P.13 screened pentode. This valve has "straight" (as distinguished from variable-mu) characteristics, and is an efficient low-frequency amplifier giving very large stage gains. The price of the S.P.13 is slightly more than that of a triode, but the small additional cost is more than compensated for by the fact that inexpensive R.C. coupling is employed with it, whereas with a triode it would be necessary, in order to obtain an equal stage gain, to employ transformer coupling.

"Wireless for the Blind"

MESSRS. BURNE JONES have specialized for many years now in the production of receivers for blind persons, and we understand that further orders have now been placed with this company for 1-, 2- and 3-valve sets with special Braille tuning system. This brings the number of sets supplied to well over 24,000.

WORKING IN EBONITE.

(*Continued from page 211*)

bracket is a slot which accommodates a long stud. On this stud is a piece of tubing ¾in. outside diameter, which is clamped in any position within the restriction of the slots by nuts and washers. Strip metal guides are fitted opposite to each other on the base, the ends of the strips being turned up and drilled for fixing screws. The width between the strips should be just sufficient to allow a warding file to work comfortably, and the top distance piece on each guide form depth stops for the file, and could be made in the form of rollers.

To Use

After cutting the former to length and squaring up the ends, mark out the positions of the slots on one rib only. Place the former on the tube with the marked rib at the top. Then set the vertical adjustment so as to restrict the depth that the file will cut, and slide the angle bracket along until the first mark is in position under the file, and tighten the bracket. Hold the former with the left hand and keep it pushed against the face of the angle bracket, filing a slot in each rib in succession. Reset the angle bracket after filing, until all slots are completed. A 6in. warding file should be used to span both the guides.

(*Continued on page 221*)

WORKING IN EBONITE.

(*Continued from page 220*)

Inserts

Often it becomes necessary, as in Fig. 3, to provide a comparatively thin shield of ebonite around a cylindrical metal part. In many cases on this class of job one has to rely for the retention of the parts in position solely upon the fit between them. An attempt to press such parts together cold would result in the ebonite splitting. They can, however, be pressed together by first heating the ebonite in boiling water for a few moments to soften it.

By heating in a similar manner, sheet material may be bent to such forms as that shown in Fig. 4. It is best first to prepare a wood shape on which to bend the ebonite, leaving it clamped thereto until cool.

Burning

In conclusion, it may be said that slots for connecting wires (see Fig. 5), and special shaped holes or recesses may be made by burning with a piece of heated metal of a convenient section. To accomplish this very little heat is required, and therefore it would be as well to experiment on an odd piece of stuff to gain experience on this point. Holes should, of course, be first drilled as large as possible, before burning out.

WIRELESS INVENTIONS THAT ARE WANTED.

(*Continued from page 202*)

in the way of its L.T. and H.T. requirements. As a matter of fact, the filament or heater current is entirely wasted, since it serves only to cause the H.T. current to pass from the cathode to the anode. The first step in increasing the efficiency of valves should therefore concern the possibility of doing away with the hot cathode altogether. This means that a cathode must be found which will emit electrons at its normal temperature and without the application of any external heating supply. There is only one kind of material that will do that—the so-called radio-active metals, such as radium. Their expense would obviously preclude their use in the construction of valves, but it might be discovered in the near future that radio-active metals can be produced synthetically and at low cost. Who knows?

A Glow-discharge Valve

An alternative method of making a valve which does not require any power for heating its cathode is to use a form of glow-discharge tube.

Sufficient has been said to show that radio has by no means reached finality; there is still much to be done, and fortunes to be made by the pioneers who do it.

THE P.M.G. AND TELEVISION.

AT the moment of going to Press statements have appeared in certain daily papers regarding the setting-up of a Committee comprising representatives of the B.B.C., the Post Office, the Department of Industrial and Scientific Research, and other interested bodies. We would advise our readers that at the moment such a committee has only been suggested and nothing definite has yet been decided. As soon as any definite information is forthcoming regarding the future of television broadcasts in this country we shall publish full details, and for fully authentic information, therefore, readers should carefully watch our pages.

FLUID-LIGHT TUNING

First Details of a New Device which was Introduced to the Public for the First Time in April

VARIOUS devices have been introduced during the past year for the simplification of tuning, and we recently published an article entitled Visual Tuning Indicators. Various interesting methods were there described which enabled the exact tuning point to be ascertained by the eye instead of the ear. The reason for this method of tuning is to be found in the employment of automatic volume control. As our readers now know, the application of a strong signal to a valve which is acting as an automatic volume control results in the application of a certain bias voltage to H.F. amplifying valves, and therefore reduces the signal strength. If now we set the tuning condenser of a receiver so fitted, exactly to the frequency of a transmitting station, a certain bias will be applied to the H.F. valves. As the tuning condenser is moved away from this resonant point the signal strength will reduce and by means of the A.V.C. device the bias on the H.F. valves will be modified and the amplification of these stages will be increased. Unfortunately, however, as the condenser has been moved from the resonant point of that particular station, the amplification which will take place will be in respect of only that frequency to which the receiver is now tuned, and if the movement has been very slight, this means that over-amplification of the side-bands (as distinct from the true signal) will take place. Distortion, therefore, results. It is very difficult with a modern receiver to decide exactly when the condensers are set to the exact frequency, and in order to obtain perfect reproduction with even amplification of the side-bands on both sides of the tuning point it is really essential to provide one of these visual tuning indicators, and this also has the merit of permitting the volume control to be set to such a point that no sound can be heard from the speaker, and then the tuning control may be set to the desired point, and the volume afterwards turned up to the required setting. Inter-station noises, etc., are thereby avoided.

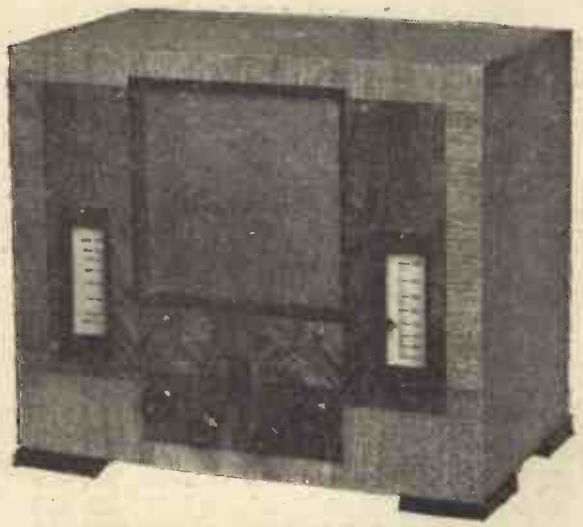


Fig. 1.—The small window through which the fluid-light device is viewed may be seen in the centre of the controls.

The H.M.V. Device

The new device, which has been produced by the H.M.V. Company, and which has been given the original name "fluid-light," is a very small fitment, at present available in two separate forms. These are illustrated in the accompanying illustrations. In Fig. 1, a small escutcheon is fitted to the cabinet front, and at the opening of this appears a narrow glass tube—not unlike a very small thermometer. When the receiver is switched on this glows a bright green colour and gives the appearance of a tube of green liquid. As the tuning control is turned the height of the liquid appears to vary, the effect actually being controlled by means of a shadow cast upon the upper rear portion. The optimum setting for a particular station is that which shows the highest column of "liquid" or, looked at in another way, the narrowest shadow. In the second version, Fig. 2, when the receiver is switched on two illuminated arrows appear at the rear of the tuning scale, and the shafts of the arrows are separated by a dark space. This space varies or, in other words, the lengths of the arrows vary, and the optimum setting is indicated by the longest arrow (or, again, the narrowest shadow).

Fig. 2.—In this model the device takes the form of two illuminated arrows on the tuning scale.

RADIO CLUBS AND SOCIETIES

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

ANGLO-AMERICAN RADIO AND TELEVISION SOCIETY

Short-wave reception was discussed at the last meeting of the Uxbridge District Branch of the above society. Mr. Leslie W. Orton reported having heard (during the preceding week) KJTY, the Antarctic ship, direct; XETE, Mexico City; COC, Havana; 1BC, 3BC, and, apparently, 5BMO, Venezuela; 2ME, Sydney; 9GW and other Canadian stations; 3XAL, 8XK, 1XAZ, 3XAU, 9XF, 2XE.

Readers interested are invited to attend any of the meetings, and there are no charges.

Full particulars from Leslie W. Orton, "Kingsthorpe," Willowbank, Uxbridge.

THORNTON HEATH RADIO SOCIETY

A meeting of this society was held at St. Paul's Hall, Norfolk Road, on Tuesday the 17th ult., presided over by Mr. Frank Whitfield. Mr. Reginald Mitchell gave [some practical hints on the construction of wireless] cabinets, and on the method of preparing the wood both by sandpapering and scraping, and finally, how the polish should be applied. He carefully explained how to deal with various kinds of wood, and demonstrated his remarks upon samples of timber. Full particulars of future demonstrations and lectures can be obtained from the Hon. Secretary, Mr. Jas. T. Webber, 368, Brigstock Road, Thornton Heath.

THE BURNT OAK AND DISTRICT RADIO SOCIETY

Automatic telephony and radio have very little in common, but the former provided an interesting diversion for members of the B.O.D.R.S. when they visited the Hendon and Colindale Automatic Telephone Exchange on Saturday, 14th April. This occupied about two and a half hours. Short-wave work has taken a prominent place in the talks during the last month, and the data that has been provided at the meetings will prove a valuable asset to the members, who anticipate investigating the short-wave band.—Hon. Sec., A. D. Donati, 59, Horsecroft Road, Burnt Oak, Middlesex.

GLASGOW AND DISTRICT RADIO CLUB

The above club has opened a workshop equipped with apparatus for members' use. Arrangements have also been made for technical instruction in all branches of wireless. Particulars of membership may be had on application to the Secretary by enclosing a stamped addressed envelope.—Hon. Sec., Mr. Henry Duff, 90, Budhill Avenue, Shettleston, Glasgow, E.2.

INTERNATIONAL SHORT-WAVE CLUB (LONDON)

An interesting demonstration, entitled "Amplifier and Microphone Technique," was given at the London Chapter meeting held on Friday, 20th April, at the R.A.C.S. Hall, Wandsworth Road, S.W.8. The amplifier used on this occasion was a Trix (Type T225), A.C. operated, three stage, giving 16 watts undistorted output. Members were given an opportunity to test their abilities before the microphone, and it was found that several of them possessed very good qualifications. An added attraction was given by Francis J. Holloway, just returned from Ceylon, who gave a talk on short-wave reception in that country.—A. E. Bear, Sec., 10, St. Mary's Place, Rotherhithe, London, S.E.16.

THE SOUTH LONDON AND DISTRICT RADIO TRANSMITTERS SOCIETY

A very interesting talk was given by Mr. Glide, of Ferranti, Ltd., at the monthly meeting of the above society, held at the Brotherhood Hall, W. Norwood, on Thursday, April 5th. The subject dealt with was precision measuring instruments and receiving components.—Hon. Secretary, H. D. Cullen (G5KH), 144, West Hill, Putney, S.W.

GOLDERS GREEN AND HENDON RADIO SCIENTIFIC SOCIETY

Loud-speaker reproduction was the subject of a lecture given by Lieut.-Col. H. Ashley-Scarlett, D.S.O., at the last meeting of this society. The lecturer first dealt with some of the fundamentals of the science of sound. Various forms of L.F. amplification were reviewed, a preference being given to resistance capacity coupling as being best for the reproduction of transients. Tone control and pick ups were discussed at some length.

The Annual Direction Finding Competition, which is open to PRACTICAL WIRELESS readers, will be held on May 27th in the neighbourhood of St. Albans—Rickmansworth—King's Langley. Wavelength, 150 m. Six valuable prizes will be offered to groups. Details of scheme obtainable on application to Hon. Sec., J. Hillier, Esq., 8, Denehurst Gardens, Hendon.

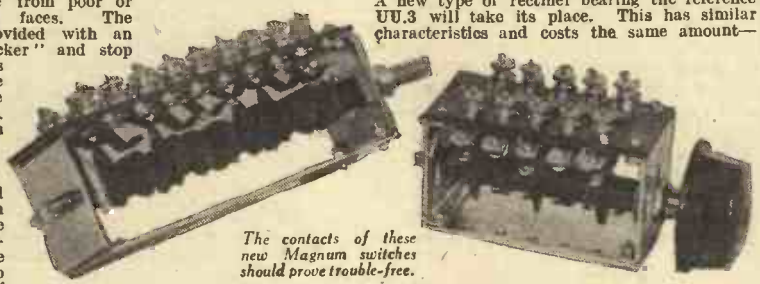
Facts and Figures

Components Tested in our Laboratory

BY THE PRACTICAL WIRELESS TECHNICAL STAFF

MAGNUM MULTI-CONTACT SWITCH

IT is an indisputable fact that the majority of troubles which arise in a broadcast receiver are the direct result of faulty contacts in one of the switches. Many different patterns have been designed from time to time, and some ingenious methods have been suggested for overcoming the troubles. One of the latest suggestions is illustrated below, and is a product of Messrs. Burne-Jones and Co., Ltd., of Magnum House, 296, Borough High Street, S.E.1. A rotating spindle is fitted with a number of insulated cams, and these press against spring arms which are of such a shape and length that a "wiping" movement is effected on the gold-silver contact points, and thus no trouble is likely to arise from poor or dirty contact faces. The spindle is provided with an ingenious "clicker" and stop device and gives a very positive indication of the correct settings. As may be seen from the photographs, the whole assembly is very rigid and varies in length according to the number of contacts which are fitted. Owing to the method of assembly the H.F. resistance of the contacts is very low and renders the switches suitable for use in receivers operating down to wavelengths of the order of 1 metre. One-hole fixing is possible, and holes drilled in the metal frame will also permit of the switch being screwed or bolted to a baseboard. The overall size of the frame is 1⅛in. by 1⅛in., and the length, as mentioned above, will vary according to the number of contacts. An eight-point switch is 4in. long. With five pairs of contacts the price is 5s. 6d., with six or seven pairs the price is 6s., and with eight or nine pairs the cost is 6s. 6d. No knob is included in these prices. A Q.M.B. switch may be operated by means of the same control, and an extra 1s. 6d. is charged for the addition.



The contacts of these new Magnum switches should prove trouble-free.

A CROONER'S MIKE

FOR those who require a sensitive, low-priced microphone, the models illustrated at the foot of this page will no doubt prove of interest. At 12s. 6d. these are remarkably cheap products, and are included in the range of microphones handled by Electradix Radios, of 218, Upper Thames Street, E.C.4. These are very small models and will prove very useful to dance-band vocalists or others desiring a sensitive low-priced instrument. We have before us two testimonials from readers of this paper who have purchased these mikes and speak very highly of the performance which they give. We also understand that a sight-seeing coach service is making use of these instruments to enable the driver to describe places of interest en route without having to shout or remove his attention from the driving wheel.

Two small microphones from the Electradix range which have proved very satisfactory to some of our readers.

MARCONIPHONE PRICE REDUCTIONS

PRICE reductions which came into operation on April 19th apply to the following Marconiphone instruments, which still form part of the Marconiphone catalogue: *Model* "291" *Radio-gram.*, from 50 guineas to 42 guineas; *Model* "290" *Radio-gram.*, from 42 guineas to 35 guineas; *Model* "276" *Receiver*, from 22 guineas to 17 guineas.

MAZDA VALVE WITHDRAWN

WE understand that the UU.60/250 indirectly-heated rectifying valve manufactured by the Mazda people will be withdrawn as from May 1st. A new type of rectifier bearing the reference UU.3 will take its place. This has similar characteristics and costs the same amount—12s. 6d. Supplies are now available and readers should make a suitable note in their reference books or catalogues.

NEW MULLARD FREQUENCY-CHANGER

ANOTHER new valve is announced from the Mullard factory, this time an indirectly-heated frequency changer of the eight-electrode type. The internal construction consists of six grids and an anode located concentrically round a cathode. The first two grids with respect to the cathode form a triode heterodyne oscillator, while the third grid acts as a screen between the oscillator and mixer portions of the valve. The remaining three grids together with the anode form a multi-mu H.F. pentode. Between the third grid, or screen, and grid 4, the control grid of the pentode mixer, exists the "virtual cathode" formed by a cloud of electrons which have been accelerated by the high potential screen and repulsed by the negative control grid of the pentode.

The Octode is an "electron-coupled" frequency changer, that is to say, the mixing of the oscillator and the signal frequencies is effected by the electron stream in the valve itself—no external coupling being required. The F.C.4 will be fitted with the standard seven-pin base.

PETO-SCOTT METAPLEX CHASSIS

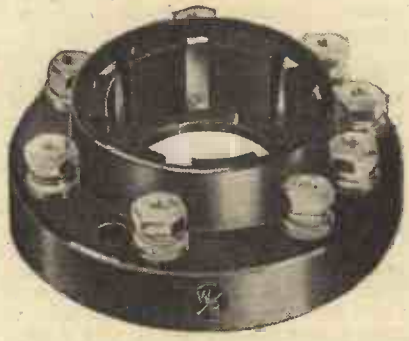
WE have received a number of complaints from our readers who state that they are unable to obtain the Metaplex chassis from their dealers. The excuse given is that the makers, Messrs. Peto-Scott, deal with the public only and will not supply the dealers. We have taken this matter up with Messrs. Peto-Scott, and learn that the British Radio Gramophone Co., Ltd., act as wholesale distributors for the British Isles, and can supply this material to any dealer. They also point out that they have circularized the whole of their trade list and have even sent sample pieces of the Metaplex material together with price lists. We shall be glad, therefore, if readers will note this fact, and in the event of any further difficulty in obtaining supplies, perhaps they would draw the dealer's attention to this fact.

FERRANTI AF4 TRANSFORMER

IN 1925 Messrs. Ferranti placed on the market a low-frequency transformer known as the AF4, and after several years it was partially withdrawn. Owing to its considerable popularity, and its freedom from breakdown under tropical conditions, Messrs. Ferranti have decided to reissue this component, and for the benefit of new readers the following characteristics of the AF4 should be noted. The ratio is 1 to 3.5, and the inductance of the primary is 45 henries with no D.C. and 20 henries with 3 mA. flowing through the primary. The component is very substantially built, weighing 1 lb. 8 oz. A .0003 mfd. fixed condenser is included inside the case and is connected across the primary winding to assist in obtaining proper rectification in the valve with which it is employed. The D.C. resistance of the primary winding is 900 ohms, and the price is 17s. 6d.

W/B VALVE-HOLDER FOR UNIVERSAL VALVES

THE illustration below shows a new baseboard type valve-holder for the new Mullard A.C./D.C. valves. The list price is 1s. 9d., and supplies are now available for immediate delivery. This component is, to the best of our knowledge, the only baseboard type available, and obviates any difficulty of poorly fitting chassis holes and consequent insecure mounting. The contacts at the side may clearly be seen in this illustration, and no doubt chassis-type holders will shortly be available.



A new valve-holder for the recently introduced Mullard Universal valves.

"EXCEL" BATTERIES

WE recently published a test report concerning the H.T. batteries manufactured by the Excel Battery Co., of Northampton. Owing to the huge demand for these batteries, the Excel Company have been unfortunately unable to keep pace with the number of orders, and they wish to apologize to those readers who have sent money and are still awaiting delivery, and they also wish to point out that, at the moment, they are unable to accept any further orders. As soon as the present delay has been overcome they will be in a position to accept orders at some hundreds per day, and delivery should not take more than two or three days—in fact, they hope in the majority of cases to send orders by return of post.

NEW SIEMENS BATTERY

MESSRS. SIEMENS have now introduced a new Full o' Power Battery for use with the K.B.274 Kobra set, and this is size No. 1193, 120 volts H.T. and 9 volts G.B. combined. Tappings for G.B. are provided at every 1½ volts, and for H.T. at 60, 72, 90, 99, 108, 114, and 120 volts positive. The list price is 12s. Dimensions, 7¾in. x 8¼in. x 3in. high.

They have also announced a reduction in the list price of size No. 1165 Battery for the Marconiphone Set No. 255 from 14s. to 12s.

One of the most attractive radio-gram cabinets ever put before the home-constructor. This is the Peto-Scott cabinet which combines a record storage cabinet and a book-rack.

IMPRESSIONS ON THE WAX

By TONEARM.

The B.B.C. Symphony Orchestra

Suite No. 3 in D Major (Bach) and *Prelude from Violin Sonata No. 6 in E* (Bach), *H.M.V. DB*1963/5, played by the B.B.C. Symphony Orchestra (conducted by Adrian Boult), is an outstanding success. Bach had a greater output than any other composer. He must have written more than a thousand different works. It is remarkable when we consider that although he composed by routine, as part of his work as organist and choirmaster, he was able to produce so many works of genius. Of all his thousand compositions, "Air on the G String" is the most popular, and is included in this 3rd Suite.

I Passed by Your Window and *There is a Flower that Bloometh*, sung by Walter Glynne, *H.M.V. B*8040. We hear that there is every possibility that this well-known concert-hall artist will accept a rôle in an important West End production in the near future. His earlier recordings of these two songs were among the most popular sales of the ballad record.

Whistler and His Dog and *Warbler's Serenade*, played by London Palladium Orchestra, *H.M.V. B*8004, is rather a novel record. The whistling, dog bark and bird trills, although so realistically recorded, are really from the mouth of Imito, the well-known animal impersonator.

Songs Without Words—Potpourri (Mendelssohn), *H.M.V. C*2615, played by Marek Weber and his Orchestra, is a selection of Mendelssohn compositions which made his name. They were the rage in the Victorian era and this is a potpourri of the best numbers.

Two bargains in inexpensive orchestral records are *H.M.V. C*2619-20, on which the London Philharmonic Orchestra, conducted by John Barbirolli, play Tchaikovsky's *Ballet Suite*. At the moment ballet music is extremely popular, and during the recent successful ballet season in London this suite provided the music for probably the finest of the dances.

John McCormack sings *I Know of Two Bright Eyes* and *As I Sit Here* on *H.M.V. DA*1342 in his usual entrancing style. The first of these titles was one of the favourite items of his repertoire when he used to sing for a guinea a night in a little Italian restaurant in Leicester Square.

Although the north of England is generally considered to be the locale of the majority of admirers of brass and massed band performances, "His Master's Voice" are finding that their records of Tattoo Massed Bands are selling extremely well in all parts of the country. Two more records which were made during the Aldershot and Tidworth Tattoos are well worth obtaining. The Bands of the Southern Command, playing *The Day Thou Gavest* and *Eternal Father* on *H.M.V. B*8038, is, we believe, the first massed bands recording of hymns, and their performance is only equalled by the Bands of the Aldershot Command playing two stirring marches, *Officer of the Day* and *Colonel Bogey*—on *H.M.V. B*8051.

Thrilling Robeson Medley

Probably the most famous coloured artist in the world is Paul Robeson, who has had a varied musical career from singing negro spirituals to the latest hits of the day. On *H.M.V. C*2621 he has recorded a medley of the songs which have made him famous. Whilst the whole record is highly entertaining, there will be few people who cannot be thrilled by his stirring voice singing *Ol' Man River* at the end. A comparatively new orchestra to the "His Master's Voice" lists is one led by Alfredo, who makes a speciality in playing at exhibitions in all parts of the country. His renderings of a *Medley of Strauss Waltzes* and *Spanish Gypsy Dance* on *H.M.V. B*8069 are captivatingly authentic with the prominent guitars and lilting rhythm.

Among the ordinary new dance records are several of special interest. Ray Noble and his Orchestra make their début in the hot rhythm class with *Tiger Rag* and *Japanese Sandman*. These titles were originally orchestrated by Ray Noble for his B.B.C. broadcast in the musical show, *One Good Turn*. A rather unusual dance record is of *This Town's Too Quiet* and *My Hat's on the Side of My Head* by the same band on *H.M.V. B*6421. The vocal refrain of this comedy number is by its author, Leslie Sarony, and certain words and the accompanying music have been left out purposely in order that listeners can supply the words. The other tune we prophesy will be the hit is from Jack Hulbert's new film. The dance record of the songs in his wife's, Cicely Courtneidge's, new picture, *Aunt Sally*, is one of the best recorded dance records that has been made for some time. Jack Jackson and his Orchestra play *We'll All Go Riding on a Rainbow* and *The Wind's in the West* on *H.M.V. B*6415, and we understand that a different method of grouping the orchestra in front of the microphone in the H.M.V. studios was used, thus giving an almost stereoscopic effect to the music.

Humour and Thereabouts

In his heyday I liked Billy Merson. He nearly always managed to get hold of good tunes for his songs. So a collection of quite his best numbers will, I think, be appreciated. His admirers will enjoy his very comprehensive turn with *Prairie Life, The Photo of the Girl I Left Behind Me*, and so forth. A chorus intrudes, but not so as to spoil anything. I have an idea that *Columbia DX*484 should be popular.

A. J. Alan—the gentleman who leads you down a very long garden, pushes you in the river and leaves you to get out and walk home. That's how I've always felt about him! Anyway, he has made a record for the first time—*Regal-Zonophone MR*991. The titles are *The Origin of the Horse Marines* and *Hilarian the Fish*. There is no thrill; each is just a far-fetched yarn with no particular point—but they are A. J. Alan.

It might be well to find out if the Vicar is likely to call before you play *Sunday School Stories*—an entirely vocal affair by Billy Cotton and his Band on *Regal MR*1020. The exploits of the older Biblical heroes are re-told in modern idiom and conception. Some will protest, but their plaints are not likely to be heard in the applause of the crowd. Better hear it and judge for yourselves.

REPLIES TO BROADCAST QUERIES.

EDITOR'S NOTE: Querists must limit their queries to three per letter.

PHONE MAD (Gillingham): Amateur transmitters: OE6DK, Karl Doppelhofer, Friedrich Hebelg. 10, Graz (Austria); CT1IB, Mario Reynaldo de Barros Ferreira, 5, Largo das Latinhas, Braga (Portugal); SU1CH, E. M. Chorlian, 7, Rue Peake-Bulkeley, Alexandria (Egypt). SHORT-WAVER (Greenock): G2ZQ, J. Hunter, 63, Harvey Road, Blackheath, S.E.3; OE1SH, amateur transmitter, Vienna; WEH, Rocky Point (N.Y.); DHE, Nauen (Germany), 40.96 m. SAMMY (Stoke Newington): 5th harmonic of Nice-Juan-les-Pins (France), on about 49.8 m. SILVANUS HAYWOOD (Tipton): Received through LSX, Monte Grande, Buenos Aires, on 28.98 m. The address is: *Transradio Internacional, San Martin* 329, *Buenos Aires* (Argentine). KFZ is one of the calls of the Admiral Byrd Expedition. Transmission heard was a test with Rugby or possibly with London terminal prior to the relay from the Bay of Whales. A. PAY (Maidstone): Yes, VK2ME, Sydney (N.S.W.) on 31.28 m. working between 06.00 and 08.00 G.M.T. (16.00-18.00 in Sydney the same afternoon). S. HOPPER (Brighton): W8BBB, R. Zepp, 403, High Street, Wadsworth, Ohio; W2BYY, H. Koegler, 220, Conover Street, Brooklyn, New York; regret cannot trace W3EGQ. ARTHUR BROWN (Forest Hill): G6VJ, Royal Naval College, Dartmouth, Devon; G6WY, H. Maxwell-Whyte, "Killiney," Worsley Bridge Road, Beckenham; cannot trace SU1CA, but if SU1CH, E. M. Chorlian, 7, rue Peake-Bulkeley, Alexandria, Egypt. E. WALKER (Sheffield): We can trace the following call signs: G6KV, E. Carrington, 90, Derby Road, Heanor, Nottingham; G2AX, N. Blackburne, 11, Sea Road, Bexhill-on-Sea, Sussex; G2XV, G. Jeapes, 2, Salisbury Villas, Station Road, Cambridge. PA0WV. Dutch amateur, but cannot trace call sign. D. WOOD (Stoke): K3SA, R. Bartholomew, Barrio de Sabana Hoyos, Garrochales (Porto Rico); W3ZJ, T. Hall, Jnr., 3.275a, Derry Street, Harrisburg (Pa.); W2DB, H. T. Cervantes, 19, Bradley Road, Scarsdale (N.Y.). Many thanks for information. A. R. GLOVER (Yorkshire): (1) Report reception to: The Secretary, Information Section, League of Nations, Geneva, Switzerland, and politely ask for confirmation, (2) HBL and HBP, Prangins, Switzerland.

SUPER ONE-VALVE RECEIVERS

(Continued from page 200)

To make good contact at these points a small wood screw and a brass washer should be employed to hold the wire in position. Two of the three electrolytic condensers make their negative connection through the baseboard, to which they are clamped, but the third one must be insulated by placing a fibre washer between the body of the condenser and the metallized surface of the baseboard.

W. B. RICHARDSON.

LIST OF COMPONENTS FOR THE PENTODE ONE-VALVER

1 Ormond .0005 mfd. variable condenser, No. 4
1 Ormond dial, No. 361.
1 Telsen dual-range aerial coil, No. 76.
1 Telsen 3-point wavechange switch.
1 Telsen fixed condenser with grid leak clips, .0001 mfd.
1 Telsen grid-leak, ½ megohm.
2 Dubilier electrolytic condensers, high voltage type, 4 mfd.
1 Dubilier electrolytic condenser, high voltage type, 8 mfd.
1 Dubilier fixed condenser type 9200, 2 mfd.
1 Dubilier metallized resistance, 1 watt type, 10,000 ohms.
1 Graham Farish .0003 mfd. differential reaction condenser.
2 Belling Lee terminal blocks.
4 Belling Lee terminals, "L.S.," "L.S.," "Aerial," "Earth."
1 Westinghouse metal rectifier, H.T.8.
1 R.I. "Dux" Audirad choke.
1 Wearite mains transformer, No. T-8.A.
1 Bulgin mains on-off switch, No. S.85.
1 Bulgin enclosed twin fuseholder with fuses, No. F.14.
1 Bulgin mains plug, No. P.28.
Metaplex baseboard, 10in. x 10in.
Plywood panel, 10in. x 10in. x 3-16in.
Plywood chassis side pieces, 10in. x 4in. x ¼in.
Glazite connecting wire.
Flex, wood screws, washers, etc.
Valve: Cossor MP/PEN.
Speaker: W.B. Microlode.

PRACTICAL LETTERS FROM READERS

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

"A Valuable Work of Reference"

SIR,—I have just received my copy of "Newnes' Everyman's Wireless Book." It is certainly a useful and valuable work of reference, and is worthy of PRACTICAL WIRELESS.—E. S. JONES (Wallasey).

Our Short-wave Section

SIR,—In regard to the letter written by "Quest" of Birmingham and appearing in your issue of March 24th, we quite agree with him regarding the apparent lack of interest in short-wave work in this country. We greatly appreciate your Short-Wave Section each week, for very few other weekly papers deal with the technical side of short-wave work, but we should like to see it enlarged and made more attractive to the advanced short-wave amateur.—C. CRAMP, Hon. Sec., International Short-Wave Club (Leicester).

An Appreciation from the East Indies

SIR,—I have received the tool kit, Newnes' "Encyclopædia of Popular Mechanics," and Newnes' "Wireless Constructor Encyclopædia," and must thank you for their wonderful value and handiness. Both the Encyclopædias are the envy of my friends. They contain so many useful tips for both amateurs and professionals alike.—ROY H. ROWLANDS (Penang, Straits Settlements).

A South African Reader's Thanks

SIR,—I thank you for the gifts recently received. The Tool Kit is just what I require, and the "Popular Mechanics Encyclopædia" is very interesting. I have now had six gifts altogether for which I also thank you, not forgetting the many interesting columns in PRACTICAL WIRELESS.—A. POLLOCK (Windhoek, S.W. Africa).

B.B.C. Television Transmissions

SIR,—I find with regret that the B.B.C. television transmissions have been cut down to two a week, and I fail to see the reason for this. The high-definition system is a long way off as yet. There must be many people who have televisors and a number who have only just built them, and who now find they are practically obsolete. To think we only have one hour out of ninety hours of radio for television. It would not be so bad if both transmissions were at night, because not many working people are at home to receive the morning transmission. There must be a large number of readers who lament this very bad state of affairs.—V. S. BORHAM (Hayes End, Middlesex).

"Everyman's Wireless Book" for Solving Problems

SIR,—Please accept my sincere thanks for your presentation of "Everyman's Wireless Book." By a strange coincidence I purchased a moving-coil loud-speaker on the day the book arrived, and experienced a slight "tinny noise" on very loud passages. Of course, I blamed the speaker, but on looking up the chapter, "Correct use of Loud-speaker," I found I had been overloading the detector. I have replaced this and everything is now O.K. Many thanks. PRACTICAL WIRELESS is years ahead of any other journal I have seen.—T. BAVL (Bath).

Suggested Progressive "Leader" Series

SIR,—I noticed recently a paragraph in PRACTICAL WIRELESS, which stated that you would welcome suggestions concerning the proposed "Leader" series of designs. As a constructor of radio sets I find it very annoying, when considering a new set, to discover that only a small proportion of the components I have in hand can be incorporated in the circuit. I suggest, therefore, that you should have a progressive series of "Leader" designs, starting with a simple receiver, say, of the detector and L.F. type, then adding refinements and enlarging it by easy stages, each set incorporating in it the components of the previous one, as far as is possible. By giving a battery and mains-operated version of each stage, the popularity of such a series would be greatly increased.

I should like to take this opportunity of thanking you for my copy of Newnes' "Everyman's Wireless Book" which is giving me great assistance in my experimental work.—PHILIP A. MURPHY (Tottenham).

A Gift not to be Missed

SIR,—I have received your book, "Everyman's Wireless Book," for which I thank you. I consider it an excellent book for any amateur; it is packed with information that is most useful, and is a gift not to be missed.—G. F. EASTWOOD (Barnsley).

CUT THIS OUT EACH WEEK.

Do you know

—THAT there are some special push-pull circuit arrangements which provide very high-quality reproduction.

—THAT owing to the method of coupling in these circuits they are known as paraphase and duophase coupled circuits.

—THAT a magnifying lens for television purposes may be constructed from two concave clock-face glasses, cemented together and filled with water.

—THAT a four-valve, eight-stage receiver may now be constructed to utilize the superhet principle.

—THAT as much as 20 per cent. overload may be tolerated in a push-pull amplifier.

—THAT between 5 and 6 metres there are 10,000 kilocycles, and yet between 300 and 500 metres there are only 400 kilocycles.

—THAT the above fact accounts for the difficulty of tuning on short-waves when using large-capacity condensers without very slow-motion drives.

The Editor will be pleased to consider articles of a practical nature suitable for publication in PRACTICAL WIRELESS. *Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor,* PRACTICAL WIRELESS, *Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2.*

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

CATALOGUES RECEIVED

To save readers trouble, we undertake to send on catalogues of any of our advertisers. Merely state, on a postcard, the names of the firms from whom you require catalogues, and address it to "Catalogue," PRACTICAL WIRELESS, *Geo. Newnes, Ltd., 8/11, Southampton St., Strand, London, W.C.2. Where advertisers make a charge, or require postage, this should be enclosed with applications for catalogues. No other correspondence whatsoever should be enclosed.*

NEW FERRANTI ELECTROSTATIC VOLTMETERS

TWO new electrostatic voltmeters have recently been marketed by Ferranti Limited. One is a 150 v. instrument, spring mounted in a cast-iron case, and arranged for measurements to be taken with the dial in a horizontal position. The other model is a 12 kv. instrument, with an upright dial, and is fitted in a polished wood case. A leaflet (Wh. 526/1) gives further particulars of these meters, and also details regarding a new 2½in. A.C. and D.C. instrument, which may be used as the basis of an elaborate testing equipment by those who desire to construct such apparatus themselves. With this instrument, A.C. and D.C. readings can be made at choice by the operation of a switch at the top of the instrument. The full scale readings are 5 v. A.C. and 50 Mv. D.C. Both these ranges have a resistance of 1,000 ohms per volt, giving additional ranges of 0-1 mA. A.C. and 0-1 mA. D.C. Copies of the leaflet can be obtained on application to Ferranti, Limited, Hollinwood, Lancashire.

WATMEL VOLUME CONTROLS

A USEFUL range of potentiometers and variable resistances is shown in a list recently issued by Watmel Wireless Coy., Ltd. Wire-wound potentiometers of 5-watt rating suitable for voltage regulation of H.T. supply, screened grid control, etc., are listed, and also a totally enclosed potentiometer with composition element. Two new components consist of totally enclosed metal-cased wire-wound potentiometers, which are obtainable in any values up to 15,000 ohms. One is fitted with a snap-action switch, rated to carry 3 amps at 250 volts. Various types of dual potentiometers, and a new heavy-duty variable resistance are also listed. The latter component, which is specially designed for the control of motors for television and for laboratory use, has the elements wound on two slates, and variation of resistance is obtained by rotation of a contact slider which spans the two resistance formers. Readers contemplating the fitting of an efficient volume control to their sets are advised to write for a copy of this list. The address is Imperial Works, High Street, Edgware, Middlesex.

AVO MINOR COMPETITION

An interesting competition in which £120 in prizes is offered is announced by The Automatic Coil Winder and Electrical Equipment Co., Ltd., Winder House, Douglas Street, London, S.W.1. Entrants in the competition have to use an Avo Minor, the well-known testing instrument, and write down a comprehensive list of tests which it is possible to make with the instrument. Alternatively, competitors may write down, in as few words as possible, their most interesting experience of the Avo Minor in locating a difficult, unusual, or surprising fault for defective component. The prize money will be distributed as follows:—A first prize of £1 a week for a year; a second prize of 10s. a week for a year; a third prize of £10 cash, or one of 25 consolation prizes. Full particulars of the competition, and entry form, are given in a folder, copies of which can be obtained from the address given above.

LET OUR TECHNICAL STAFF SOLVE YOUR PROBLEMS

REPLIES TO QUERIES and ENQUIRIES by Our Technical Staff

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

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

SPECIAL NOTE.

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

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

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

BRINGING AN OLD SET UP TO DATE

"I have an old type 3-valve set with plug-in coils and 4-volt valves. Could you tell me what alterations would be required to bring it up to modern requirements?"—S. O'D. (Moville, Co. Donegal).

It is quite possible that the circuit arrangements of your receiver would not warrant the expenditure of new components. However, we would suggest first of all the replacement of the plug-in coils by a modern tuning coil of the dual-range type, and new valves of the two-volt class. Fit also an output filter as has been explained in these pages on many occasions. The actual wiring cannot be given owing to lack of knowledge of the present circuit arrangements, but you could no doubt arrange something on the lines of the recently described Leader, or the Selectone, or a similar circuit.

MAKING A CALIBRATION CHART

"I am about to make a calibration chart for medium and long waves. I know that I have to use squared paper and mark the dial readings along the bottom and the medium waves on the left and the long waves on the right, but I am not clear regarding the placing of the various dots which I know I have to join up to get the curve. Can you please explain this point?"—A. W. (Salford).

Having marked out the paper as you mention you must tune in a station on the medium waves and when its exact position has been found note the reading of the condenser which tunes the detector grid circuit (not the aerial tuning condenser). Suppose for example you tune to London National on 261.1 metres, and the dial is set to 10 degrees. The first dot is then marked at the point where the vertical line running up from 10 crosses the horizontal line running from the 261.1 metre mark. Next tune to, say, Athlone on 531 metres. Suppose this is found at the condenser setting of 80 degrees. Running up from this marking on the lower edge of your chart you will cross the line which runs horizontally from the 531-metre mark and the point of intersection is where the dot is made. Continue to do this for as many stations as possible, and then join them with a straight line. Disregard the slight kinks in the curve.

BLUE PRINT REQUIRED

"Have you any details of an A.C. mains three-valver including one stage of S.G.-H.F. amplification followed by a grid rectifier and a pentode output stage? The valves to be indirectly-heated with a 4-volt 1 amp. rectifier."—G. S. C. (Renfrew, N.B.).

The Mains Express Three, which was described in one of our earlier issues, fills all the above requirements. The Blue Print is No. 3, and it may be obtained from these offices for 1s. post free.

JELLIFYING ACID

"My query might interest other readers. I wish to know how to jellify the acid in L.T. accumulators, and also how to make a cheap rectifier. I started to make the charger you described some time ago, but I was told the tantalum strip would cost 4s. and not 1s., as you stated."—E. B. (Halifax).

To jellify the acid in an accumulator you must add silicate of soda slowly to the acid until the required solidity has been attained. Alternatively, you can buy various proprietory brands of chemical which are sold for the purpose. Your local dealer may be able to assist you. The tantalum strip you refer to may be obtained at the price mentioned from The Hart Accumulator Company, of Stratford, E.15.

DATA SHEET No. 77

Cut this out and paste it in a notebook.

H.T. BATTERIES SUITABLE FOR PORTABLES.

MAKER	VOLTAGE	DIMENSIONS
Brittania Batteries	99 volt	9½ x 5½ x 2⅞
	90 volt	7⅞ x 6⅛ x 31/16
Ever Ready.. ..	99 volt	9⅜ x 5⅛ x 2⅝
Helicsens	99 volt	9½ x 5 x 3
Grosvenor.. ..	99 volt plus 6 volt G. B.	8⅝ x 6 x 3
	99 volt	9½ x 5 x 3
Siemens	99 volt	9⅜ x 5⅛ x 3
Smith & Sons ..	99 volt	9⅛ x 5 x 3
Vince's	108 volt	10⅜ x 5¼ x 3

MAINS TRANSFORMER PROBLEM

"I have a mains transformer which has a winding marked 2.0.2 1 amp. and 2.0.2 3 amps. Is this suitable for 4 volt indirectly-heated valves with metal rectification? Also, could I use a metal rectifier for a set which is shown with valve rectification?"—J. P. S. (Burton-on-Trent).

The 2.0.2 volt windings are intended for the operation of indirectly-heated valves, and we should imagine that your particular specimen is intended for the operation of three such valves, with the remaining 2.0.2 (1 amp.) winding for the heating of a rectifying valve. It is possible to change the metal rectifier of a circuit for valve rectification, provided the mains transformer has a suitably secondary. The actual alterations will, of course, depend upon the type of circuit which is used, i.e., voltage-doubler, half-wave, etc.

REWINDING A SPEAKER MAGNET

"A few months ago I bought a balanced armature loud-speaker and dropped it. I had to unwind the magnets to mend it, and now I am at a loss in which direction to rewind it so as to preserve the magnetism. Can you help me?"—G. R. (Pontypridd).

Wind back the original wire on the formers which you removed, putting the turns on in a clockwise direction. When finished, you will have to connect the speaker to the receiver in order to obtain a knowledge of the direction of the flow of the current so as to obtain the correct direction. To do this, adjust the armature until it is attracted to the pole faces and then slowly release the tension until it flies away. Reverse the connections to the receiver, and if in the new position you can give the tensioning device a few more turns before it is drawn to the pole faces, the original connection was all right. If, on the other hand, the new connection causes the armature to be attracted at once, then this is the correct way round and the leads should be suitably marked.

ALTERNATIVE COILS FOR THE LEADER

"I would like to build your Leader Three, but I have in my possession two old type coils of reputable make. Could these be used in place of those specified, and so save me the expense of buying new coils?"—H. N. (Portsmouth).

You could, of course, substitute your coils for those in the Leader, but you would not be building the Leader, which has coils wound in a different manner. Furthermore, we could not guarantee the performance of the receiver. The coils would, however, function quite satisfactorily in this circuit.

TELEVISION MOTOR

"I have a Universal motor rated at 75 volts .2 amps which I intend to use in your Portovisor circuit. Could I run this from the mains? If so, what resistances would I need for dropping the volts and controlling speed?"—R. H. W. (Hollinwood).

You would need a 700-ohm fixed resistance in series with a 100-ohm variable resistance for your purpose. Each of these should, of course, be capable of carrying the current named by you.

LEAKING ELECTROLYTIC CONDENSERS

"I have a mains set in which are included two 8 mfd. electrolytic condensers. Upon inserting a milliammeter in each of the leads to these condensers I find that the current seems to be leaking to earth to the tune of about 20 milliamps. Is this excessive? I suppose I cannot renew the electrolyte in these condensers?"—R. B. (Prestwich).

We should certainly call 20 milliamps an excessive leakage current for the condensers, although we do not know the method which you employed in testing them, nor the type of instrument with which the test was made. Perhaps it would be preferable to let the makers of these components give you their verdict, by sending them for test. It would appear that they have been damaged at some time, and they should be replaced.

FREE ADVICE BUREAU

COUPON

This coupon is available until May 12th, 1934, and must be attached to all letters containing queries.

PRACTICAL WIRELESS, 5/5/34.

Miscellaneous Advertisements

Advertisements are accepted for these columns at the rate of 3d. per word prepaid — minimum charge 3/- per paragraph—and must reach this office not later than Tuesday for the following week's issue. All communications should be addressed to the Advertisement Manager, "Practical Wireless," 8 Southampton Street, Strand, London.

PREMIER SUPPLY STORES

offer the following Set Manufacturers' Surplus New Goods at a fraction of the original cost; all goods guaranteed perfect; carriage paid over 5/-, under 5/- postage 6d. extra (Ireland, carriage forward).

PREMIER SUPPLY STORES announce the purchase of the entire stock of a world-famous Continental valve manufacturer. All the following types of standard mains valves at 4/6 each. H. HL. L. Power. Directly heated 6-watt Pentode. Directly-heated 9-watt Pentode. High magnification Screen-grid, low magnification Screen-grid. Variable-Mu Screen-grid. 250 volt 60 milliamp, full-wave rectifiers.

THE following type 5/6 each. Indirectly heated Pentode, 350 volt 120 milliamp, full-wave Rectifier. 500 v. 120 ditto, 6/6. Dario Battery Valves 4v. filament, Set of 3, consisting of Screen-Grid, Detector and Power or Super-Power, 6/6 the lot. Power or Super-Power, 2/6.

ELIMINATOR Kits, including Transformer, choke, Westinghouse metal rectifier, Dubilier condensers, resistances and diagram, 120v, 20 m.a., 20/-; trickle charger 8/- extra; 150v. 30 milliamps, with 4v. 2-4 amps. C.T. L.T., 25/-, trickle charger 6/6 extra; 250v. 60 milliamps, with 4v., 3-5 amps. C.T. L.T., 30/-; 300v. 60 m.a., with 4 volts 3-5 amps. C.T. L.T., 37/6; 150 volts 50 milliamps, 27/6.

AMERICAN Triple Gang 0.0005 Condensers, with trimmers, 4/11; Premier chokes, 25 milliamps. 20 henries, 2/9; 40 milliamps. 25 hys., 4/-; 65 milliamps. 30 hys., 5/6; 150 milliamps. 30 hys., 10/6; 60 milliamps, 80 hys., 2,500 ohms, 5/6.

HARLEY Pick-up, complete with arm and volume control, 12/6.

BRITISH RADIOPHONE Wire Wound Potentiometers, with mains switch incorporated, 10,000 ohms, 3/6.

PREMIER British-made Meters, moving-iron, flush mounting, accurate, 0-10, 0-15, 0-50, 0-100, 0-250 ma., 0-1, 0-3, 0-5 amps.; all at 6/-.

SPECIAL offer of Mains Transformers, manufactured by Phillips, input 100-120v. or 200-250v. output 180-0-180 volts 40 m.a., 4 v. 1 amp., 4 v. 3 amp., 4/6; 200-0-200v., 4v. 1a., 4v. 3a., 4/6.

ALL Premier Guaranteed Mains Transformers have Engraved Terminal Strips, with terminal connections, input 200-250v. 40-100 cycles, all windings paper interleaved.

PREMIER H.T.8. Transformers, 250v. 60 m.a., rectified with 4v. 3-5a. and 4v. 1a. C.T. L.T., screen primary, 15/-; with Westinghouse rectifier, 25/-.

4V. 3a. C.T., 6v. 2a C.T., 9v. 1a., 12v. 1a., 7/6 each; 4v. 3-5a., 22v. 1a., 8/6 each; 10v. 3a., 14v. 4a., 10/- each.

PREMIER H.T.9 Transformer, 300 v. 60 m.a., with 4v. 3-5a. and 4v. 1a. C.T., L.T., and screened primary, 15/-; with Westinghouse rectifier, 26/-.

PREMIER H.T.10 Transformer, 200v. 100 m.a., rectified, with 4v. 3-5a. and 4v. 1a. C.T., L.T. and screened primary 15/-; with Westinghouse rectifier, 26/-.

PREMIER Mains Transformers, output 135v. 80 m.a. for voltage doubling, 8/6; 4v. 3-4a., C.T., L.T., 2/- extra; Westinghouse rectifier for above, giving 200v. 30 m.a., 8/6.

PREMIER Mains Transformers, output 250-0-250v. 60 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a (all C.T.); with screened primary, 15/-.

PREMIER Mains Transformers, output 350-0-350v. 90 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 1-2a. (all C.T.), with screened primary, 15/-.

PREMIER Mains Transformers, output 400-0-400v. 100 m.a., 4v. 4-5a., 4v. 2-3a., with screened primary, 15/-.

PREMIER Auto Transformers, 100-110/200-250v., or vice versa, 100-watt, 10/-.

MULTI Radio Output Transformers, 4/6. Twin Screened Wire 3d. per yard.

CENTRALAB Potentiometers, 50,000, 250,000 half meg, any value, 2/-; 200 and 400 ohms, 1/-.

RELIABLE Canned Coils with Circuit, accurately matched dual range, 3/- per coil. Please state whether Aerial or H.F. required. Ditto iron core, 3/6.

PREMIER L.T. supply Units, consisting of Premier Transformer and Westinghouse rectifier, input 200-250v. A.C., output 2v. ½ amp., 11/-; 8v. ½ amp., 14/6; 8v. 1 amp., 17/6; 15v. 1 amp., 19/-; 6v. 2 amp., 27/6; 30v. 1 amp., 37/6.

MAGNAVOX D.C. 152, 2,500 ohms, 17/6; D.C. 154, 2,500 ohms, 12/6; D.C. 152 Magna, 2,500 ohms, 37/6; all complete with humbucking coils; please state whether power or pentode required; A.C. conversion kit for above types, 10/-; Magnavox P.M., 7in. cone, 18/6. Ditto 9in. cone, 29/6.

GRAMPIAN M.C. Loud-speakers, 2,500 ohm field, 9in. cone, handles 5 watts; 21/-.

GRAMPIAN P.M. Loud-speakers, 9in. cone, handles 4 watts; 18/6.

POLAR 3-Gang STAR, .0005, manufacturers type. Fully screened, 7/6, with trimmers, 1/6 extra.

(Continued at top of column three)

Easy Terms

We deal with you direct

W.B.P.M. 4 MICROLODE MOVING-COIL SPEAKER

SEND FOR IT ON 7 DAYS' TRIAL

With Switch-controlled multi-ratio input transformer.

5/- DOWN

Send only 5/- for 7 days' trial. If approved, balance in 8 monthly payments of 5/3. Cash or C.O.D. Carriage Paid, £2/2/0. W.B.P.M.6. Send only 2/6. Balance in 8 monthly payments of 4/3. Cash or C.O.D. Carriage Paid, £1/12/6.

BLUE SPOT 29 P.M. MOVING COIL SPEAKER. A very popular P.M. Moving-coil Speaker for operation from Power or Pentode. Send only 2/6 for 7 days' trial. If approved, balance in 8 monthly payments of 4/3. Cash or C.O.D. Carriage Paid, £1/12/6. **2/6** With Order.

ROLA CLASS "B" AMPLIFIER UNIT. Complete Class B Amplifying Unit, with Valve and Rola P.M. Moving-coil Speaker. Send only 5/- for 7 days' trial. If approved, balance in 11 monthly payments of 6/6. Cash or C.O.D. Carriage Paid, £3/11/0. **5/-** With Order.

ATLAS ELIMINATOR. Model C.A.25. Suitable for all outputs, including Class B and Q.P.P. Send only 3/6 for 7 days' trial. If approved, balance payable in 11 monthly payments of 5/6 (or cash in 7 days £2/19/6.) Carriage Paid. D.C. Model 15/25. Cash or C.O.D. Carriage Paid, £1/19/6, or 4/- down and 10 monthly payments of 4/-. **3/6** With Order

N.T.S. CLASS 'B' SPEAKER-AMPLIFIER

SEND FOR IT ON 7 DAYS' TRIAL

Gives Seven Times the Volume. Ready Assembled with Class "B" Valve.

5/- DOWN

Send only 5/- for 7 days' trial. If approved, balance in 11 monthly payments of 5/6. Cash or C.O.D. Carriage Paid, £2/19/6. Simply plug-in to your existing battery set.

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New Times Sales Co.

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FOR BETTER RADIO USE BETTER VALVES

More volume, better tone, greater selectivity, longer life. 362 patents reduce production costs, you reap the benefit.

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Post free from **3/6**

"362" BATTERY TYPE VALVES: H., HL., & L. 3/6. Power, 4/-. Super-Power, 4/6. S.G., 7/6. Var. Mu. 7/6. "Class B," 9/-. Pentode Type, 10/-. *(Metallised, 3d. extra.)*

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6D.

(Continued from foot of column one)

WESTERN ELECTRIC Condensers, 250v. working, 2 mfd., 1/-; 1 mfd., 6d.; 4 mfd., 2/-; 1 mfd., 400v., 1/-; 2 mfd., 1/6.

B.T.H. Truespeed Induction Type (A.C. only) Electric Gramophone Motors, 100-250v.; 30/-, complete. Type YH 100/250v. A.C. or D.C., 42/-.

SPECIAL Offer of Wire Wound Resistances, 4 watts any value up to 10,000 ohms, 1/-; 8 watts, any value up to 15,000 ohms, 1/6; 15 watts, any value up to 50,000 ohms., 2/-; 25 watts, any value up to 50,000 ohms, 2/6.

CYLDON Capacitors (Double Trimmer), 1/-. Utility .0005 2-gang Bakelite Condensers, concentric Uniknob Trimming and Disc Drive, complete, 3/6.

EDISON BELL Double Spring Gramophone Motors, complete with turntable and all fittings, a really sound job, 15/-.

AMPLION Cone Loud-speaker Units, 1/9, complete with 12in. cone and chassis, 3/11 each. Worth treble. Larger Unit with 12in. chassis, 5/9.

ORMOND Condensers, 0.0005 2-gang, semi-shielded, 2/6; brass vanes, with trimmers, 3/6.

WIRE Wound Potentiometers, 15,000 ohms, 1/6; 50,000 ohms, 2/-; 500,000 ohms, 3/6.

HOME Radio Microphone, complete, 5/-; simply plug in to pick-up terminals.

A LARGE Selection of Pedestal, table, and radiogram cabinets, by best manufacturers, at a fraction of original cost for callers.

WESTERN ELECTRIC Mains Transformers, 300-0-300v. 60 m.a., 4v. 1-2 amp., 4v. 2-3 amp. 8/6. 500-0-500v. 150 m.a., 4v. 3-5a., 4v. 2-3a., 4v. 2-3a., 4v. 1a. C.T., 4v. 1a. C.T., 19/6.

RELIABLE Intervalve Transformers 3-1 or 5-1, 2/-. Dubilier, .05 mica, 1/9.

T.C.C. Condensers, 250v. working; 2mfd., 1/9; 1,000 ohm, 150 m.a., variable resistance, 2/-.

T.C.C. Electrolytic Condensers, 440 volts working, 4 mf. or 8 mf., 3/-; 15 m.f., 50 v. working, and 50 mf. 12v. working, 1/-; 25 mf. 25 v. working, 1/3.

KOLSTER-BRANDES Mains Transformers, Input 200-250 volt, output 350-0-350v. 100 m.a., 4v. 1 amp., 4v. 2 amp., 4v. 3-4 amp., 10/-. Ditto, input 100v., 5/-.

ORMOND Brass Variable Condenser, .0005 complete with knob-dial 2/-, with slow motion 3/-.

R. & A. Cone Unit and Chassis, a really sound job, 10in. diameter, 6/6.

H.M.V. Block Condensers, 400v. working; 4 x 4 x 1 x 1 x 1 x 1 x 0.1 x 0.1 x 0.1, 6/-; 4 x 2 x 1 x 1 x 1 x 0.5, 4/6.

DUBILIER Condensers, 2 mf. 1,200v. working, 4/-; 8 mfd. dry electrolytic, 450v. working, 3/-.

THE Following Lines 6d. each or 5/- per dozen—Chassis valve holders, 5 or 6 pin, screened screen-grid leads, any value 1-watt wire end resistances, wire end condensers, 0.0001 to 0.1, trimming condensers, T.C.C. 6 mfd. 50 v. electrolytics.

PLEASE mention PRACTICAL WIRELESS when ordering.

PREMIER SUPPLY STORES

20-22, High Street, Clapham, S.W.4, MACaulay 2188. Close 1 o'clock Wednesdays; open to 9 o'clock Saturdays. Nearest Station, Clapham North Underground.

THE following Unused set Manufacturers' surplus, all goods guaranteed perfect; immediate delivery.

FERROCART coils, G1-G2-G3 with switch, 30/-. G11-G12-G13-G14 with switch, 36/-.

DUBILIER or Eric 1-watt resistors, 7d. 2-watt, 1/3.

MARCONI K19 pick-ups, 22/6. Westinghouse rectifiers, HT.8, 9/6; H.T.9, H.T.10, 11/-; L.T.5, 11/6.

REGENTONE transformers for H.T.8 or H.T.9 with 4v., 4a. L.T. winding, 7/6. Wards transformers, output 350-0-350v., 60ma., 4v. 4a. 4v. 2a. 12/6.

ELIMINATORS, outputs 150v. 25ma., S.G. and Detector. D.C. type, 12/6; A.C. type, 24/-.

DUBILIER dry electrolytic condenser, 8mf. or 4mf., 500v. working, 50v., 50mf., 3/6. B.T.H. pick-up tone-arms, 3/-.

ALL types of brand new American valves in stock, first-class makes, guaranteed.

47, 35, 51, 89, 18, 19, 46, 59, 6A7, 15, 42, 41, 38, 39, 78, 75, 57, 58, 24, 44, 36, 35, 43, 12/-.

UX171A, UX199, UX280, UX245, UX226, UY227, 8/-. UX250, UX281, UX210, 18/-.

B.T.H.-RK 6-volt speakers, suitable for P.A. work, 27/6. A.C. type with field rectifier, £2/7/6.

MAGNAVOX speakers, complete with hum-bucking coils, output transformers, etc., 152 (9in. cone), 24/-; 154 (7in. cone), 16/3; Rola F.6 (7in. cone), 17/6, with their 2,500 or 6,500 ohm fields. Magnavox P.M.254, 18/6. Carriage paid, cash with order or C.O.D. Send for list.

WARD, 2nd floor, 45, Farringdon Street, London, E.C.4. Telephone: Holborn 9703.

7/6 A.C. BATTERY CHARGER

Kit "A," ¼ amp., consists of Tantalum, 1/3; Mains Transformer, 4/6; other parts, 1/3; 7/6 complete.
Kit "B," as "A" but charging at 1 amp., 10/6 post free.
Kit "C," with Westinghouse Rectifier, ¼ amp., 12/6 post 6d.
FROST RADIO CO., 21, Red Lion St., E.C.1.

SOUTHERN RADIO'S Bargains.—Set manufacturer's guaranteed surplus.

COILS.—Igranic iron-core band-pass 3 coils unit. Screened. Ganged on base with switch, 16/- (list 33/-).

LISSEN Super-het 3 coils unit. Screened. Ganged on base with wave-change and filament switches. Type LN5181 for battery or mains, 12/6 (list 30/-).

LEWCOS Coils.—Types O.S.C./126; T.O.S.; I.F.T.; T.B.F. B.P.F. band-pass filter, 4/- (list 12/-). Varley Constant Square Peak Coils 4/- (list 15/- BP5). Varley H.F. Intervalve Coils 3/- (list 8/6 BP6).

VARIABLE Condensers.—Lotus 3-gang 0.0005, 12/6; Lotus 2-gang, 0.0005, 8/6; Lotus Dyblock single, 0.0005, 4/9 (list 9/6); all condensers are with dials, escutcheons, knobs, fully screened trimmers, and boxed; Hydra block condenser, 16 mfd. (2+2+8+2+1+1), 1,000 v. D.C. 7/- each; 20 mfd. (2+2+2+2+2+2+2+2+1+1+1+1), 1,500 v. D.C., with terminals, 11/6; Dubilier 4 mfd. (2+1+1), 1,000 v. D.C., 2/0; 4.5 mfd. (2.25+2.25) 1,000 v. for mains noise suppression, 3/-; Fixed 4 mfd., 2/3; 2 mfd., 1/6; 1 mfd., 1/-.

BRITISH RADIOPHONE Class B Super-Het. 5 Valve Chassis. Wired ready for use. Complete with 5 Mullard Valves. £4/19/6. Brand New and boxed (list 12 guineas).

SPEAKERS.—Blue Spot Permanent Magnet with universal transformer for power, super power, pentode and Class B, 23/- (list 39/6).

BLUE Spot. Genuine 100U, inductor speaker on chassis, 13/6 (list 39/6).

READY Radio D.C. mains energised moving-coil speakers with Humbuckling coils and universal transformers. All voltages, 16/6 (list 30/6). Permanent Magnets 18/6 (list 42/6).

S.T.400 kits, all specified proprietary components, £2/19/6 (list £4/17/6).

SPECIFIED Cabinets for Ready Radio Meteor kits, 17/6. "303" kits, 13/6.

IGRANIC Complete Tuning Unit, known as "Igranipak," for A.C. mains, 27/- each (listed 57/6). Brand new.

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SPECIAL Offer Lewcos Spaghetti Resistances, all sizes, in original sealed boxes, 4/- dozen, assorted; price to trade, 26/- per gross.

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MAINS Transformers.—Full list of Mains transformers and chokes sent Free. Specials supplied in 3 days. All transformers and chokes guaranteed 12 months.

MISCELLANEOUS.—Rotorohm and Radiophone volume controls, all values, 3/- each: with switch, 3/3 (list 10/6); Hellesen's 8 mfd. electrolytic condensers, 2/9 each; Westinghouse metal rectifiers, H.T. 6, 7, 8, 9/3 each; Ferranti chokes, 20 henry 60 m.a., 6/9 each; Lewcos superhet 8-way bases, complete with valve-holders, grid leak, fixed condenser, type "48," 2/- each.

ALL Goods Guaranteed and Sent Carriage Paid.

BRANCHES at 271-275, High Rd., Willesden Green, N.W.10, and 46, Lisle St., W.C.2; please send all post orders to 323, Euston Rd., N.W.1.

SOUTHERN RADIO, 323, Euston Rd., London, N.W.1 (near Warren St. Tube). 'Phone: Museum 6324.

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H. A. WIRELESS for everything radio.

FIVE valve chassis sets, complete with PM12M, PM22A, PM1HL, PM2DX and PM2B Mullard Valves. Carriage paid, £3/19/6. Send for specification.

LOTUS 2-gang, 8/3; single, 5/-; 66K, list 15/-, 6/6; Twin magnet adjustable cone unit and chassis list, 22/6, 10/-; Double reading voltmeter, panel, 0-6, 0-120 volts, 4/6.

REGENTONE Eliminators, 33⅓ per cent discount; Celestion PPM list, 45/-, 19/6; W.B. Class B, 15/-; Igranic 3-1 or 5-1 transformers, 3/-; Marconi two-valve battery set, complete, 44/-.

MAY we quote you for the latest sets, components, etc. All parts supplied for AC Leader 3 and other PRACTICAL WIRELESS sets. Television parts supplied. Please note we do not supply secondhand goods, and all goods are brand new and guaranteed. Send for lists. Cash with order or C.O.D.

H. A. WIRELESS (Shoreditch), Dept. MO1, 9 and 13, Hackney Road, Shoreditch, E.2. Telephone—BIShopsgate 8169 (PBX).

RADIOMART PRACTICAL WIRELESS Short-Wave Convertor. New and boxed Eddystone I.F.U.'s, 2/6. .0001 short-wave variables, 1/9. All short-wave gear lowest prices.—Radiomart, 19, John Bright Street, Birmingham.

TELEVISION.—The "Salter" Junior motor and 20in. new type scanning Disc, 32/6 nett.—John Salter, Featherstone Buildings, High Holborn, W.C.

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WOBURN RADIO offers special purchase of Westinghouse Rectifiers (new); H.T. 7, 8, 9, 9/-; H.T. 10, 10/-; L.T. 5, 10/6. 10hy. 100ma. Chokes, 4/- each.

DUBILIER dry electrolytics, 4 mfd. and 8 mfd., 500v., 3/6; 50 mfd., 50v., 3/6. Wego Condensers, 750v. test, in bakelite, 1 mfd., 1/-; 2 mfd., 1/3; 4 mfd., 2/3. Ready Radio and Lotus Diffs., 0003, 00035, 00015, 1/-. 0005 reaction, 1/-.

ELIMINATORS specially manufactured for us, D.C. 3 tappings, 25 ma., 11/9; A.C., 25/-. Guaranteed for 12 months.

CLASS "B" Drivers and Chokes, 9/6 per pair, with suitable valve (BVA) and 7-pin holder, 19/11; Binocular Chokes, 1/3; H.F. Chokes, 1/-; Valveholders, 4/5-pin chassis type, 1/6 half doz.; 7-pin, 6d. Columbia L.F. Transformers, 3/1 ratio, 3/-. Tubular Condensers 0.01, 0.1 and 0.05, 6d. Large Stock of Erie and Dubilier Resistances. Lucerne Dual Range Iron-cored coils, 3/6; Eston Iron-cored coils with circuit, 3/-.

SINCLAIR P.M. Speakers with universal transformer, or Class B 7in. Cone, 12 months' guarantee, 16/6. Sinclair Matched pairs, one 9in. one 7in. P.M.'s or Energised, 35/- (carr. 1/-).

ANYTHING on H.P. above 40/-. Quotations for Kits and Components by return. Trade Enquiries Invited.

WOBURN RADIO CO., 7, Woburn Buildings, W.C.1. Euston 1571. (Near King's X and Euston Stns. Back of St. Pancras Church.)

ERICSSON 3/1 L.F. Transformers. List price 17/6. New and guaranteed. Our price 2/3 post free U.K.

VARLEY Constant Square Peak Band Pass Coils. Type B.P.5. Complete with switch, brand new in *makers* original carton. With full instructions and diagrams. List price 15/-, our price 3/9 post free U.K.

POLAR 3-gang Star Minor Condenser with Trimmer. Brand new. List price 18/9. Our price 7/6 each post free U.K.

PIONEER Radio, Coptic Street, London, W.C.1. Museum 9606.

VALVES REPAIRED whether burnt out or broken. 2v. H.F., L.F., Det., R.C., 2/9, Power, 3/7½, S.P., 4/1, S.G., Pentode, 6/6, Rect., 4/9. Satisfaction guaranteed or money refunded.—Valve Repairing Company, 1a, Sumner Street, London, S.E.1.

REPAIRS—REWINDING—OVERHAULS. New cones and centres fitted any make M/c chassis, Mc/s rewound. Mains transformers, etc. Receivers converted D.C. to A.C. Write Repair Dept. C.

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ELIMINATORS, 25 m.a. D.C. 10/-, A.C. 21/-; Transformers 3-1, 5-1, 1/9. British-Made Valves H.F., L.F. and Dect. 1/9. Power 2/-. S.G. 5/-. Carriage Paid Cash with Order.—Radio Electrical Supplies, 237, Camberwell Road, London, S.E.5.

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